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1570BB

HFC PLATFORM
TECHNICAL SYSTEM DESCRIPTION

CONTENTS

1 SYSTEM DESCRIPTION HFC MODULES

1.1 System Overview

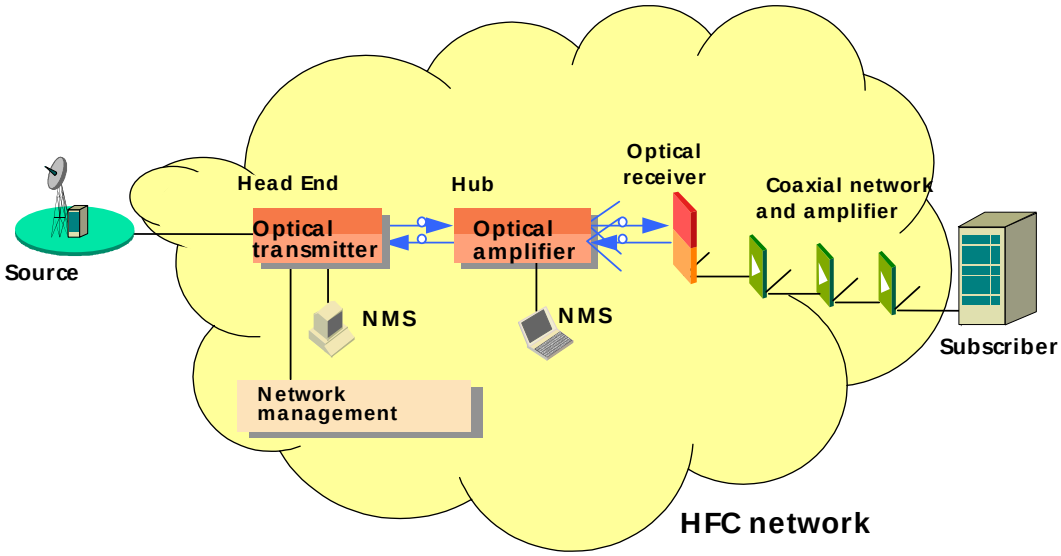


Figure 1-1: System Overview

The HFC transmission system from BKtel systems GmbH & Co. KG is destined for transparent optical and electric transmission of analogue broadband signals (CATV, digital television, cable modem and cable-based telephony) over cable networks.
The HFC transmission system is in full harmony with the international standards on EMC and product safety and with EU conformance guidelines.

Product Family

The product family includes various types of optical transmitters, optical amplifiers, coaxial amplifiers and network management facilities to meet the requirements of an advanced HFC network.
The product family is of modular design offering a wide range of capabilities. It is flexible enough to allow the deployment of different network structures in any type of network topology at low costs.

Technology

The system uses the 1550 nm technology. A wavelength of 1550 nm is a suitable way of bridging distances of up to 90 km and more between feeder point and optical receiver.
The system works in a distribution frequency range of 47 to 870 MHz and an upstream channel frequency range of 5 to 65 MHz.

Reliability

Introducing automatic stand-by circuitry and/or alternate path circuitry/ring topology can even enhance the high reliability, which is achieved by high-quality components. The availability of these options plays an important part where interactive services are offered.

Interactive Services

The standard HFC network offers a purely distributive service. Interactive services used in TV programme transmission such as video-on-demand or teleshopping require interaction between subscriber and service provider, for which an upstream channel is necessary.
Apart from the applications mentioned above, there are interactive services such as online services, Internet gateway, telecommunication services which can be run independently of TV transmission over the network.

Network Management

A network management function is provided for all applications to monitor all active system elements. The offer includes customized solutions ranging from basic to complex and centralized network management.
The modular network management concept allows the implementation of all function packages to suit the customer's current needs.

Network Architectures

The HFC network is composed of three sub networks (refer Figure 1-2 and Figure 1-3):

Transport network (between head end and hub)

Access network (between hub and coaxial amplifier output)

Customer premises network (in subscriber building).

The BKtel HFC system covers the transport network and the access network. The reference points of the system include the reference feeder point on the head end and the output of the last coaxial amplifier point or to any further sub network (building distribution network).
The transport network begins at the head end and ends at the hubs. It consists of rings or point-to-point connections between head end and hub or point-to-multipoint connections.
The Access network begins at the hub and ends at the coaxial amplifier output. Optical receivers (fibre nodes) to which the active coaxial network is connected terminate the optical distribution network.
The customer premises network consists of the distribution system in the building extending from the transfer point to the wall socket outlets; this customer premises network is not usually within the network operator's responsibility.
The transport and Access networks may take any form of system architecture including or excluding path and/or equipment redundancy. Both star like and ring structures in particular can be operated by means of the HFC system.

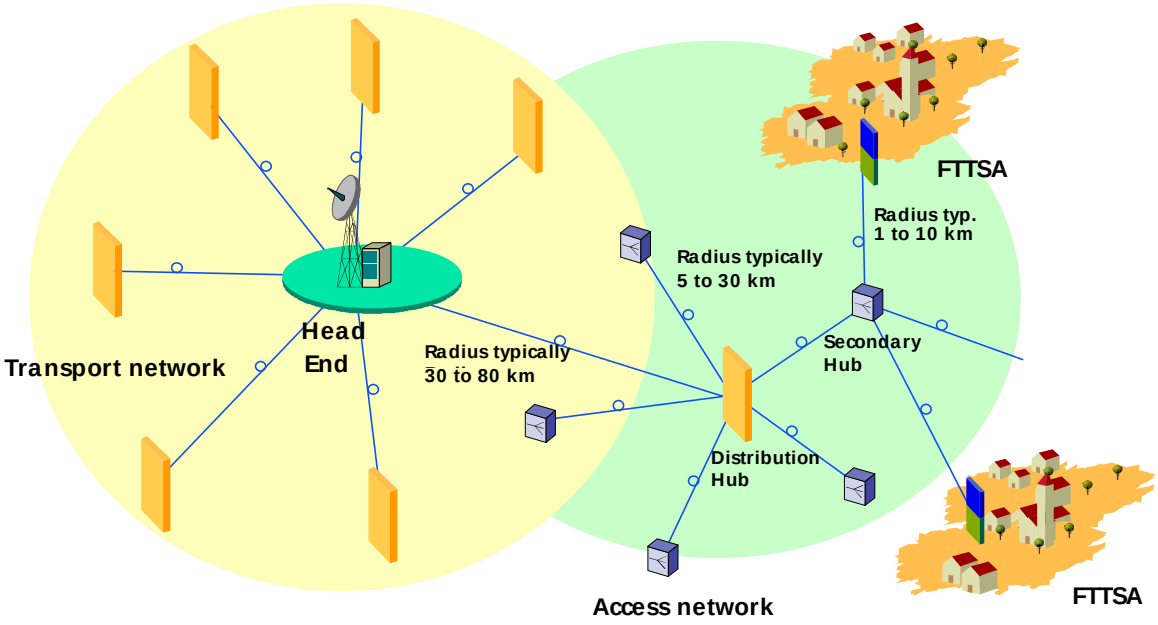


Figure 1-2: Schematic view of a star type network architecture

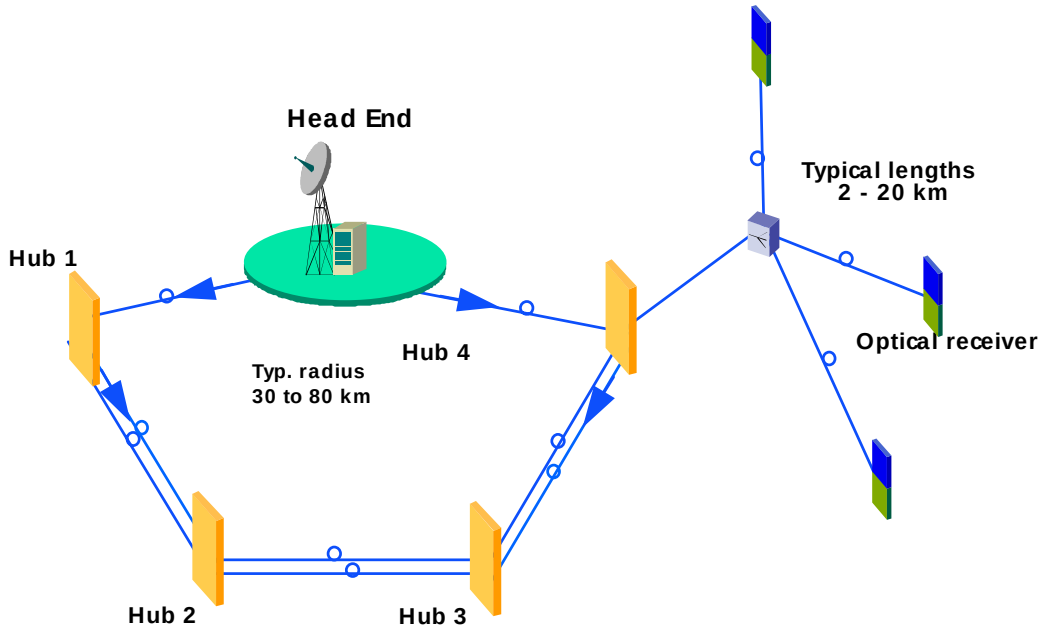


Figure 1-3: Schematic view of a ring-type network structure with redundancy

1.2 Downstream Functional Principle

1.2.1 System Overview of Downstream Direction

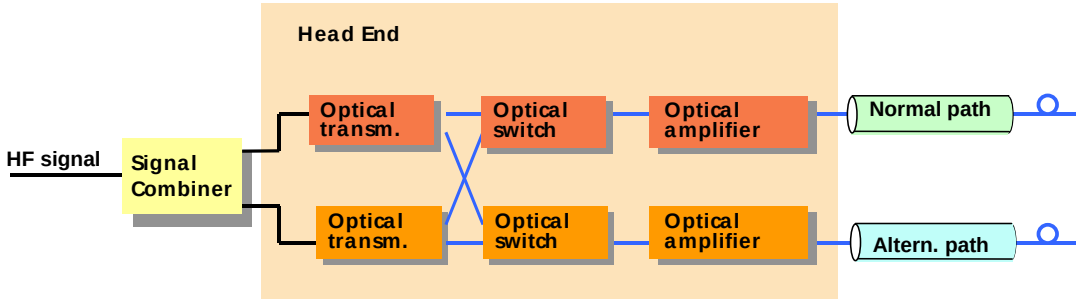


Figure 1-4: System overview of downstream direction in the head end (example)

The electric signal is converted to an optical signal in the optical transmitter after the signal-combining network described in section 1.2.3. The optical transmitter signal is fed into an optical amplifier so as to bridge extended fibre lengths. The devices can be duplicated and interconnected via optical switches for the purpose of device and/or path redundancy.

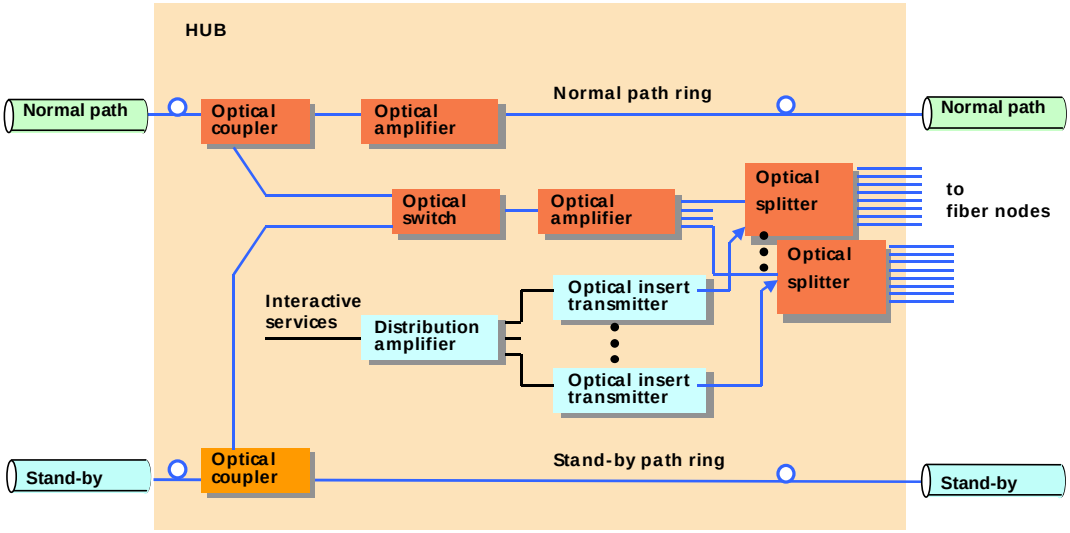


Figure 1-5: System overview of distribution direction in the hub (example)

Hubs receive their optical signal by coupling a portion of the ring fibre optical power into an optical EDFA amplifier to further distribute the signal. An optical switch provides the selection between nominal and redundant path.

It is possible to inject an additional optical signal into the distribution outputs. Optical signal injection is explained in section 1.2.5.

1.2.2 Downstream Distribution Printed Board Assemblies

Name	Explanation
OTXE090	Optical CATV transmitter for extended lengths
SCUAPPC-B	Optical switch for optical transmitter
SCUACCP-B	Optical switch for optical distribution amplifier
OAH01x13	Optical distribution amplifier 1x13dBm
OAH01x16	Optical distribution amplifier 1x16dBm
OAH04x13	Optical distribution amplifier 4x13dBm
OAH06x13	Optical distribution amplifier 6x13dBm
OAH08x13	Optical distribution amplifier 8x13dBm
OAH02x16	Optical distribution amplifier 2x16dBm
OAH03x16	Optical distribution amplifier 3x16dBm
OAH04x16	Optical distribution amplifier 4x16dBm
AOS04	Optical coupler with 4 dB branching loss
AOS05	Optical coupler with 5 dB branching loss
AOS06	Optical coupler with 6 dB branching loss
AOS07	Optical coupler with 7 dB branching loss
AOS08	Optical coupler with 8 dB branching loss
AOS09	Optical coupler with 9 dB branching loss
AOS10	Optical coupler with 10 dB branching loss
AOS12	Optical coupler with 12 dB branching loss
AOS14	Optical coupler with 14 dB branching loss
OS16PP	Optical X-branch 1:16 (1+15 inputs)
OS12PP	Optical X-branch 1:12 (9 inputs)
OS08PP	Optical X-branch 1:8 (1+7 inputs)
OS04PP	Optical X-branch 1:4 (1+3 inputs)
SOTXD815A	Optical insert transmitter 7dBm
SOTXD815B	Optical insert transmitter 3dBm
NECH	HMS Net Element Controller for HEC
NECUH	HMS Net Element Controller Upstream for HEC
LONI	Interface
HEC	HMS Head End Controller for head end controller
XCONA	Optical HMS Controller for hub

Table 1: Hub printed board assemblies

1.2.3 System Overview of Signal Combiner

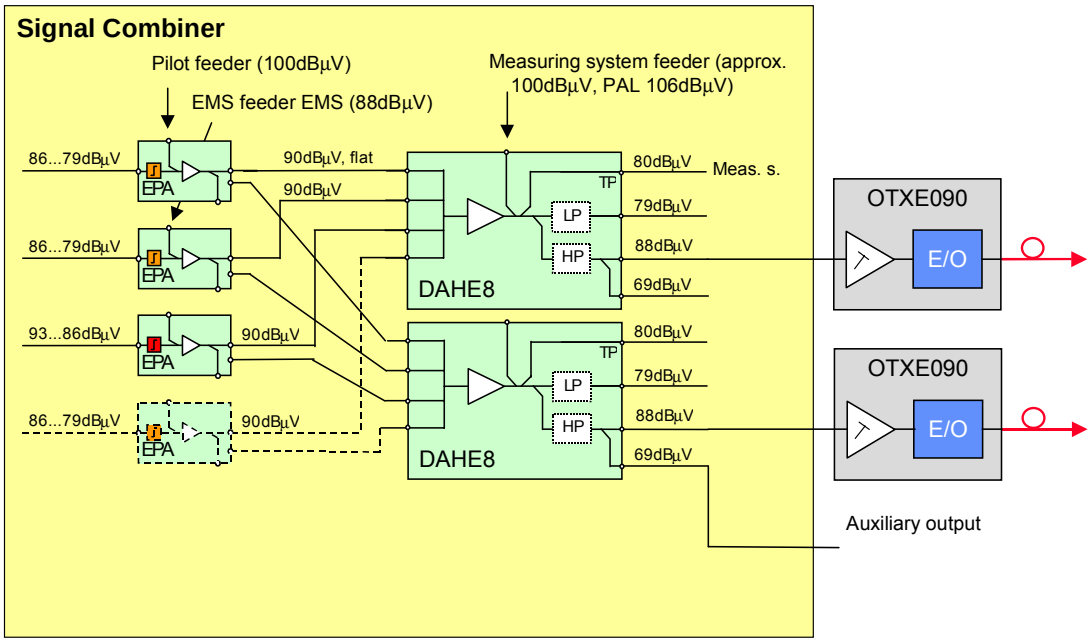


Figure 1-6: System overview of signal combiner in the head end (example)

The interconnection and distribution of different received signals is accomplished by a modular signal combiner, which is composed of the EPA and DAHE modules in BK equipment practice in a flexible manner. The input and output interfaces offered include:

- Four main inputs that are able to feed signals in the 47 to 862 MHz range. These main inputs can be equipped with plug-in equalizers and attenuators according to the length of the indoor cable connected. The level after equalization is 79 dBµV.
- Further inputs with 25 dB input coupling attenuation to feed the pilot signal (100 dBµV for –4 dB level reduction) and the EMS signal (88 dBµV for –16 dB level reduction).
- Another input for measured signals of a measuring system (for example Stealth, 100 dBµV for –6 dB level reduction)
- Two main outputs with a level of 88 dBµV to drive optical transmitters (without band I where a highpass filter is equipped)
- Two auxiliary outputs with a level of 69 dBµV to drive electric AB amplifiers (without band I where a highpass filter is equipped)
- Two test outputs with a level of 80 dBµV to connect measuring equipment and a Stealth measuring system
- Two outputs with a level of 79 dBµV with band I (however without bands IV and V where a 450 MHz lowpass filter is equipped).

The filters used in the DAHE PBA are plug-in types to ensure future safety and flexibility of the switching network.

Equalizers may be required in the EPA PBA at the input of the signal combiner in Figure 1-6 to allow the input of signals on longer indoor cables. These equalizers are installed on the EPA800 PBA; the type used depends on the length of the signal input cable. The cable loss $a_{indoor\ cable}(f)$, at 20°C, is valid for indoor cable type (e.g. type 1zKx, 75 Ω S-02YKDY of TL 5805-3118 of DTAG):

$$a_{indoor\ cable}(f)/100m = 0.225dB \times (\sqrt{f}/MHz) + 0.0013dB \times (f/MHz)$$

1.2.4 Signal Combiner Printed Board Assemblies

Name	Explanation
EPA800C	Equalizing amplifier
EQ*ATT*	Adjustable plug-in equaliser and attenuator
EQ*1DB	Plug-in EPA equalizing filter 1 dB (86dBµV)
EQ*2DB	Plug-in EPA equalizing filter 2 dB (86dBµV)
EQ*3DB	Plug-in EPA equalizing filter 3 dB (86dBµV)
EQ*4DB	Plug-in EPA equalizing filter 4 dB (86dBµV)
EQ*5DB	Plug-in EPA equalizing filter 5 dB (86dBµV)
EQ*6DB	Plug-in EPA equalizing filter 6 dB (86dBµV)
EQ*7DB	Plug-in EPA equalizing filter 7 dB (86dBµV)
EQ*1DBAT	Plug-in EPA equalizing filter 1 dB (93dBµV)
EQ*2DBAT	Plug-in EPA equalizing filter 2 dB (93dBµV)
EQ*3DBAT	Plug-in EPA equalizing filter 3 dB (93dBµV)
EQ*4DBAT	Plug-in EPA equalizing filter 4 dB (93dBµV)
EQ*5DBAT	Plug-in EPA equalizing filter 5 dB (93dBµV)
EQ*6DBAT	Plug-in EPA equalizing filter 6 dB (93dBµV)
EQ*7DBAT	Plug-in EPA equalizing filter 7 dB (93dBµV)
ATT*0DB	Plug-in attenuator 0 dB for EPA
ATT*1DB	Plug-in attenuator 1 dB for EPA
ATT*2DB	Plug-in attenuator 2 dB for EPA
ATT*3DB	Plug-in attenuator 3 dB for EPA
ATT*4DB	Plug-in attenuator 4 dB for EPA
ATT*5DB	Plug-in attenuator 5 dB for EPA
ATT*6DB	Plug-in attenuator 6 dB for EPA
ATT*7DB	Plug-in attenuator 7 dB for EPA
ATT*8DB	Plug-in attenuator 8 dB for EPA
ATT*9DB	Plug-in attenuator 9 dB for EPA
ATT10DB	Plug-in attenuator 10 dB for EPA
ATT11DB	Plug-in attenuator 11 dB for EPA
ATT12DB	Plug-in attenuator 12 dB for EPA
ATT13DB	Plug-in attenuator 13 dB for EPA
ATT14DB	Plug-in attenuator 14 dB for EPA
ATT15DB	Plug-in attenuator 15 dB for EPA
DAHE8A	Coupling amplifier
DFLP450A	Lowpass filter for DAHE8
DFHP86A	Highpass filter for DAHE8

Table 2: Signal Combiner printed board assemblies

1.2.5 Optical Signal Injection

Optical signal insertion of Targeted Services signals in the Optical Transmission Node is performed with either 1310 nm signal insertion or 1550 nm insertion technology, which is both proved BKtel technology. It allows for flexible upgrade scenarios and variable signal insertion concept (cost-effective start at the beginning with few equipment and equipment expanding according to actual service evolution).

Optical signal insertion means using an optical X-coupler for injecting an additional optical input signal (see Figure 1-7). As a result, the splitter outputs carry two wavelengths. These two optical signals are treated as one combined optical signal by the optical receiver's PIN diode, which does not distinguish but adds both signals and converts it together into an electrical RF signal. Thus, the video and the Targeted Services signal are provided at the Fibre Node RF output.

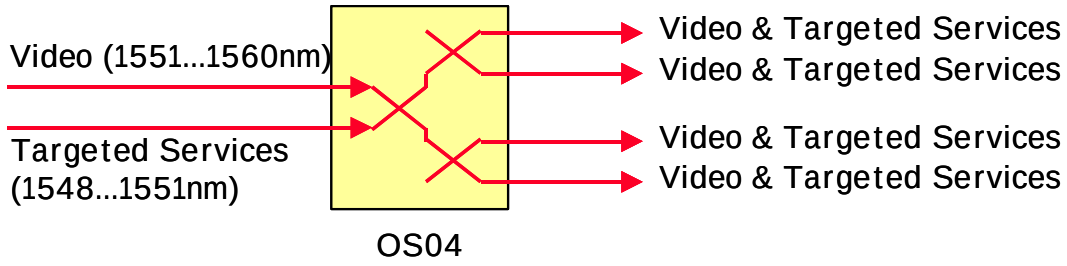


Figure 1-7: Principle of Optical Signal Insertion

Usually, Targeted Services' optical signal is injected with a power back off compared to Video optical signal depending on injected signal load. Yet, the splitter loss for Video and Targeted Services' signal is equal. Therefore, the optical splitter loss is not affected by optical signal insertion especially concerning Video signal leading to very flexible and re-configurable insertion topologies without interrupting running Video service.

The whole X-splitter is internally built as a cascade of 2-splitters. Therefore, several input stages exist. Depending on the used input stage for Targeted Signal insertion, the number of NOs with the same combined optical signal varies. At the deepest stage (using the last 2-splitter, compare Figure 1-8), only 2 outputs of the X-splitter provide the same combined optical signal.

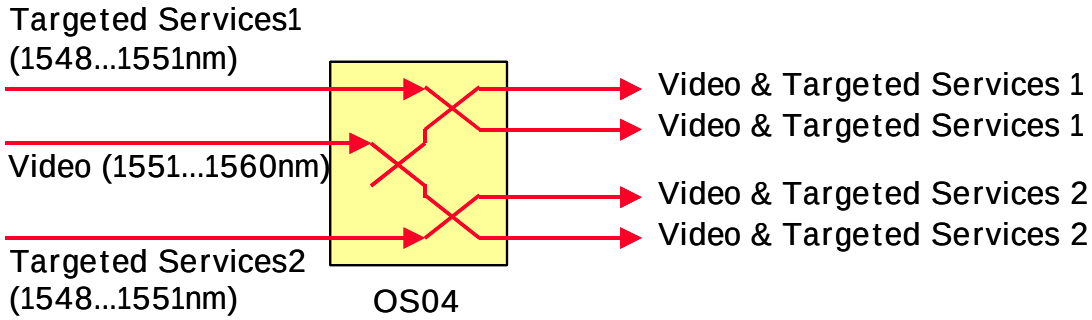


Figure 1-8: Optical Signal Insertion at deeper stages

Figure 1-9 shows the complete passive optical X-splitters, which are used for optical signal injection. BKtel product portfolio comprises OS04PP, OS08PP, OS12PP and OS16PP.

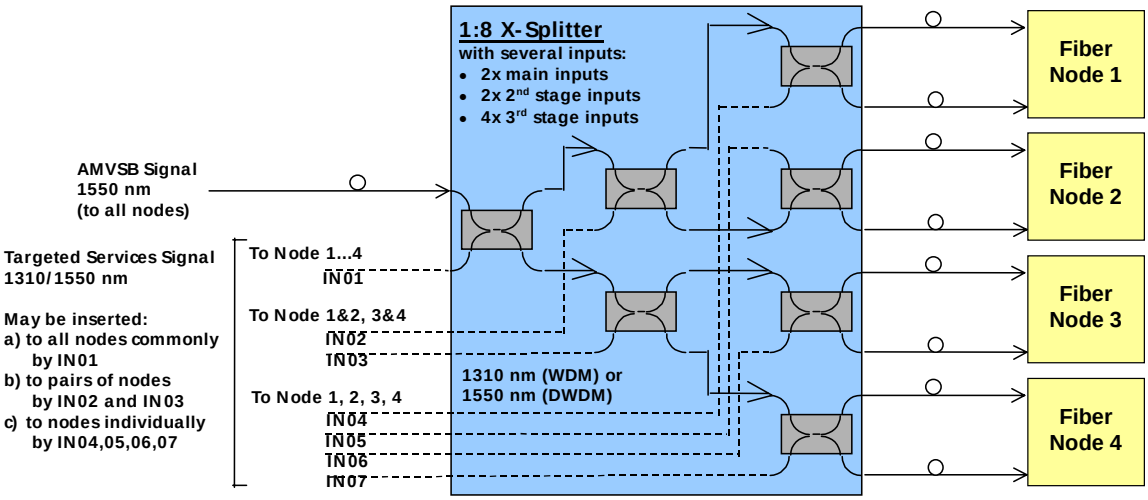


Figure 1-9: Flexible Optical Signal Insertion by X-splitters (example OS08PP)

1.3 Functional Principle of Opt. Upstream Channel (Transport Network)

1.3.1 System Overview of Optical Upstream Channel

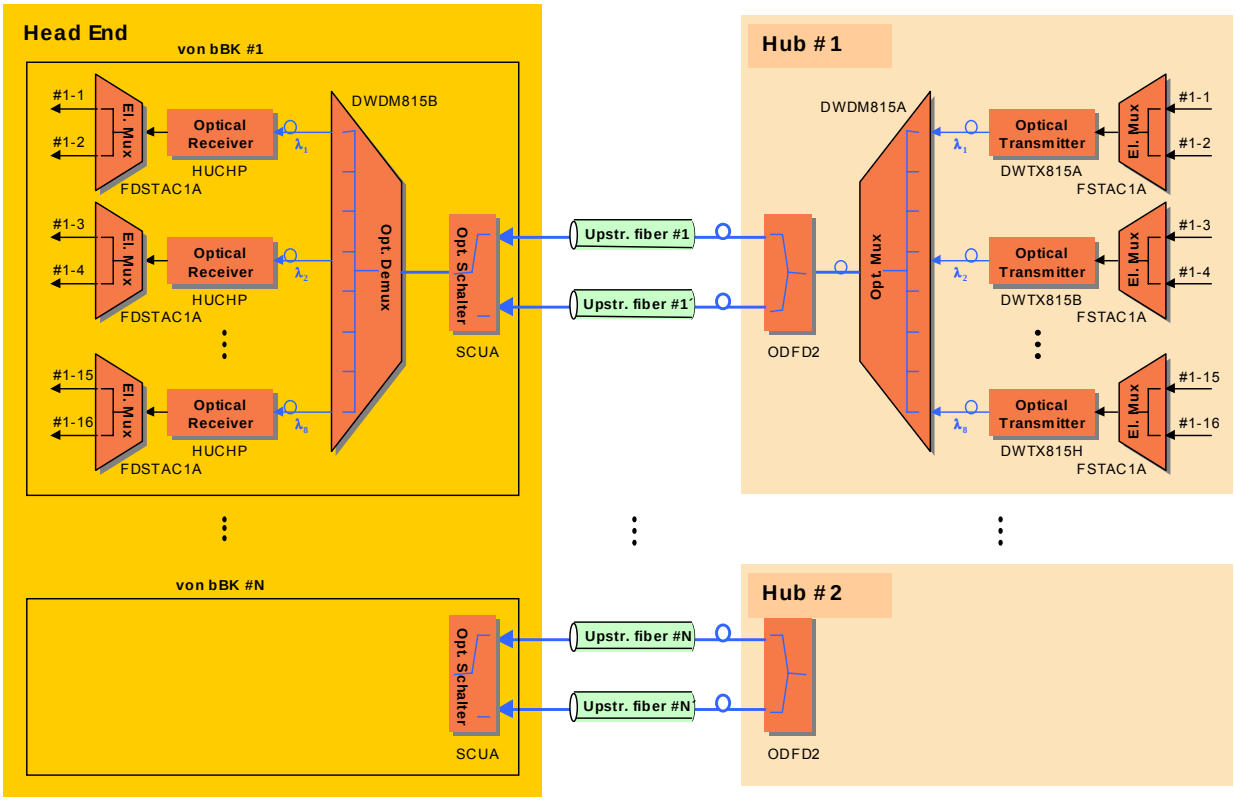


Figure 1-10: System overview of optical upstream channel in the hub (example)

The upstream channel signals may be returned optionally from the distribution points to the head end. Both path redundancy and wavelength division multiplexing can be provided to ensure protected transmission, on the one hand, and to minimize the number of required fibres, on the other.

The optical switch selects the normal fibre and carries it to a passive optical wavelength division demultiplexer to which the optical receivers are connected. The electric signals are applied to the output of the optical receivers for further use by interactive equipment (cable modem system, cable-based telephony etc.).

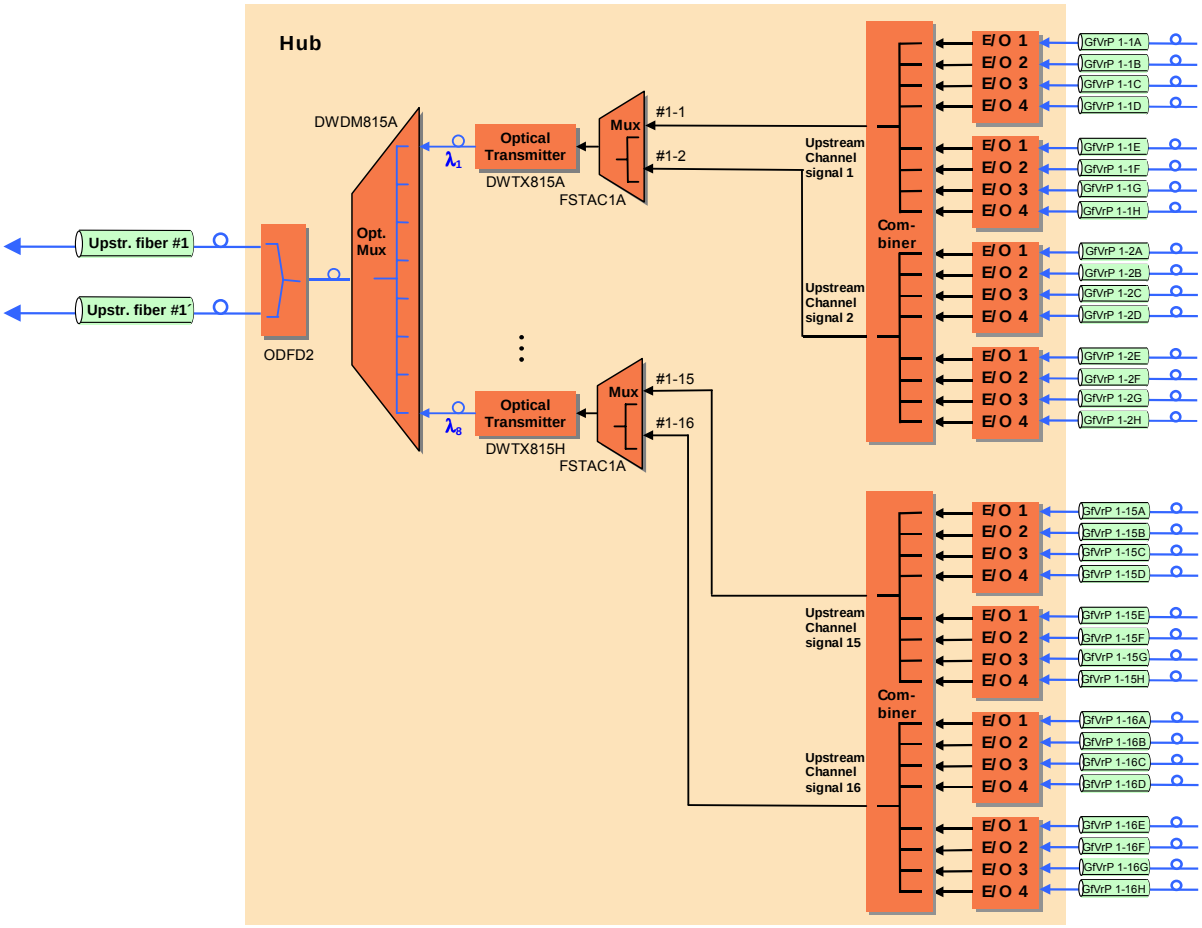


Figure 1-11: System overview of optical upstream channel in the hub

The optical signals from the fibre nodes are received in the hub and converted to electric signals in order to combine them in an active filter amplifier in a flexible manner (1:4: 1:8, 1:16). An optical transmitter can send the combined upstream channel signals to the head end using the wavelength division multiplexing technique.

1.3.2 Optical Upstream Channel Printed Board Assemblies

Name	Explanation
HUCHP	Optical quadruple receiver for fibre node signals
UCC	Electric upstream channel coupler (1:4, 1:8, 1:16), with filtering function
FSTAC1	Frequency Stacker
FDSTAC1	Frequency Destacker
DWTX315A	Optical Transmitter DW 1558.98nm (Ch23)
DWTX315B	Optical Transmitter DW 1557.36nm (Ch25)
DWTX315C	Optical Transmitter DW 1555.75nm (Ch27)
DWTX315D	Optical Transmitter DW 1554.13nm (Ch29)
DWTX315E	Optical Transmitter DW 1552.52nm (Ch31)
DWTX315F	Optical Transmitter DW 1550.92nm (Ch33)
DWTX315G	Optical Transmitter DW 1549.32nm (Ch35)
DWTX315H	Optical Transmitter DW 1547.72nm (Ch37)
DWDM815A	DWDM multiplexer for upstream channel
DWDM815B	DWDM demultiplexer for upstream channel
ODFD2	Optical distribution frame
SCUAPPC-B	Optical switch for upstream channel receiver

Table 3: Optical upstream channel printed board assemblies

1.4 Compact Fibre Nodes

1.4.1 Compact Fibre Node CRXLD

The Compact Fibre Node (see Figure 1-12) CRXLD receives an optical distribution signal (analogue CATV signal), converts it into an RF signal and amplifies it to feed it into coaxial cables.
Diplex filters at the output filter the return path signal to lead it to a return path amplifier. The return path amplifier is connected to an optical transmitter. The optical transmitter consists of either a FP laser or an uncooled DFB laser with optical isolator.

The Compact Fibre Node CRXLD is accommodated in die-cast aluminium housings with EMC shielding according to protection class IP52. The housings are provided with openings for an optical cable, the Z-Interface and power supply cable. The electrical RF outputs are designed as coaxial screw connections or plug connections.

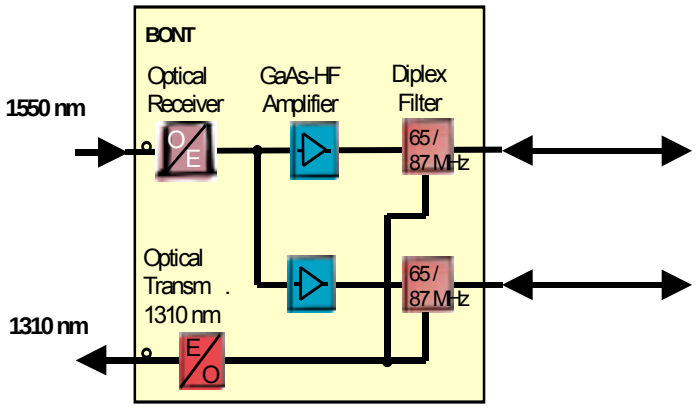


Figure 1-12: Block diagram of Compact Fibre Node CRXLD

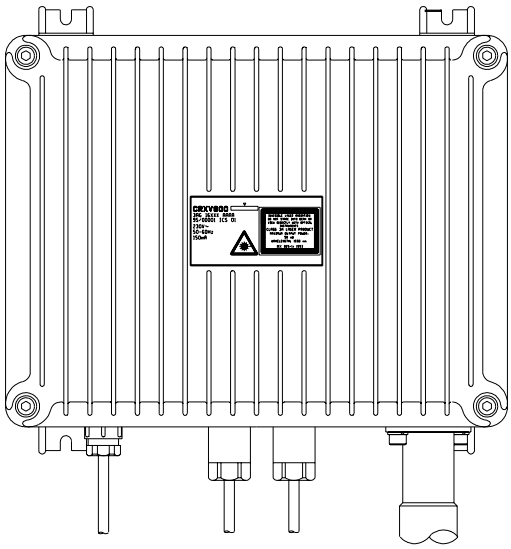


Figure 1-13: Housing of the Compact Fibre Node CRXLD

1.4.2 Compact Fibre Node CFN for Redundancy Applications

The Compact Fibre Node CFN receives an optical AMVSB and Targeted Services signal, convert it into an electrical one and amplify the signal to feed it into coaxial cable.
Return path signals are combined and converted into an optical signal to be transmitted.

A block diagram of BKtel's Compact Fibre Node (CFN) is depicted in Figure 1-14. The CFN is especially foreseen for

1. Full-service networks requiring very high performance and reliability
   (all essential, life time limiting functions are redundant (receiver, transmitter, power supply))
2. Evolutionary network architectures requiring scalability
   (modular concept in compact housing dimensions)

The CFN's features enable the described applications:

- The CFN provides 2 high-power and highly linear GaAs outputs and is equipped with pluggable diplex filters. A feeder output is foreseen to feed an optional external coax amplifier.
- The CFN is equipped with two optical receivers and two optical transmitters to provide a combined path and equipment redundancy. The receivers and transmitters are pluggable to be upgraded in evolutionary network architectures and easily exchanged in case of service.
- The return path optical transmitters are equipped with uncooled DFB (distributed feedback) lasers with optical isolators.
- The CFN is equipped with two pluggable power converter modules also offering 1:1 redundancy.
- Pluggable transponder supervision module with HMS (hybrid management system) compliance
- Outdoor or cabinet mounting
- Mains (local) or remote powering capability

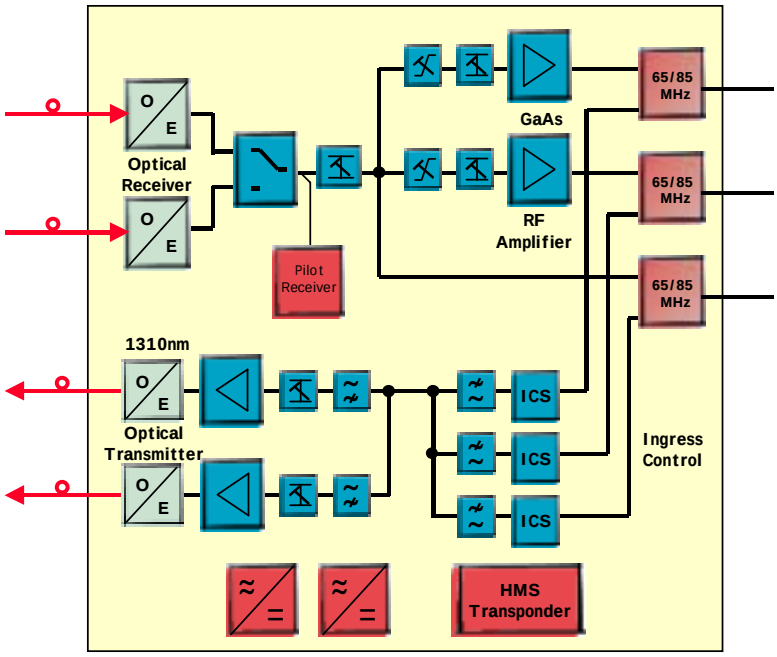


Figure 1-14: Block Diagram of Compact Fibre Node CFN

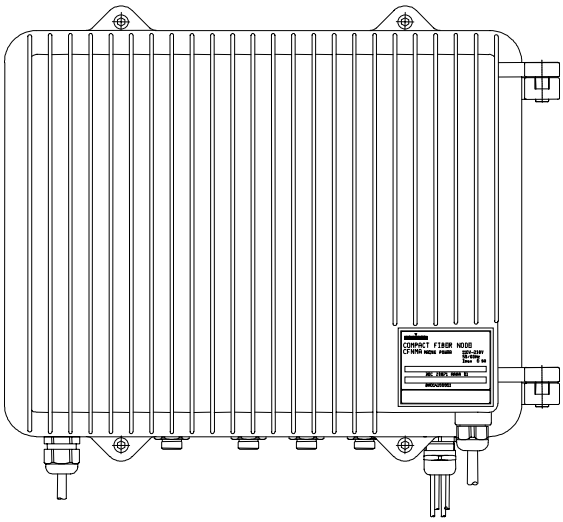


Figure 1-15: Housing of Compact Fibre Node CFN

1.5 Modular Fibre Nodes

1.5.1 Modular Fibre Node MFN (Generic Application)

The Modular Fibre Node MFN receives an optical AMVSB and Targeted Services signal, converts it into an electrical one and amplifies the signal to feed it into coaxial cable. Return path signals are combined and converted into an optical signal to be transmitted.

A block diagram of BKtel's Modular Fibre Node (MFN) is depicted Figure 1-16. The MFN is especially foreseen for

1. Full-service networks requiring very high performance and reliability
   (all essential, life time limiting functions are redundant (receiver, transmitter, power supply)
2. Evolutionary network architectures requiring scalability and modularity
3. Mounting in a cabinet providing rack mechanics

The MFN consists of the following modules:

- MOTRA (MFN optical receiver and transmitter)
- MISAA (MFN interstage amplifier)
- MBOAA (MFN booster amplifier)
- MUPAA (MFN upstream amplifier)
- MSUP (MFN supervision module)
- MPSC (MFN power supply converter)

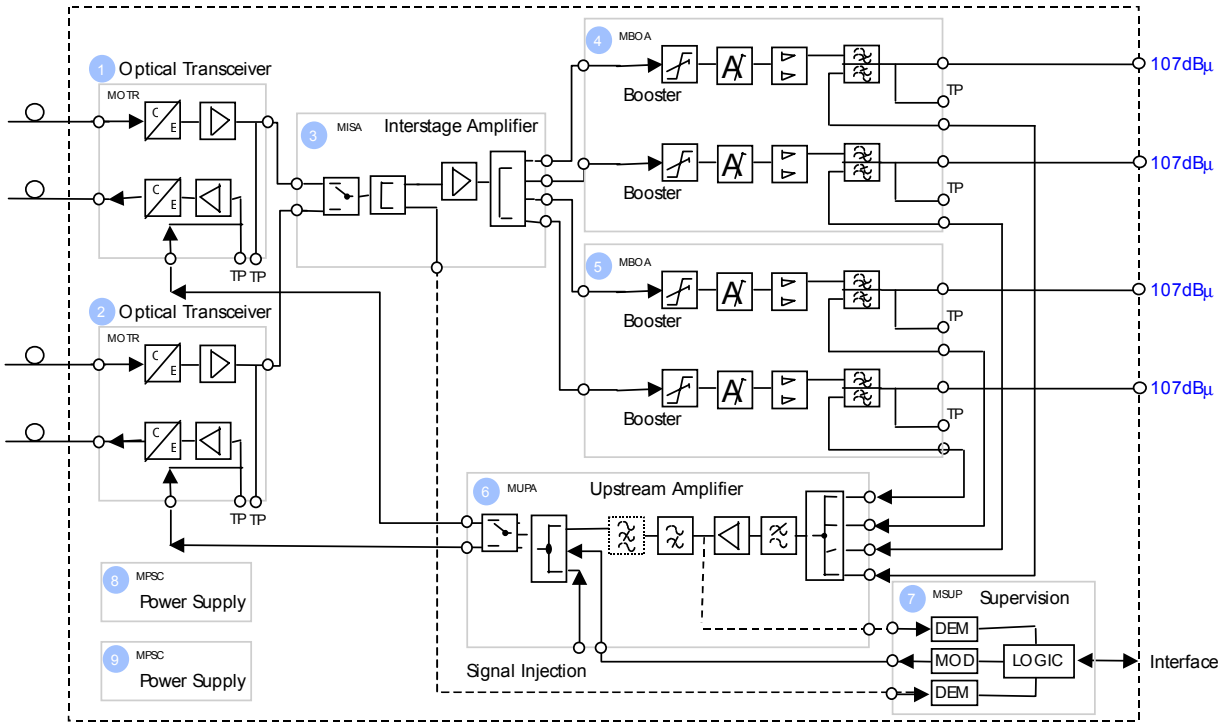


Figure 1-16: Block Diagram of Modular Fibre Node MFN

The Modular Fibre Node MFN uses BK equipment practice that consists of a BK subrack which can accommodate up to ten assemblies with a modular width of 40 mm. Slots 9 and 10 are mechanically encoded, so that only power supply assemblies can be installed there. The rear panel of the subrack serves as a heat sink. All assemblies are automatically connected to the supply voltage via the rear panel when installed. The 60-V-DC battery voltage is connected to the subrack via a Filtering Unit.

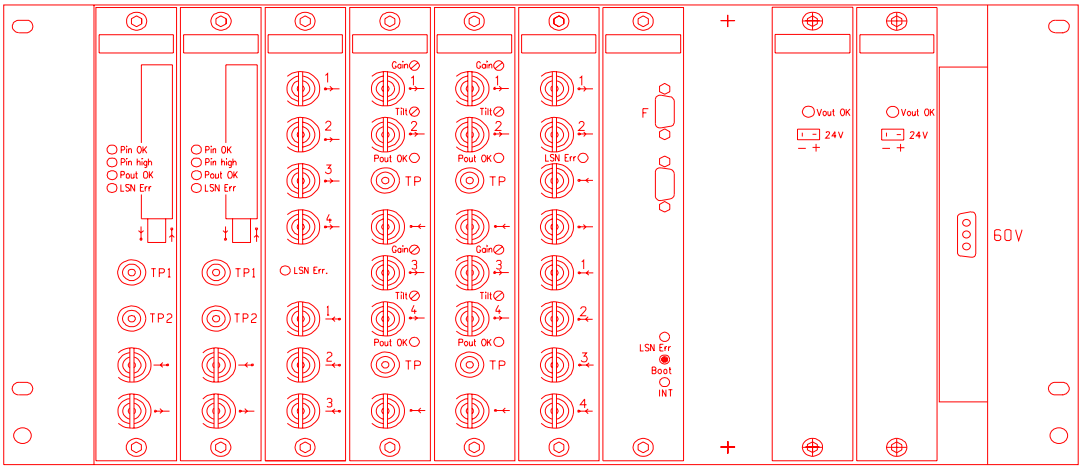


Figure 1-17: Housing of Modular Fibre Node MFN

1.5.2 Modular Fibre/Coax Node MFN and CFN (BK862 Application)

The Modular Fibre/Coax Node MFN/CFN for German BK862 application receives an optical AMVSB and Targeted Services signal, converts it into an electrical one and amplifies the signal to feed it into coaxial cable. The Node can be also equipped to receive an electrical RF signal. Return path signals are combined and converted into an optical signal to be transmitted.

A block diagram of Modular Fibre Node MFN for BK862 Application is depicted in Figure 1-18, whereas Figure 1-19 depicts the Modular Coax Node MCN for BK862 Application. The Nodes are especially foreseen for an upgrade of the existing German BK450 Cable Television System.

The Nodes consist of the following modules:

- MOTRD (MFN optical receiver and transmitter)
- MIAF (MFN amplifier for A/B level)
- MIAC (MCN amplifier for A/B level
- MBOC (MFN/MCN booster amplifier for C level)
- MUPAC (MFN/MCN upstream amplifier)
- MTRS (MFN/MCN HMS compliant transponder supervision module)
- MPSC (MFN power supply converter)

MFN and MCN use BK equipment practice (see Figure 1-20) that consists of a BK die cast housing which can accommodate up to twelve assemblies with a modular width of 40 mm. Slots 11 and 12 are mechanically encoded, so that only power supply assemblies can be installed there. The die cast housing serves as a heat sink. All assemblies are automatically connected to the supply voltage via the rear panel when installed. Remote voltage is connected to the subrack via power insertion filters contained in the diplex filter housings.

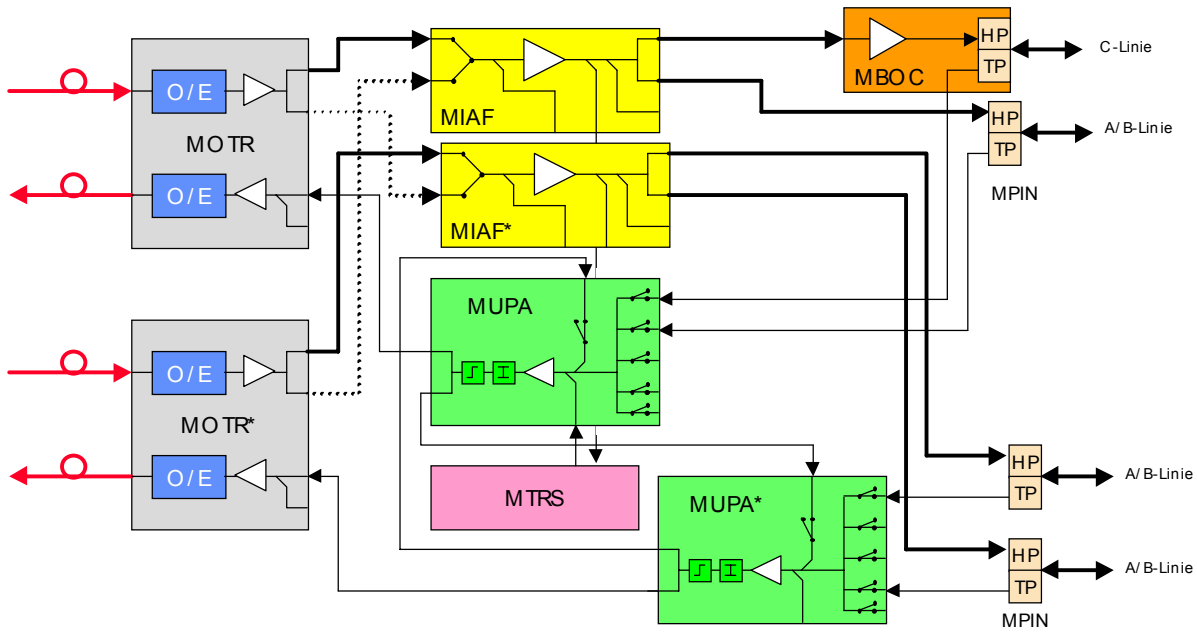


Figure 1-18: Block Diagram of MFN for BK862 Application

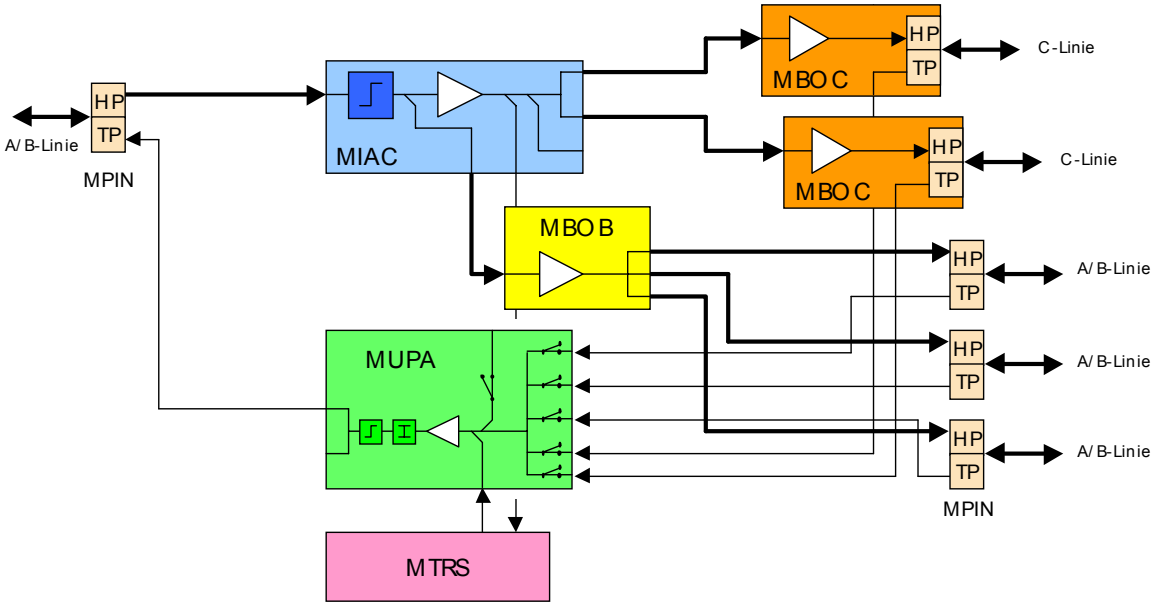


Figure 1-19: Block Diagram of MCN for BK862 Application

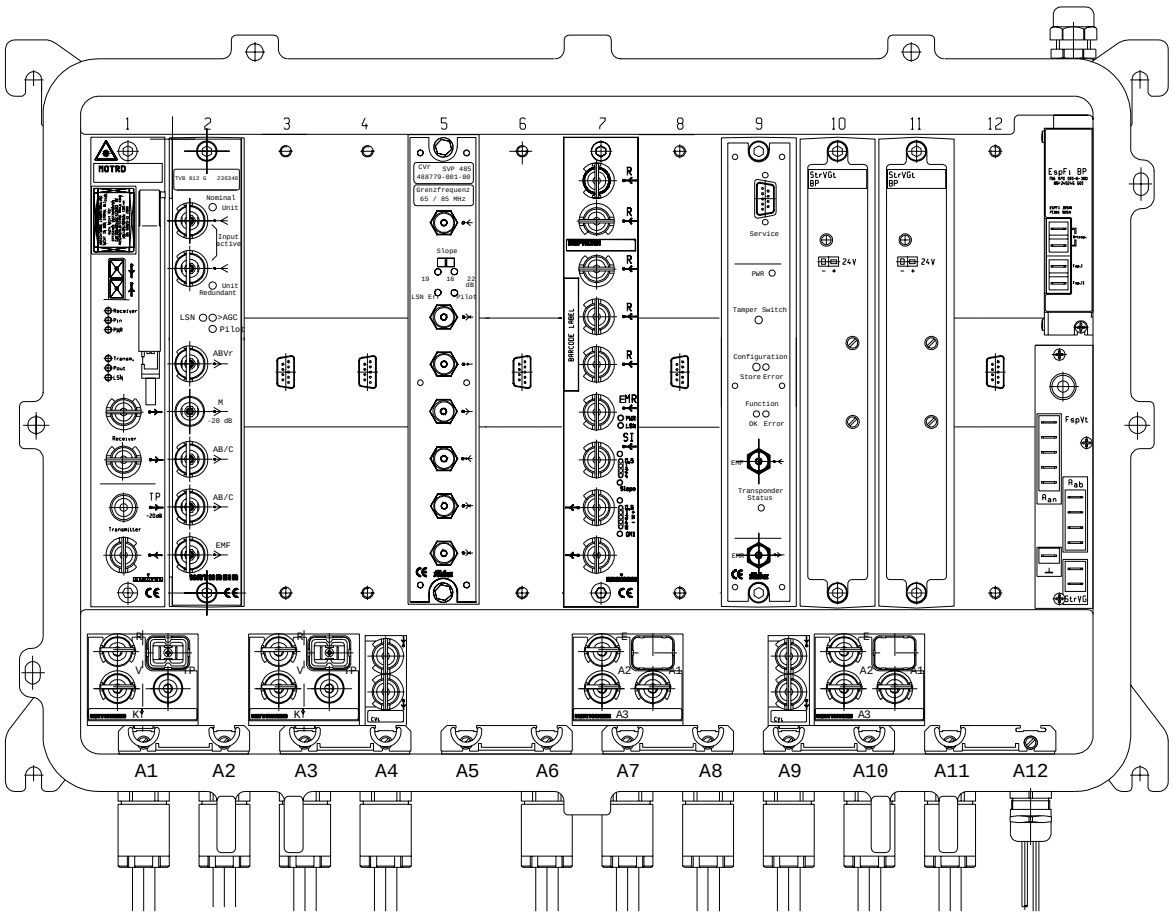


Figure 1-20: Housing of MFN and MCN for BK862 Application

1.6 Compact Amplifier

Figure 1-21 displays the block diagram of the compact amplifier MAX. The device amplifies RF signals and feeds coaxial cables. It also contains a return path amplifier for return path signals.
The MAX amplifier provides the following features:

- Compact housing
- Modular design with pluggable return channel amplifier, attenuation modules, equalization modules, splitters, taps and diplex filters
- Active high level, high performance outputs by GaAs amplifier modules
- 1570BB monitoring features
- Swappable power supply

The device is housed in the compact die cast housing depicted in Figure 1-22.

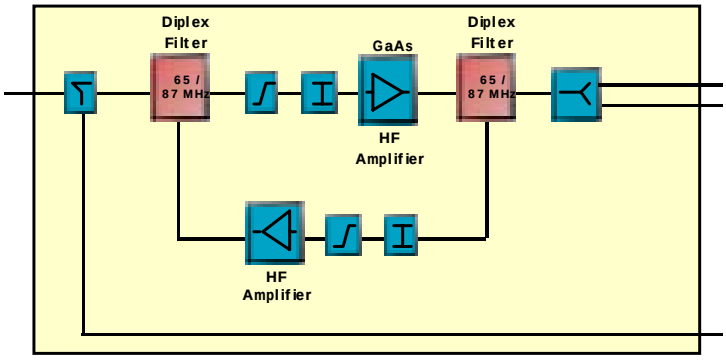


Figure 1-21: Block diagram of Compact Amplifier MAX

There are various types of MAX amplifiers:

- MAX030G for line amplification equipped with one GaAs high power hybrid amplifier and optionally AGC and/or equalization
- MAX037G for line amplification equipped with one GaAs high power hybrid amplifier
- MAX236G for line and distribution amplification equipped with two GaAs high power hybrid amplifiers
- HMAX030G/037G as home amplifier types equipped with one GaAs high power hybrid amplifiers

Please see data sheets for more details.

Figure 1-22: Housing of Compact Amplifier MAX

2 EQUIPMENT AND FIBER PROTECTION

2.1 Equipment Protection in the Head End

The additionally installed protection equipment runs in hot-standby mode. If a module of the operating equipment fails, the optical switch (SCUA) will switch over to the redundant branch of the protection equipment.

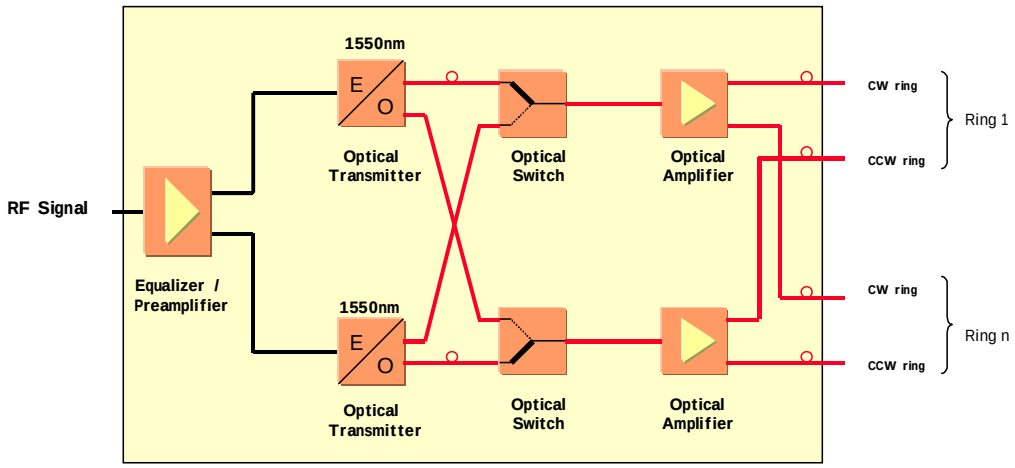


Figure 2-1: Equipment Protection in the Head End for HMS Solution

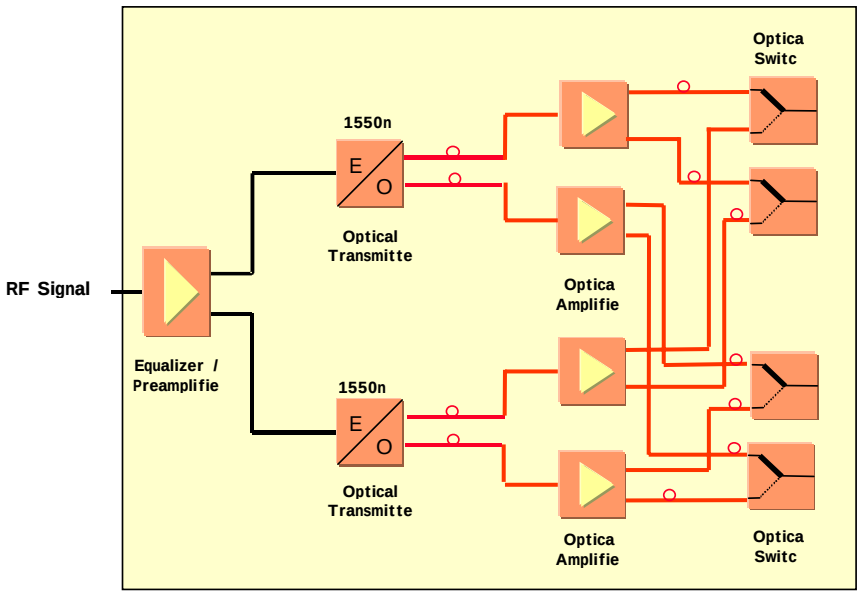


Figure 2-2: Equipment Protection in the Head End for Nectas Solution

2.2 Equipment Protection in the Distribution Hub

BKtel's High-Power Optical Amplifier family used mainly in the Distribution Hub include pump laser redundancy, which make the use of protection equipment for this type of optical amplifier unnecessary.

2.3 Fibre Protection in the Transport Network

In the HMS system the optical switches (SCUA) switch over automatically to the redundant feeder path.

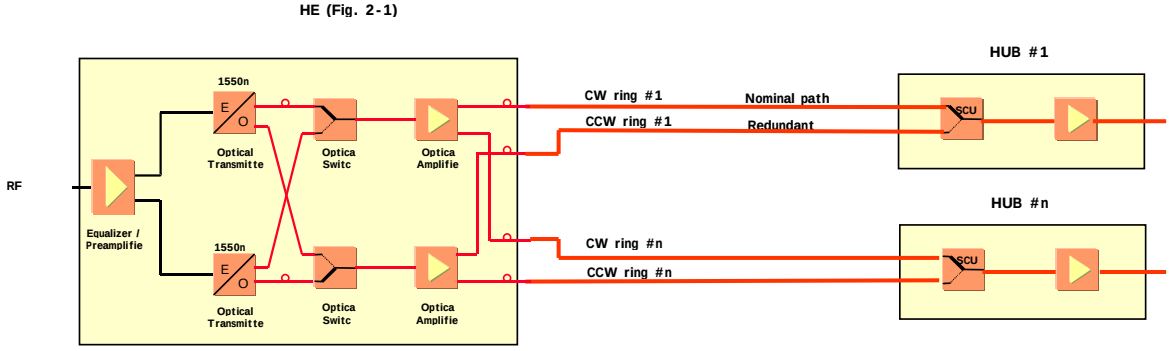


Figure 2-3: Fibre Protection in the Transport Network for HMS Solution

If an optical feeder range in the Transport Network is interrupted, the Q Concentrator (QCON) will control the optical switches (SCUA) to switch over to the redundant feeder path.

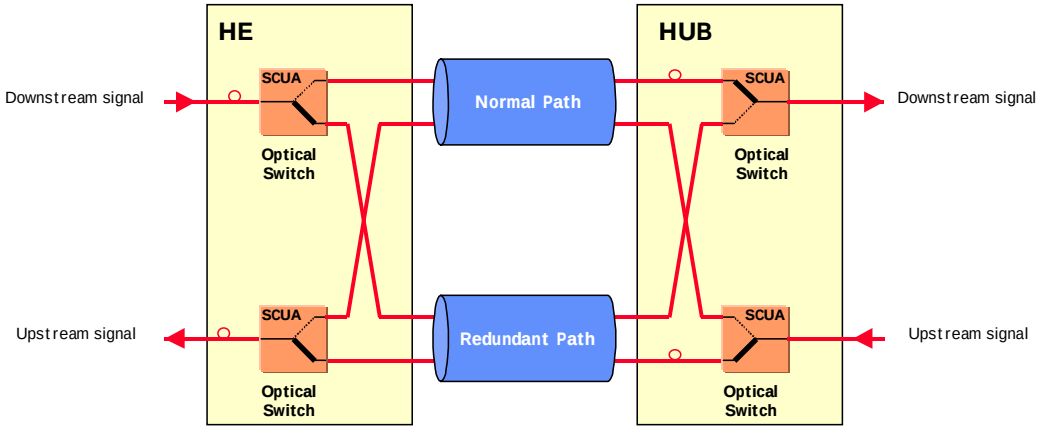


Figure 2-4: Fibre Protection in the Transport Network Nectas Solution

3 SYSTEM POWERING

3.1 Operating Station Powering

The entire equipment of the 1570BB in the operating stations is powered by the 48/60-V-DC battery voltage as per standard TNV (Telecommunication Network Voltage, EN 60950). The 48/60-V-DC battery voltage is connected to the top rack unit in the S9 rack and distributed to the Power Supply (PSO) in the subracks via a circuit breaker and a Coding and Filtering Unit (CFU).
The Power Supply (PSO) converts this voltage into a 24 V DC voltage. The capacity of each PSO is sufficient to supply a fully equipped subrack. The PSO can also be installed with 1+1 redundancy in order to increase the operational reliability.

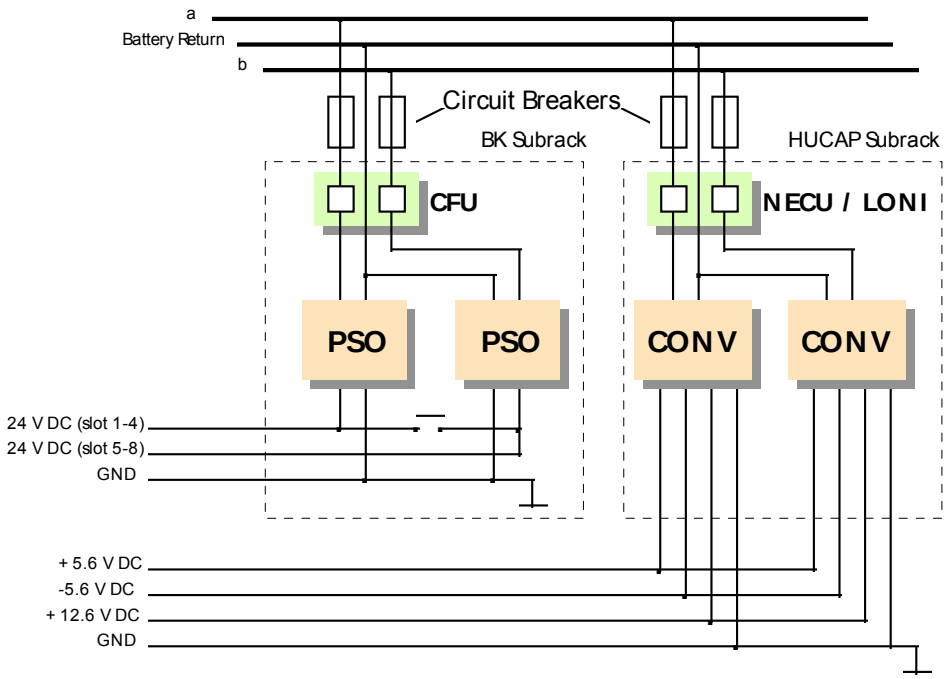


Figure 3-1: Power supply in an S9 rack

3.2 Powering of Fibre Nodes

There are various possibilities for powering of the Fibre Nodes:

CRXLD:

- 230/110 V (47...63 Hz) local powering
- 40.5...115 V DC remote powering
- 30...65 V rms AC (47...63Hz) remote powering

CFN:

- 230/110 V (47...63 Hz) local powering
- 40.5...100 V DC remote powering
- 34.2...71.5 V rms AC (47...63 Hz) remote powering

4 EQUIPMENT PRACTICE

4.1 ETSI or Alternatively 19'' Racks

As far as head end and hub equipment is concerned, BKtel's HFC system is housed in

- Either ETSI racks with footprint of 600 mm x 300 mm and a height of 2200 mm
- Or alternatively in 19'' racks with a footprint of 600 mm x 600 mm.

The ETSI rack is the preferred solution and depicted in Figure 4-1.

The ETSI-racks carry

- Either up to 5 ETSI-subracks (535 mm x 240 mm, ETSI subracks require less space)
- Or up to 4 S9-subracks.
- It is also possible to install 19'' subracks (483 mm x 240 mm) in ETSI-racks.

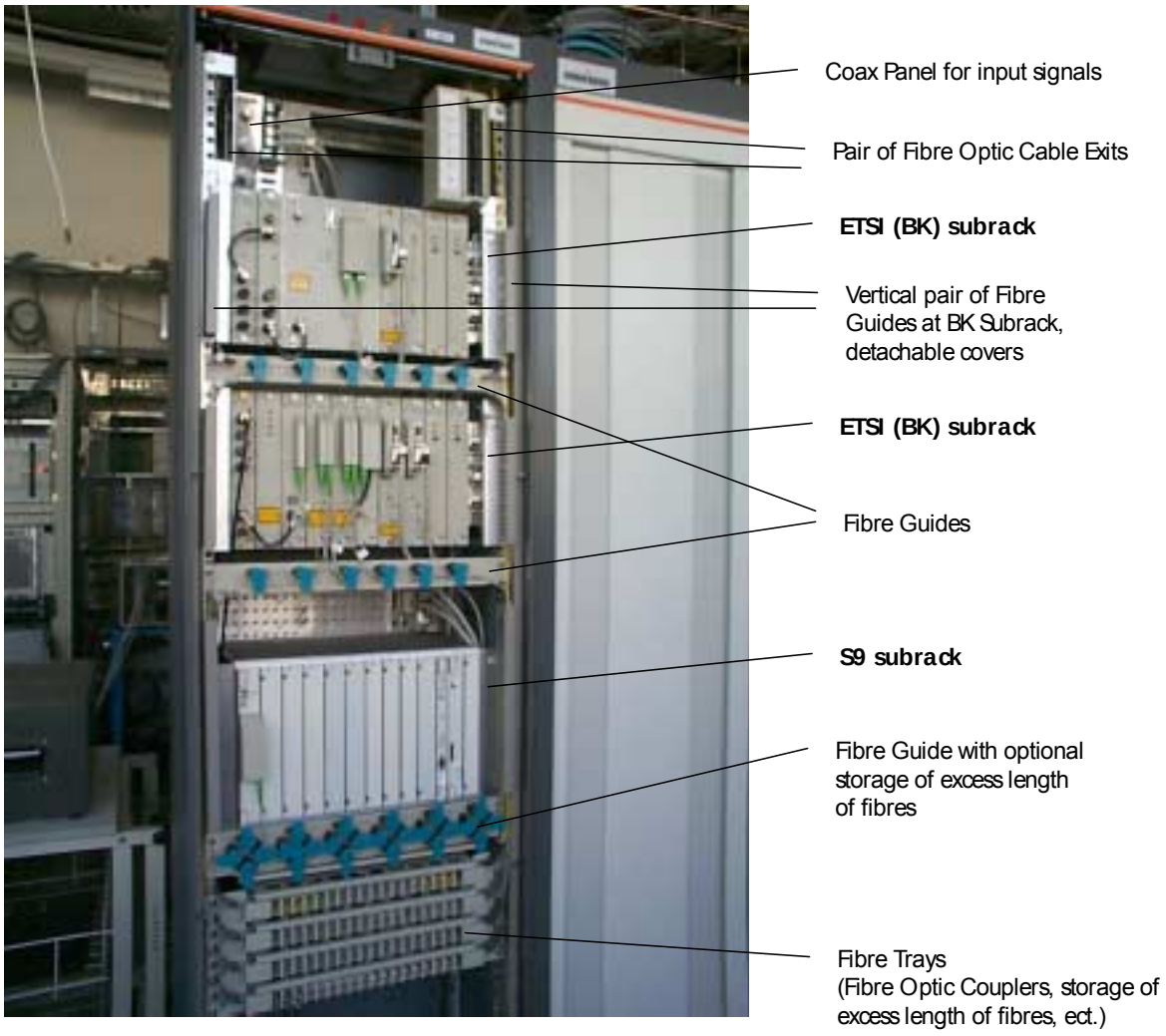
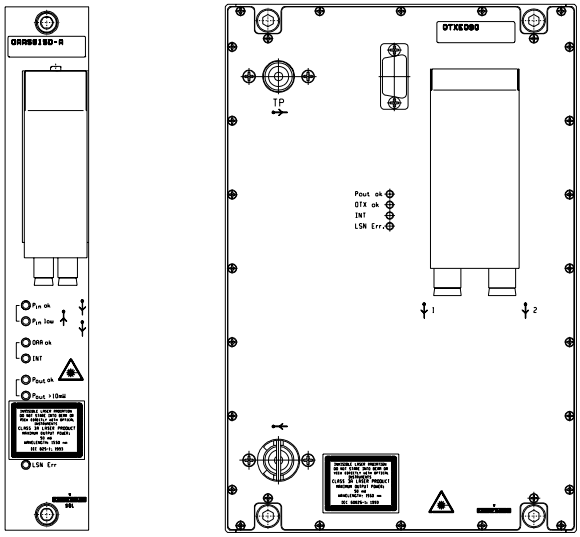


Figure 4-1: ETSI-rack (housing for head end and Primary Hub equipment)

4.2 ETSI Subracks ("BK-Subrack")

Each BK Subrack can accommodate ten assemblies of the downstream or service injection system with a modular width of 40 mm. See Figure 4-1 and Figure 4-3. The BK modules can be 1, 2, 3 or 4 slots in width. See Figure 4-2.

Slots 9 and 10 are mechanically encoded, so that only power supply assemblies (PSO) can be installed there. The rear panel of the subrack serves as a heat sink. All assemblies are automatically connected to the supply voltage and the LSN via the rear panel when installed. The LSN and the 60-V-DC battery voltage, for which a fuse is installed in the Top Rack Unit, are connected to the subracks via the Coding and Filtering Unit (CFU).



Module Used Slots	Height x Width x Depth
1	250 mm x 40 mm x 100 mm
2	250 mm x 82 mm x 100 mm
3	250 mm x 124 mm x 100 mm
4	250 mm x 167 mm x 100 mm

Figure 4-2: BK-Modules

4.2.1 Coding and Filtering Unit (CFU)

The Coding and Filtering Unit (CFU) is installed in every BK subrack. It contains the interfaces for both the Local Signalling Network (LSN) and the 60 V power supply of the subrack. The CFU filters the 60-V-DC voltage and generates coding frequencies, which are forwarded to the plug sockets of the subracks. These frequencies allow the assemblies with LSN interface to identify their position in the subrack so that it can be reported when communicating via the LSN.

4.3 S9-Subracks ("S9-Subrack")

The S9 subrack is used for the equipment of the return path in the Head End or in the Distribution Hub. It can accommodate up to 13 slots for S9-modules (width 40mm), where one or two (for redundancy) are used for power supplies (CONV), one for the network management unit (NECU), two optionally for return path combiner (UCC) and up to 8 return path receiver (HUCx) (see Figure 4-4).
On the top of the subrack is the connection panel, where all interfaces are installed.

4.4 SIP

The Signal Interface Panel (SIP) is an interface between the summary of AIT signals and the optical signal displayed by the lamp set at the top of the S9 rack.

4.5 Fibre Management System (FMS)

As fibre optic rack cabling requires much higher observance in design than Power Cabling or Coaxial Cabling, all fibre routing components are designed to enclose fibre cables and guard against inadvertent snags from passing personnel and equipment. The fibre management system as further illustrated in Figure 4-1, Figure 4-3, Figure 4-4 and Figure 4-5 provides many features:

1. Flexible, modular design
   If equipment grows from few fibres to maximum capacity of fibre, new cables can be added without sacrificing space or function.
2. Protection of fibre optic cables
   The Fibre Management System (FMS) protects the fibre optic cables by physically separating them from copper communication cables, power cables, coaxial cables, and so on.
   The FMS protects the fibres from physical damage and tampering.
3. New assembly and replacement of fibre optic components
   All fibre optic components are designed in front access version. The result is a fast, safe and all time supervisable new assembly or replace in case of repair.
4. Bend radius limiters used throughout the racks
   Ensures installation work in accordance with minimum bend radius guidelines: minimum 30 mm (1.18 in).
5. Fibre Trays
   Fibre trays with space for optical splitters, optical connectors and excess fibre lengths. The fibre trays are already fitted with fibre guide and fixing components to guarantee the best arrangement of cables and splitters.
6. Fibre Guide
   Fibre guides route the fibre cables horizontally and are available in two options one with the capability to store the exceptional length of the fibres.
7. Based on Equipment Practice BK and S9-subracks, 19" Equipment Practice Version optionally
   The Fibre Management System (FMS) is a system component within 1570BB.

8. Assembly Costs
   Dramatic reduction in installation time of fibre cables by quick and safe installation in systematically structured rack design.

Figure 4-3: Fibre Optic Cabling at BK-subrack

Figure 4-4: S9 subrack

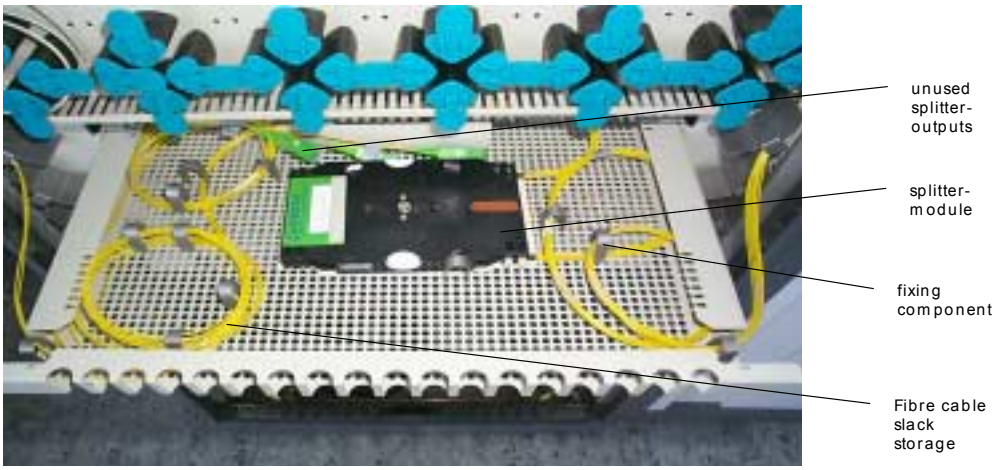


Figure 4-5: Fibre Tray

The fibre tray is equipped with optical splitter and fixing components (associated cover to protect the fibre cables is not indicated in this illustration). Ventilated design promotes airflow in remote cabinets. An even temperature profile is maintained throughout the equipment.

Figure 4-6: Coaxial Tray example

The Coaxial Tray in the example is equipped with two coaxial splitters (associated cover to protect the coax cables is not indicated in this illustration). Ventilated design promotes airflow in remote cabinets. An even temperature profile is maintained throughout the equipment. Tray design allows variable placement of coaxial components.

4.6 Top Rack Unit

The Top Rack Unit contains up to ten fuses, depending on the number of power supply assemblies (PSO or CONV) in the S9 Rack. In addition, the Q2 and LSN bus can also be connected in the Top Rack Unit, together with the coaxial lines for the incoming electrical multiplex signal in the Head End.

4.7 Optical Connectors

Three different optical connector types can be used in the system according to the customer's requirement:

- HRL-10
- SC/APC (8° slant)
- OPTOCLIP 2

Other optical connector types could be delivered on request if their availability, qualification and quantity are ensured. In any case optical connectors should provide CATV performance i.e. an optical return loss of at least 50 dB.

5 TECHNICAL DATA

5.1 General Technical Data

Head End Input Signal	
Input signal level	79...93 dBµV
Frequency response variation	≤ ± 1 dB typical
Input CNR (5 MHz)	≥ 54 dB typical
Input CSO / CTB	≥ 75 dB, 80 dB typical
Impedance	75 Ω
Input return loss	≥ 20 dB @ 47MHz –1dB/octave, 17 dB min. (typical)

Downstream Channel	
Nominal wavelength	1550…1560 nm 1290…1330 nm
Frequency range	47...870 MHz
Frequency response of the overall system: 47...606 MHz 607...870 MHz	 ± 3 dB ± 3.5 dB
Channel Load	80 analogue TV channels or equivalent load of mixed analogue and digital channels

Return Path	(Access Network)
Nominal wavelength	1310 nm ± 30 nm
Optical fibre attenuation	≤ 20 dB
Modulation of service signals	FSK, PSK, (D)QPSK, 16QAM
Frequency range	8...65 MHz

Return Path	(Transport Network)
DWDM Wavelength of service signals	1547 … 1559 nm
Wavelength of NECTAS supervision signals	1310 nm ± 10 nm
Optical fibre attenuation	≤ 20 dB
Frequency range	5...300 MHz

Fibre Node	
Output level	> 103...110 dBµV 0 ... 10 dB pre-emphasis
CNR (5 MHz)	45 ... 50 dB
CSO /CTB	≥ 54...60 dB

Demarcation Point	
Signal level (level ”window”)	63...83 dBµV
Impedance	75 Ω
Return loss	≥ 16 dB
CNR (5 MHz)	45...47 dB
CSO / CTB	≥ 54...58 dB

5.2 Standards and Requirements

5.2.1 Environmental Requirements

Environment	Standard
Operation of equipment in central offices (Head End and Distribution Hub equipment)	ETS 300 019-1-3 (Feb. 1992) Environmental class 3.1: Operation at temperature-controlled locations
Operation of equipment in cabinets (Fibre Nodes, Line Amplifier)	ETS 300 019-1-3 (Feb. 1992) Environmental class 3.3: Operation at not temperature-controlled, weather protected locations
Operation of outdoor equipment (Fibre Nodes, Line Amplifier)	ETS 300 019-1-4 (Feb. 1992) Environmental class 4.1: Operation at non-weather protected locations
Storage of equipment	ETS 300 019-1-2 (Feb. 1992) Environmental class 1.1: Storage at weather protected, partly temperature-controlled locations
Transport of equipment	ETS 300 019-1-2 (Feb. 1992) Environmental class 2.2 and 2.3: Careful transportation for mechanical conditions Public transportation for all other parameters

5.2.2 Electromagnetic Compatibility

Electromagnetic Compatibility	Standard
General Standards	ETS 300 386-1
Immunity	EN 50082-1
Emission	EN 55022

5.2.3 Product Safety

According to EN 60950. Safety of Information Technology Equipment including Electrical Business Equipment.

5.3 Typical Channel Allocation

5.3.1 Band I (F I)

47 - 54 MHz	K2	-
54 – 61 MHz	K3	-
61 – 68 MHz	K4	-

5.3.2 Band II (F II)

87.55 MHz	U1	FM
87.85 MHz	U2	FM
88.45 MHz	U3	FM
88.85 MHz	U4	FM
89.60 MHz	U5	FM
90.85 MHz	U6	FM
91.50 MHz	U7	FM
91.85 MHz	U8	FM
92.60 MHz	U9	FM
93.50 MHz	U10	FM
93.95 MHz	U11	FM
94.50 MHz	U12	FM
95.60 MHz	U13	FM
96.40 MHz	U14	FM
96.95 MHz	U15	FM
97.35 MHz	U16	FM
97.65 MHz	U17	FM
99.40 MHz	U18	FM
100.10 MHz	U19	FM
100.60 MHz	U20	FM
101.40 MHz	U21	FM
102.00 MHz	U22	FM
102.40 MHz	U23	FM
103.50 MHz	U24	FM
104.40 MHz	U25	FM
105.55 MHz	U26	FM
105.85 MHz	U27	FM
106.55 MHz	U28	FM
107.45 MHz	U29	FM
107.90 MHz	U30	FM

5.3.3 Band III

111 - 118 MHz	S2	AMVSB
118 – 125 MHz	S3	AMVSB
125 – 132 MHz	S4	AMVSB
132 – 139 MHz	S5	AMVSB
139 – 146 MHz	S6	AMVSB
146 –153 MHz	S7	AMVSB
153 –160 MHz	S8	AMVSB
160 –167 MHz	S9	AMVSB
167 174 MHz	S10	AMVSB
174 –181 MHz	K5	AMVSB
181 –188 MHz	K6	AMVSB
188 – 195 MHz	K7	AMVSB
195 – 202 MHz	K8	AMVSB
202 – 209 MHz	K9	AMVSB
209 –216 MHz	K10	AMVSB
216 –223 MHz	K11	AMVSB
223 –230 MHz	K12	AMVSB
230 –237 MHz	S11	AMVSB
237 – 244MHz	S12	AMVSB
244 – 251 MHz	S13	AMVSB
251 – 258 MHz	S14	AMVSB
258 – 265 MHz	S15	AMVSB
265 –272 MHz	S16	AMVSB
272 –279 MHz	S17	AMVSB
279 – 286 MHz	S18	AMVSB
286 – 293 MHz	S19	AMVSB
293 - 300 MHz	S20	AMVSB
302 - 310 MHz	S21	AMVSB
310 –318 MHz	S22	AMVSB
318 –326 MHz	S23	AMVSB
326 –334 MHz	S24	AMVSB
334 –342 MHz	S25	QAM64 (DVB)
342 –350 MHz	S26	QAM64 (DVB)
350 – 358 MHz	S27	QAM64 (DVB)
358 – 366 MHz	S28	QAM64 (DVB)
366 – 374 MHz	S29	QAM64 (DVB)
374 – 382 MHz	S30	QAM64 (DVB)
382 – 390 MHz	S31	QAM64 (DVB)
390 – 398 MHz	S32	QAM64 (DVB)
398 – 406 MHz	S33	QAM64 (DVB)
406 – 414 MHz	S34	QAM64 (DVB)
414 – 422 MHz	S35	QAM64 (DVB)
422 – 430 MHz	S36	QAM64 (DVB)
430 – 438 MHz	S37	QAM64 (DVB)
438 - 446 MHz	S38	QAM64 (DVB)
446 – 454 MHz	S39	QAM64 (DVB)
454 – 462 MHz	S40	QAM64 (DVB)
462 – 470 MHz	S41	QAM64 (DVB)

5.3.4 Band IV

470 - 478 MHz	K21	AMVSB
478 – 486 MHz	K22	AMVSB
486 – 494 MHz	K23	AMVSB
494 – 502 MHz	K24	AMVSB

502 – 510 MHz	K25	AMVSB
510 – 518 MHz	K26	AMVSB
518 – 526 MHz	K27	AMVSB
526 – 534 MHz	K28	AMVSB
534 – 542 MHz	K29	AMVSB
542 – 550 MHz	K30	AMVSB
550 – 558 MHz	K31	AMVSB
558 – 566 MHz	K32	AMVSB
566 – 574 MHz	K33	AMVSB
574 – 582 MHz	K34	(AMVSB)
582 – 590 MHz	K35	(AMVSB)
590 – 598 MHz	K36	(AMVSB)
598 - 606 MHz	K37	(AMVSB)

5.3.5 Band V

606 - 614 MHz	K38	QAM64 (DVB)
614 – 622 MHz	K39	QAM64 (DVB)
622 – 630 MHz	K40	QAM64 (DVB)
630 – 638 MHz	K41	QAM64 (DVB)
638 – 646 MHz	K42	QAM64 (DVB)
646 – 654 MHz	K43	QAM64 (DVB)
654 – 662 MHz	K44	QAM64 (DVB)
662 – 670 MHz	K45	QAM64 (DVB)
670 – 678 MHz	K46	QAM64 (DVB)
678 – 686 MHz	K47	QAM64 (DVB)
686 – 694 MHz	K48	QAM64 (DVB)
694 – 702 MHz	K49	QAM64 (DVB)
702 – 710 MHz	K50	QAM64 (DVB)
710 – 718 MHz	K51	QAM64 (DVB)
718 – 726 MHz	K52	QAM64 (DVB)
726 – 734 MHz	K53	QAM64 (DVB)
734 – 742 MHz	K54	QAM64 (DVB)
742 – 750 MHz	K55	QAM64 (DVB)
750 – 758 MHz	K56	QAM64 (DVB)
758 – 766 MHz	K57	QAM64 (DVB)
766 – 774 MHz	K58	QAM64 (Data)
774 – 782 MHz	K59	QAM64 (Data)
782 – 790 MHz	K60	QAM64 (Data)
790 – 798 MHz	K61	QAM64 (Data)
798 – 806 MHz	K62	QAM64 (Data)
806 – 814 MHz	K63	-
814 – 822 MHz	K64	-
822 – 830 MHz	K65	-
830 – 838 MHz	K66	-
838 – 846 MHz	K67	-
846 – 854 MHz	K68	-
854 - 862 MHz	K69	-

5.3.6 EMS Signals

85 – 87.5 MHz (78 – 162 MHz)	EMS Signals Downstream
5 – 10 MHz (5 – 21 MHz)	EMS Signals Upstream

5.4 Modules

5.4.1 AIT

Alarm Interface TRU

Part Number 3AG 16112 XXXX

Functional Description

- Data exchange with NEC / NECO
- Generates a summery of alarms and offers alarm extensions
- Processes the alarm information
- Push button for attending alarms
- Three control lines to drive lamps in TRU
- The AIT has the following interfaces:
- Connection to the backpanel
- Connection to indication equipment

Technical Data

Interface to alarm interface top rack unit	25-Pin Sub-D
Relays	
Rated contact current	1.25 A
Rated contact voltage	30 W
Limiting contact current	2 A
Optocoupler	
Forward current continuous	60 mA
Forward voltage continuous	24...78 V
Power consumption	≤ 5 W
BK equipment practice	Module Width 1
Weight	~ 1.1 kg

5.4.2 AORX800

Analogue Optical Receiver

Part Number 3AG 16112 XXXX

Functional Description

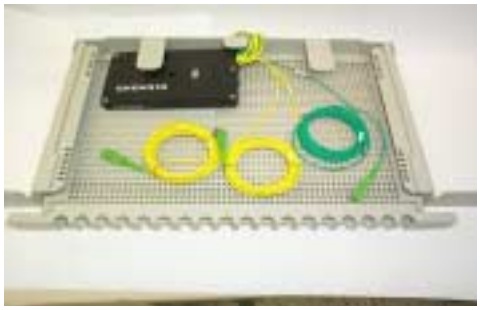
- Opto/electrical conversion of a broadband signal at 1310/1550 nm
- Two optical input power ranges covering -7 to +4dBm in total
- Additional electrical input for local signal insertion
- Possibility for internal output split
- Output test port
- Input and output signal detection
- Standby mode
- BK equipment practice

Technical Data

Optical Input	
Wavelength range	1280 nm … 1580 nm
Input power range	–7 … +4 dBm
Optical return loss	>45 dB
Connector	SC/APC 8° slant
RF Output	
Impedance	75 Ω
Frequency range	47 … 862 MHz
Power level at OMI = 5%	high: 1x 98 dBµV or 2x 94 dBµV low: 1x 94 dBµV or 2x 90 dBµV
Flatness	±1.0 dB (referred to single output)
Level offset	±1.0 dB
Return loss	≥20 dB (@47MHz) – 1.5 dB/oct. (minimum 15 dB)
RF local insertion input attenuation	0 ± 1.5 dB referred to single output
Test port attenuation	20 ± 1.5 dB referred to single output
Power consumption	≤ 14 W
Dimensions of BK equipment practice	Module width 2
Weight	~2.5 kg

5.4.3 AOSx

Asymmetrical Optical Splitter



Part Number 3AG 16336 XXXX

Functional Description

- Passive optical splitter to build up ring structures
- In cassettes, a fibre tray (FBT) is needed for installation

Technical Data

Wavelength:		
1310 nm	1310 nm ± 20 nm	
1550 nm	1550 nm ± 20 nm	
Attenuations:	Tap attenuation	Insertion attenuation
AOS04	4.0 dB ±0.5 dB	2.5 dB ±0.5 dB
AOS05	5.0 dB ±0.5 dB	2.0 dB ±0.5 dB
AOS06	6.0 dB ±0.5 dB	1.7 dB ±0.5 dB
AOS07	6.7 dB ±0.8 dB	1.4 dB ±0.5 dB
AOS08	7.9 dB ±0.8 dB	1.2 dB ±0.5 dB
AOS09	8.6 dB ±0.9 dB	1.1 dB ±0.5 dB
AOS10	9.7 dB ±0.9 dB	0.9 dB ±0.5 dB
AOS12	11.7 dB ±0.9 dB	0.7 dB ±0.5 dB
AOS14	13.5 dB ±1.0 dB	0.6 dB ±0.5 dB
Return loss input	≥ 50 dB	
Return loss output	≥ 50 dB	
Dimensions (h x w x d)	19 mm x 92 mm x 155 mm	
Weight	~0.3 kg	

5.4.4 BUCHP

Point-to-Point Return Path Transmitter

Part Number 3EC 20564 XXXX

Functional Description

- Plug-in module for Compact Fibre Node CRXLD
- Electrical/optical conversion of the return path signals
- Return path optical transmitter with 1310 nm Fabry Perrot or alternatively DFB laser
- Transmission of supervision data of the fiber node CRXLD and coaxial amplifiers to the HUCHP module (in the frequency range 5...8 MHz)

Technical Data

Impedance	75 Ω
Frequency range for service signals	(5)8 ... 70 MHz
Frequency range for AM-TV	100 ... 200 MHz
Electrical input level for OMI = 3.75%	60.2 … 72.2 dBµV (2 dB steps)
Optical wavelength	1310 nm ± 40 nm
Optical output power	
Fabry Perrot	-3 dBm
DFB with optical isolator	0 dBm
DWDM option	0 dBm or +3 dBm
Dynamic range for NPR > 40 dB measured with an optical receiver (Ieq = 7 pA/√Hz) for -3 dBm optical input power (DFB laser type)	typ. 8 dB
Power consumption	≤ 4 W
Dimensions (h x w x d)	72 mm x 147 mm x 42 mm
Weight	~0.4 kg

5.4.5 CB855

Electrical Combiner/Splitter 1:8 for 5 … 255 MHz

Part Number 3AG 16030 XXXX

Functional Description

- Passive electrical 1:8 combiner/splitter for return path signals

Technical Data

Impedance (input and output)	75 Ω
Frequency range	5...250 MHz
Nominal insertion loss	12 dB ± 0.3 dB
Flatness	± 0.2 dB
Return loss inputs (8)	≥ 20 dB (@ 47 MHz) -1.5 dB/oct, min.15 dB
Return loss output (1)	≥ 18 dB (@ 47 MHz) -1.5 dB/oct, min.15 dB
Electrical isolation	≥ 20 dB
Power consumption	≤ 1.2 W
Dimensions of BK equipment practice	Module width 1
Weight	~0.9 kg

5.4.6 CFN

Compact Fibre Node

Part Number 3EC YYYYY XXXX

Functional Description

- Fully modular concept in compact housing dimensions
- Two high-level RF outputs
- Individual adjustment of slope and level for each RF output
- Doubling of all essential, life-time limiting functions (RX-, TX- modules, power converters)
- Interstage amplifier with RF switch for access link protection
- 2 return channel transmitters providing high return channel bandwidth (200 MHz) and high linearity
- Return path amplifier with upstream combiner and gain adjustment, and RF Switches for Access Link Protection
- Transmission of up to 4 channel bands with up to 80 return channel carriers
- Smooth upgrade of return channel transport capacity according to the interactive service needs
- Plug-in diplex filters for flexible return path/downstream separation
- Plug-in noise suppression filters in the return path
- Redundant power supply modules
- Cabinet and outdoor applicable

Technical Data

Optical Receiver and Transmitter

Downstream	-6 dBm to +2 dBm
Input Level:	≤ - 45 dB
Optical Return Loss:	SC/APC 8° slant
Connector Type:	
Upstream	0 dBm ± 1 dB (Laser output)
Output Level:	-3.5 dBm ± 1 dB (opt. Splitter outputs)
Single Input	1310 ± 30nm, alternatively 1550 ± 30nm
Dual Input	≤ -45 dB
Wavelength Range:	SC/APC 8° slant
Optical Return Loss:	
Connector Type:	

Electrical

RF high power Outputs (OMI=5%):	97 dBµV ... 115 dBµV
Intermodulation	
Cenelec 42, 6 dB slope, 0 dBm:	
Output Level for 60 dB CTB performance	110 dBµV
Output Level for 60 dB CSO performance	112 dBµV
Downstream	
Frequency Range:	47 ... 870 MHz
Return Loss:	18 dB at 47 MHz (-1 dB/octave, min. 14 dB)
Upstream	
Frequency Range:	5 ... 65 MHz
Return Loss:	≥ 18 dB (5 ... 200 MHz)
Powering	
Power Consumption	41 W
Remote Power Input Voltage	94 ... 121 V AC (47... 63 Hz)
	196 ... 253 V AC (47 ... 63 Hz)
Power Passing Capability	≤ 14 A (7A per output)

5.4.7 CONV3.1

Converter

Part Number 3EC 20054 XXXX

Functional Description

- Generates the supply voltages for the return path assemblies in the HUCAP
- Test socket for checking the output voltage on the front panel
- Alarm signalling in the event of under-voltage
- Can be installed redundant and changed during operation (hot insertion)
- S9 equipment practice

Technical Data

Input voltage	40.5...75 V
Output voltage	U_1: +5.6 V = ± 1.5% U_2: -5.6 V = ± 1.5% U_3: +12.6 V = ± 2.0%
Output current	U_1: 30.0 A U_2: 6.0A U_3: 1.5 A
Over-voltage protection	U_1: +7.0 V U_2: -7.0 V U_3: +16.0 V
Efficiency	85%
Dimensions (h x w x d)	248 mm x 30 mm x 220 mm
Weight	1 kg

5.4.8 CRXLD

Compact Fibre Node

Part Number 3EC 20244/20245 XXXX

Functional Description:

- Two coaxial outputs and additional coax amplifier feeding output
- Two independently adjustable GaAs power doubler RF outputs
- Externally available output test port
- Supervision included in plug-in return transmitter module BUCHP
- Compact design

Technical Data

Wavelength range	1280...1580 nm
Optical input level (selectable by jumper)	-7 ... +1 dBm or -4 ... +4 dBm
Impedance	75 Ω
Frequency range	47 ... 870 MHz
Frequency response	± 1.8 dB
Output level at 870 MHz (OMI = 5%), for each of the 2 outputs, individually adjustable	99 … 117 dBµV
Pre-emphasis (47...870 MHz), adjustable	0 ... 10 dB
Return loss	19 dB (@ 47 MHz) – 1.5 dB/oct, min. 15 dB
Power feeding voltage	
Mains power feeding	94 ... 253 V AC
Remote power feeding DC	40.5 ... 115 V DC
Remote power feeding AC	30 ... 65 V_{rms} (47 ... 63 Hz sinusoidal)
Ambient air temperature	-33°C ... +40°C (outdoor version) -25°C ... +55°C (cabinet version)
Power consumption	≤ 41.5 W ≤ 48 W (including return transmitter)
Dimensions (h x w x d)	270 mm x 295/320 mm x 135 mm (without/with external connectors)
Housing	IP 65 (outdoor version) IP 52 (cabinet version)
Weight	~5.3 kg

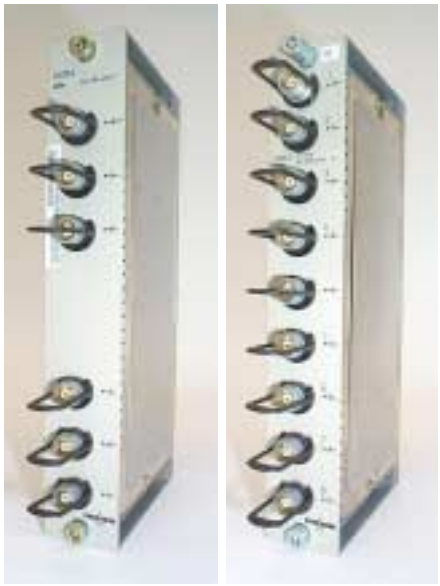
5.4.9 CSx

Combiner / Splitter Family for 47…862 MHz

Part Number 3AG 16446/16338 XXXX

Functional Description:

- Passive electrical combiner/splitter 2 times 1:2 CSD2800
- Passive electrical combiner/splitter 1:8 CS8800



Technical Data

Impedance (input and output)	75 Ω
Frequency range	47...862 MHz
Insertion loss between in- and output	
CSD2800 (2x 1:2)	4.2 dB ± 0.3 dB
CS8800 (1:8)	13 dB ± 0.3 dB
Flatness	±0.2 dB
Return loss	≥ 20 dB (@ 47 MHz) -1.5 dB/oct, min 15 dB
Electrical isolation	≥ 20 dB
Power consumption	≤ 1.2 W
Dimensions of BK equipment practice	Module width 1
Weight	~0.9 kg

5.4.10 DAHE8

Combiner Amplifier

Part Number 3EC 20734 XXXX

Functional Description

- Combination of up to four input signals, which are supplied by the EPA amplifiers (equalized and amplified AMTV, BKVI, HF5-signals)
- Additional test port input
- Output with high-pass filter to drive a CATV broadband transmitter with 88 dBµV
- Output with high-pass filter to drive an AB amplifier with 69 dBµV
- Output with low-pass filter to drive a BKVI transmitter with 79 dBµV
- Output test port (80 dBµV)

Technical Data

Impedance	75 Ω
Frequency range	47...862 MHZ
Frequency response	
47 ... 606 MHz	± 0.3 dB
607 ... 870 MHz	± 0.5 dB
Nominal input level	90 dBµV
Output levels	
High pass filtered output foreseen to feed optical transmitter	88 dBµV
High pass filtered output foreseen to feed an electrical amplifier	69 dBµV
Low pass filtered output foreseen to feed a “BKVI” opt. transmitter of German Telecom	79 dBµV
Test port	80 dBµV
Power consumption	≤ 7 W
Dimensions of BK equipment practice	Module width 1
Weight	~0.9 kg

5.4.11 DOTXD815

Optical Transmitter 1550 nm
used for DWDM transmission of narrowband signals

Part Number

Functional Description:

- Amplification and electro/optical conversion of narrowband multiplex signal into an optical 1550 nm signal with a direct modulated laser
- For optical DWDM transmission of individual signals from headend to the distribution hub
- SBS suppression technology

Technical Data:

Number of inputs	2
Impedance	75 Ω
Frequency range	47 ... 870 MHz
Nominal RF input level (OMI = 5 %)	80 dBµV
RF adjustment range	-3.5 … +3.5 dB
Frequency response 47...870 MHz	± 0.75 dB
Return loss	≥ 16 dB
Optical output power DOTXD815	10 dBm
Optical wavelength	
DOTX815A	1531.90 nm (ITU grid No. 57)
DOTX815B	1533.47 nm (ITU grid No. 55)
DOTX815C	1535.04 nm (ITU grid No. 53)
DOTX815D	1536.61 nm (ITU grid No. 51)
DOTX815E	1538.19 nm (ITU grid No. 49)
DOTX815F	1539.77 nm (ITU grid No. 47)
DOTX815G	1541.35 nm (ITU grid No. 45)
DOTX815H	1542.94 nm (ITU grid No. 43)
Power consumption	≤ 15 W (Standby-Modus 1W)
Dimensions of BK equipment practice	Module width 1
Weight	~1.4 kg

5.4.12 DWDM815x

DWDM Multiplexer and Demultiplexer for Upstream Channel

Part Number 3EC 20752/20753/20787/20788 XXXX

Functional Description:

- DWDM815A: passive optical multiplexer for up to 8 wavelengths
- DWDM815B: passive optical demultiplexer for up to 8 wavelengths
- Housed in cassettes
- A fibre tray is needed for installation

Technical Data

Number of Inputs	
DWDM815A	8
DWDM815B	1
Number of Outputs:	
DWDM815A	1
DWDM815B	8
Optical wavelengths	1547.72 … 1558.98 nm (ITU Grid Channel 23, 25, 27, … 37)
Insertion Loss:	
DWDM815A and B in total	< 7 dB
DWDM815A/B single	< 5 dB
Return Loss	> 45 dB
Decoupling of DWDM815B:	
referred to adjacent channels	> 22 dB
referred to non-adjacent channels	> 30 dB

5.4.13 DWTX315x

Optical Transmitter DW

Part Number 3EC 20754 XXXX

Functional Description

- Performs the electrical/optical transformation to transmit the upstream channel signals optically from the distribution hub to the headend
- Possibility for wavelength multiplex with up to 8 different wavelengths
- Possibility to apply frequency division multiplex (frequency stacking)
- Supervision of the laser and generation of internal alarms

Technical Data

Number of inputs	2 (main input and lower level input)
Impedance	75 Ω
RF input level (OMI = 6.0 %)	87 dBµV
Frequency Range	5 ... 330 MHz
Optical output power	+7 dBm
Optical Wavelength	
DWTX315A	1558.98 nm (ITU grid No. 23)
DWTX315B	1557.36 nm (ITU grid No. 25)
DWTX315C	1555.75 nm (ITU grid No. 27)
DWTX315D	1554.13 nm (ITU grid No. 29)
DWTX315E	1552.52 nm (ITU grid No. 31)
DWTX315F	1550.92 nm (ITU grid No. 33)
DWTX315G	1549.32 nm (ITU grid No. 35)
DWTX315H	1547.72 nm (ITU grid No. 37)
Power consumption	≤ 9 W
Dimensions of S9 equipment practice	248 mm x 30 mm x 220 mm
Weight	~1 kg

5.4.14 1570BB ECT/MECT

Equipment Craft Terminal
Master Equipment Craft Terminal

Part Number

Functional Description

- Provides all function to operate an 1570BB HFC network element locally
- Consists of an proprietary manager managing one network element at a time
- Is mainly used by installation or maintenance personnel, connecting it to a network element for installation and maintenance purposes
- Provides management functions to display status information and configuration parameter of a network element
- MECT (desktop) is used to setup a session to a network element in the HFC network via direct connection to the MCON in the 1570BB head end location, thanks to the Q2* routing function
- Laptop used with connection via cable to the RS232 port of the network element controller

Technical Data:

Used computing hardware is a standard Desktop PC or Laptop with following features:

State of the art cost effective controller e.g. Pentium III, 300MHz, with 64MB RAM, 4GB HD, CD-ROM drive, 3.5 FD drive, minimum 14inch colour screen, resolution min. 1024 x 768, WIN 95/98/NT, Cable set, and Dongle

Beside the OEM software WIN 95/98/NT, the ECT / MECT NECTAS software and the dedicated 1570BB NE application software is needed to run the system.

The ECT / MECT software platform consists of:

- NECTAS Software
- OEM software (WIN95/98/NT)

The 1570BB NE application software is designed in a modular way.

- Element management functions are provided for:
  - Alarms and controls
  - NE configuration
  - Laser performance
  - Remote inventory information
  - NE administration
  - Event log
  - GUI with physical and functional views of equipment in rack / subracks

5.4.15 EPA800

Part Number 3AG 16027 XXXX

Functional Description:

- RF preamplifier for headend and hub
- Fixed or adjustable gain (plug-in module)
- Fixed or adjustable equalisation (plug-in module)
- Injection of pilot signal and test signals possible
- 2 RF outputs
- Supervision and alarming of input signal level
- Output test port

Technical Data

Impedance	75 Ω
Frequency range	47 ... 862 MHz
Input level	79 ... 93 dBµV
Frequency response	
47 ... 606 MHz	± 0.3 dB
607 ... 870 MHz	± 0.5 dB
Output level at 2 outputs	
EPA800 C/D	90 dBµV
EPA800 E	≤ 94 dBµV (adjustable)
Power consumption	≤ 9.2 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.16 FSTAC1A

Frequency Stacker

Part Number 3EC 20756 XXXX

Functional Description

- The module contains two independent frequency multiplexer circuits
- Each frequency multiplexer combines two input signals (5-65 MHz) by frequency shifting one of the two input signals in the frequency range 88-148 MHz and afterwards combining it with the second input signal
- Compliant with former return path modules (12dB attenuation for HUCUPP/BUCUPP-F)

Technical Data

Number of inputs	2 for each frequency multiplexer circuit (both ports at the connector panel of the HUCAP subracks can be used)
Number of outputs	1 for each frequency multiplexer circuit
Impedance	75 Ω
Nominal input level	87 dBµV
Nominal output level	
Internal attenuation 0 dB	87 dBµV
Internal attenuation12 dB	77 dBµV
Frequency range	
Input signals	5 … 65 MHz
Output signals	5 ... 148 MHz
Pilot tone	4.5 MHz
Power consumption	≤ 3.5 W
Dimensions of S9 equipment practice	252 mm x 30 mm x 235 mm
Weight	~0.6 kg

5.4.17 FDSTAC1A

Frequency Stacker

Part Number 3EC 20757 XXXX

Functional Description

- The module contains two independent frequency demultiplexer circuits
- Every frequency demultiplexer circuit filters the 1st band (5-65MHz) out of the input signal and passes it on to an output. The 2nd band (88-148MHz) included in the input signal is shifted back to its original state (5-65MHz) and passed on to the second output.

Technical Data

Number of inputs	1 for each frequency demultiplexer circuit
Number of outputs	3 at each frequency demultiplexer circuit (2 outputs available at connector panel of HUCAP subrack, 1 output internally wired to UCC slot)
Impedance (inputs and outputs)	75 Ω
Nominal input level	84 dBµV
Nominal output level	82 dBµV and 74 dBµV(externally available) 82 dBµV (internally for UCC module)
Frequency Range	
Input signals	5 ... 148 MHz
Output signals	5 … 65 MHz
Pilot tone	4.5 MHz
Power Consumption	≤ 5 W
Dimensions of S9 equipment practice	252 mm x 30 mm x 235 mm
Weight	~0.6 kg

5.4.18 HEC

Head End Controller

Part Number 1AF 02692 AAAA (48 VDC supply)

1AF 02692 ABAA (110/230 VAC)

Functional Description

- Installed in the head end
- Gateway for SNMP/IP/Ethernet network management systems
- Supervision of all VrP controllers installed in the network
- Communication with the VrP controllers via the distribution and the upstream channel of the CATV network
- 8 independent receivers for outstanding noise consistency

Technical Data

Frequency Range:	
Frequency on receipt	5...65 MHz (steps of 50 kHz)
Sending frequency	48...162 MHz (steps of 50 kHz)
Receiver level	40...80 dBµV, type 60 dBµV
Transmitter level	96...111 dBµV
Modulation scheme	FSK, +/- 67 kHz, 38.4 kbit/s
HF outputs per modem card	1
HF inputs per modem card	2
Supply voltage	48-VDC or 110/230 -VAC version
Power consumption	≤ 25 W

5.4.19 HUCHP

Upstream Unidirectional Point-to-Point Receiver

Part Number 3EC 20565 XXXX

Functional Description

- Performs the optical/electrical conversion of four return path signals, coming from the fibre nodes
- Four optical receiver circuits in 1 module
- Demodulation of supervision information sent from return transmitter BUCHP, supervision of the internal conditions and status reports to the supervision interface
- 2 external outputs
  1 internal output for UCC module

Technical Data

Number of optical inputs	4
Optical input power	-20 ... 0 dBm
Optical wavelength	1200 ... 1600 nm
Optical return loss	≥ 45 dB
Number of RF outputs	4x 3 (4 receivers, 3 outputs each)
Impedance	75 Ω
Frequency range	5 ... 200 MHz
RF output level	87 dBµV and 73 dBµV (externally available) 87 dBµV (internally for UCC module)
RF return loss	≥ 18 dB (15 dB for 150...200 MHz)
Power consumption	≤ 10.7 W
Dimensions of S9 equipment practice	248mm x 30 mm x 220 mm
Weight	~1 kg

5.4.20 LCA800

Load Controlled Amplifier

Part Number 3AG 16018 XXXX

Functional Description

- Combining of either two broadband downstream signals equally levelled or two broadband signals with 10 dB level difference (e.g. AMVSB and DVB signals)
- The input combiner for the two BB downstream signals can be bridged affording less input level at one input
- Amplification and regulation for a constant total modulation index needed for the optical transmitters
- One or two outputs (internally configurable), adapted to the required input performance of the 1310 nm optical transmitter (in the OTXE090 the LCA function is integrated)
- Test point for the output signal
- Output signal supervision

Technical Data

Frequency range	47...862 MHz
Frequency response:	
47...606 MHz	± 0.5 dB
606...862 MHz	± 0.75 dB
Nominal gain	7 dB / 11 dB[2]
Range of gain control	+4 / -4 dB
Total load reference	+2.7 dBm
Nominal input level	86 dBµV[3]
Output level, modulating the OTX with 5%	
at 1 output	97 dBµV
at 2 outputs	93 dBµV
Power consumption	≤ 10 W
BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.21 LONI

LON Interface

Part Number 3EC 20119 XXXX

Functional Description

- Interface for the Local Signalling Network (LSN)
- LSN bus connection of two subracks
- Generates coding frequencies which are forwarded to the plug sockets of the subrack
- S9 equipment practice

Technical Data

Frequency range	80 MHz ... 1 GHz
Power consumption	≤ 2 W
Dimensions (h x w x d)	210mm x 21mm x 233mm
Weight	~0.9 kg

5.4.22 MAX030G

MAX030G CATV Broadband Amplifier

Part Number

- Key Features:
- Compact housing
- 1 GHz platform
- Modular design
- Active high level, high performance outputs
- Monitoring features
- Optional system equalizer (bumper/debumper)
- Directional RF test point at output with switchable measurement direction
- Optional automatic gain control

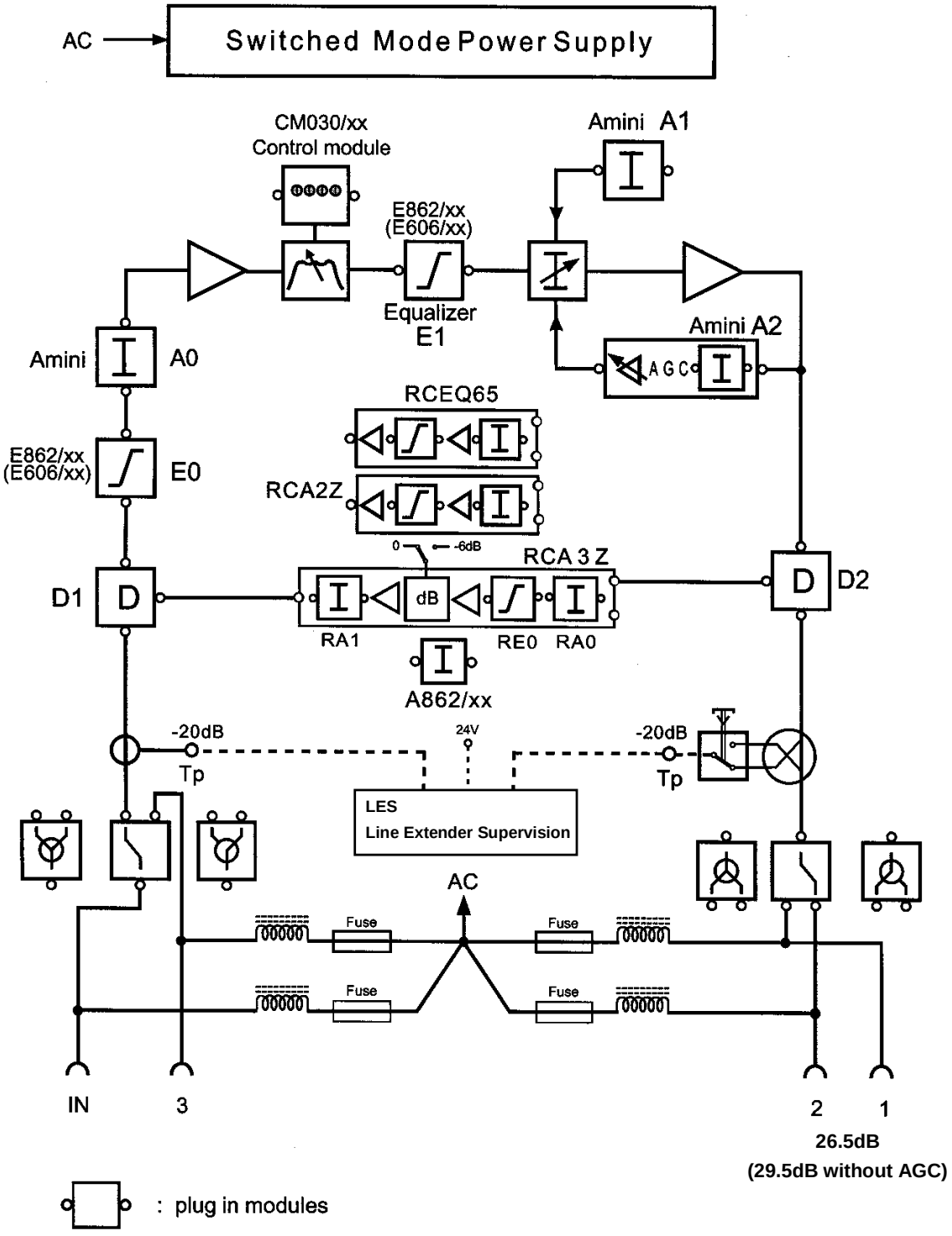
Technical Data

Characteristics:

Band coverage	47/54/70/85 – 862 MHz
Frequency response	± 0.5 dB
Noise figure type	8 dB
Return Loss (including diplex filters)	>18 dB at 47 MHz
Gain without AGC	31 dB
Gain with AGC	28 dB
Distortion parameters according to EN50083-3 channel-loading CENELEC 42 with diplexer modules and 8 dB slope	
Output level performance for type 66 db CTB	109 dBµV 49 dBmV
Output level performance for type 66 db CSO	109 dBµV 49 dBmV
Recommended operation level	98 – 102 dBµV 38 – 42 dBmV
Impedance	75 Ohm
Test point	-20 dB
Power consumption	18 W

Automatic Gain Control AGC 030	
Gain control range	- 3 to + 3 dB
Accuracy	± 0.5 dB
Pilot frequency (vision carrier)	170 to 230 MHz
Active Reverse Channel Amplifier RCA3Z 25/xx	
Band coverage	5 – 30/42/65 MHz
Module gain	25 dB
Station gain (output – input)	23 dB with diplex filter at full gain
Passive Reverse Channel Module RCEQ Z 65	Reverse channel equalizer, frequency compensated attenuator and equalizer with Amini 4 dB station insertion loss
A862/0	2 dB station insertion loss
Reliability	
Life time at 40°C	>10 Years
MTBF	>50 Years
Plug-in Modules	
Reverse channel module 25 dB gain	RCA3Z 25/30 MHz, RCA3Z 25/42 MHz, RCA3Z 25/65 MHz
Diplex filters	D30/47 MHz, D42/54 or 52.5 MHz, D50/70 MHz, D65/85 or 80 MHz
Automatic Gain Control (E06, E07)	AGC030/182.25 MHz, AGC030 198.25 MHz
Control module	CM030/47 MHz, CM030/54 MHz, CM030/85 MHz
Attenuators fixed	Amini pads 0,1,2..., 19,20 dB A862/0 dB bridger, A862/2,4,6,8,10 dB
Splitter	3.5 dB/3.5 dB
Directional couplers	TAP 8/1.5 dB, TAP 10/0.5 dB, TAP 16/0.5 dB
Cable equivalence	CE862/2;4;6,8 dB
Equalizers	E606/2,4,6..., 18,20 dB, E862/2,4,6...14,16 dB
Adjustable equalizer	E862/0 – 16 dB
Reverse channel equalizer/attenuator	RCEQ Z 65

Block Diagram MAX030G



5.4.23 MAX037G

MAX037G CATV Broadband Amplifier

Part Number

- Key Features:
- Compact housing
- 1 GHz platform
- Modular design
- Active high level, high performance outputs
- Monitoring features
- Directional RF test point at output with switchable measurement direction

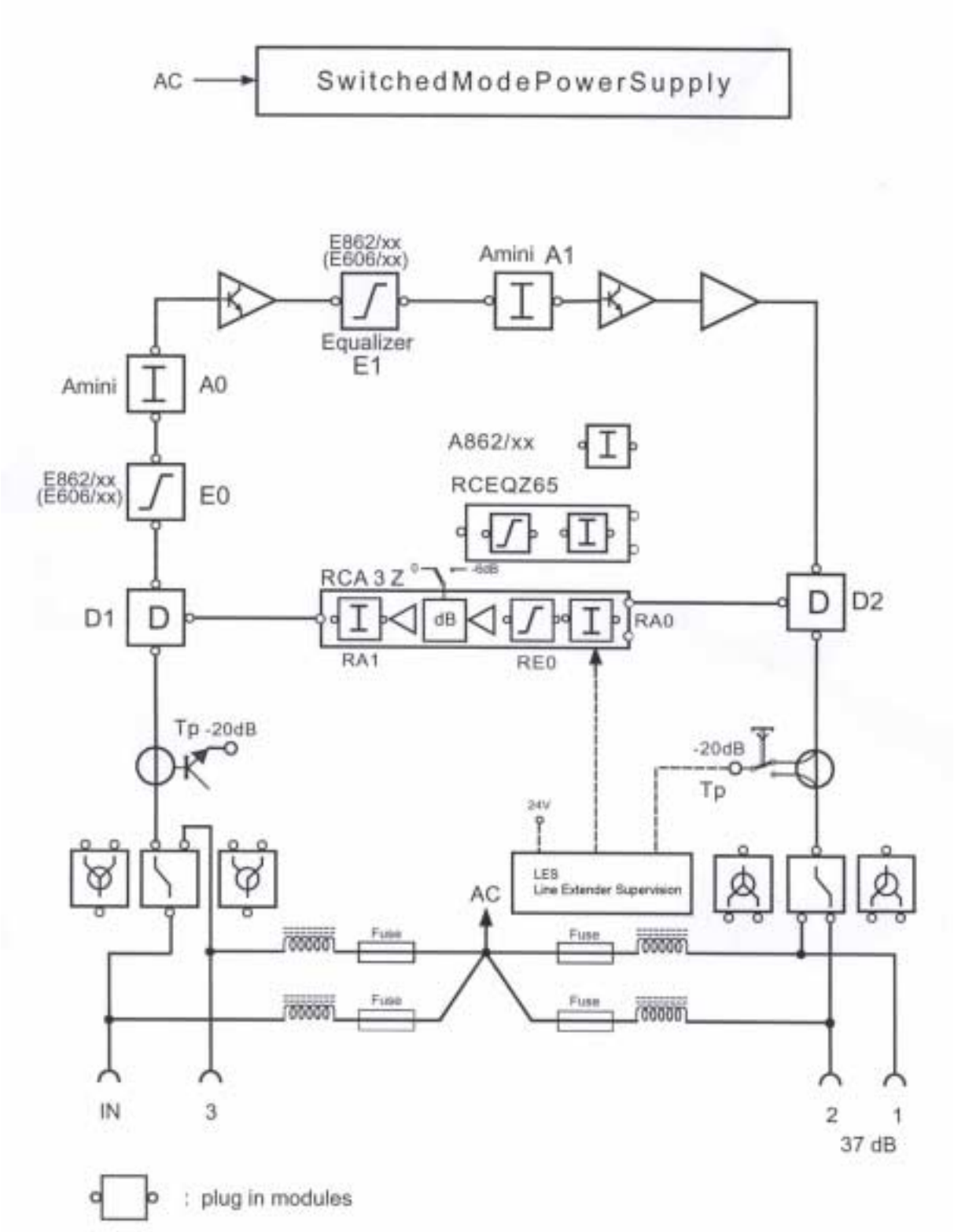
Technical Data

Characteristics:

Band coverage	47/54/70/85 – 862 MHz
Frequency response	± 0.75 dB
Noise figure type	7 dB, measured at full gain
Return loss (inclusive diplex Filter)	>18 dB at 47 MHz –1.5 dB/Oct. Up to 862 MHz
Gain	37 dB ± 1
Distortion parameters according to EN50083-3 channel-loading CENELEC 42 with diplexer modules and 8 dB slope	
Output level performance for type 62 db CTB	≥110 dBµV ≥50 dBµV
Output level performance for type 63 db CSO	≥110 dBµV ≥50 dBµV
Recommended operation level	MAX037G used as line amplifier 100 – 102 dBµV 40 – 42 dBmV
Recommended operation level	MAX037G used as distribution amplifier 104 – 108 dBµV 44 – 48 dBmV
Impedance	75 Ohm
Test point	-20 dB

Power consumption	16 W
Reliability	
Life time at 40°C	>10 Years
MTBF	>50 Years
Active Reverse Channel Amplifier RCA3Z 25/xx	
Band coverage	5 – 30/42/65 MHz
Module gain	25 dB
Station gain	23 dB with diplex filter at full gain
Passive Reverse Channel Module RCEQ Z 65	Reverse channel equalizer, frequency compensated attenuator and equalizer with Amini 4 dB insertion loss
A862/0	2 dB station insertion loss
Plug-in Modules	
Reverse channel amplifier 25 dB gain	RCA3Z 25/30 MHz, RCA3Z 25/42 MHz, RCA3Z 25/65 MHz
Diplex filters	D30/47 MHz, D42/54 or 52.5 MHz, D50/70 MHz, D65/85 or 80 MHz
Attenuators fixed	Amini pads 0,1,2,... 19, 20 dB A862/0 dB Bridger, A862/2,4,6,8,10 dB
Attenuator frequency compensated	CA862/4 dB, CA862/6 dB
Splitter	S3.5/3.5
Directional couplers	TAP 8/1.5, TAP 10/0.5, TAP 16/0.5
Cable equivalence	CE862/2;4;6,8 dB
Equalizers	E606/2,4,6..., 18,20 dB, E862/2,4,6...14,16 dB
Adjustable equalizers	E862/0 – 16 dB
Reverse channel equalizer/attenuator	RCEQ Z 65

Block Diagram MAX037G



5.4.24 MAX236G

MAX236G CATV Broadband Amplifier

Part Number

Key Features:

- Modular design
- Transponder module
- Accurate bi-directional output test point
- Surge arrestor at all ports
- Fixed plug-in attenuator and equalizer pads
- Temperature compensation
- Compact housing

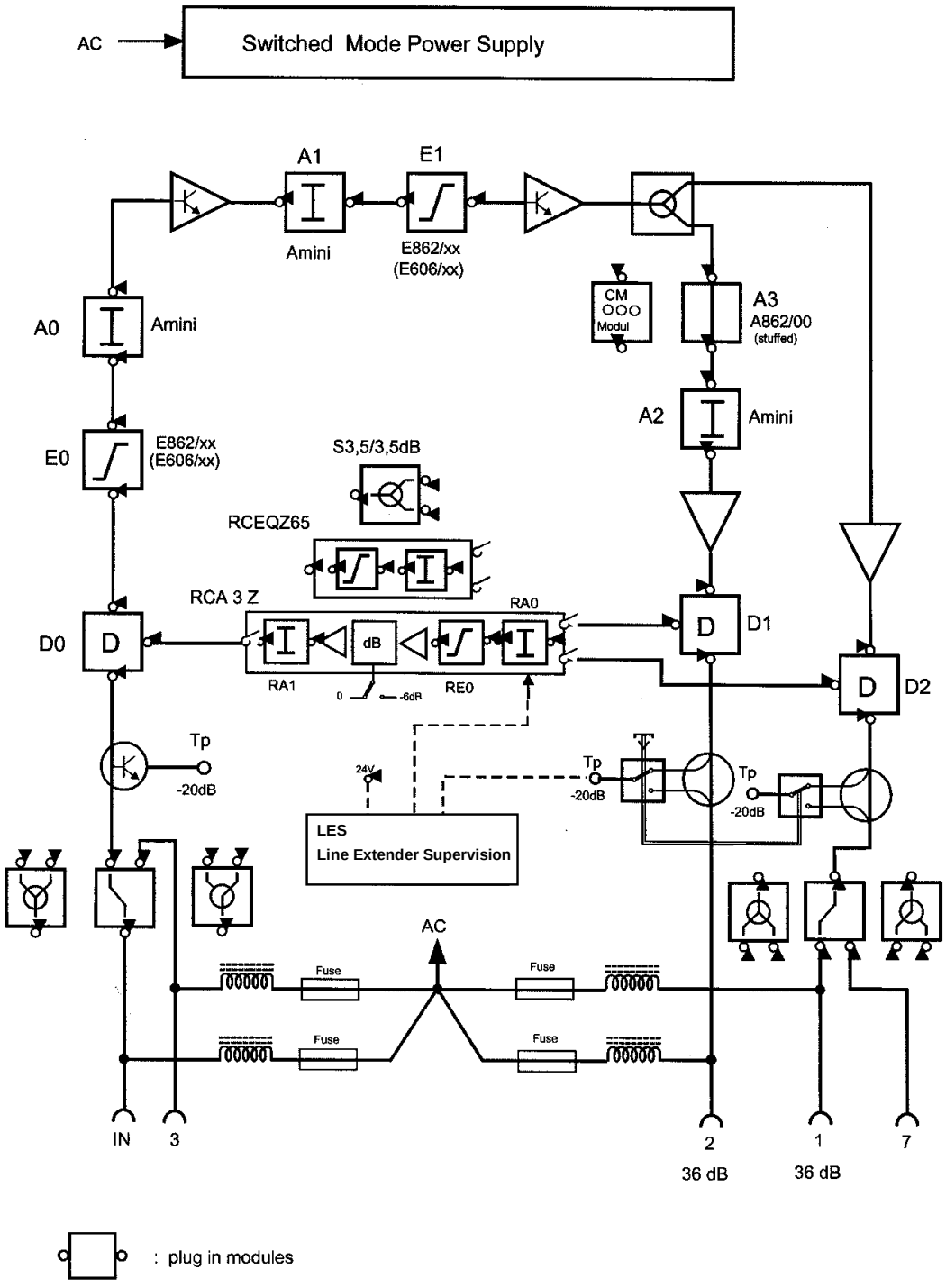
Technical Data

Characteristics:

Band coverage	47/54/7085 – 862 MHz
Frequency response	± 1.0 dB
Noise figure	6 dB
Return loss (inclusive diplex filters)	>18 dB (47 MHz) (-1.5 dB/Oct.)
Gain	2 x 36 dB
Distortion parameters according to EN50083-3 channel-loading CENELEC 42	
Output level performance for 60 dB CTB	110 dBµV 50 dBµV
Output level performance for 60 dB CSO	110 dBµV 50 dBµV
Impedance	75 Ohm
Test point	-30 dB
Power consumption	<30 W

Active Reverse Channel Amplifier RCA3Z 25/xx	
Band coverage	5 – 30/42/65 MHz
Module gain	25 dB
Station gain	19 dB with diplex filters at full gain
Passive Reverse Channel Modules RCEQ Z 65	Reverse channel equalizer, frequency compensated attenuator and equalizer with Amini 8 dB station insertion loss
S3.5/3.5	6 dB station insertion loss
Plug-in modules	
Reverse channel amplifier 25 dB gain	RCA3Z 25/30 MHz, RCA3Z 25/42 MHz, RCA3Z 25/65 MHz
Diplex filters	D30/47 MHz, D42/54 or 52.5 MHz, D50/70 MHz, D65/85 or 80 MHz
Attenuators fixed	Amini pads 0, 1,2..., 19, 20 dB A862/0 dB bridger, A862/2, 4,6,8,10 dB
Attenuator frequency compensated	CA862/4 dB, CA862/6 dB
Splitter	S3.5/3.5
Directional couplers	TAP 8/1.5, TAP 10/0.5, TAP 16/0.5
Cable equivalence	CE862/2,4,6,8 dB
Equalizers	E606/2,4,6... 18, 20 dB, E862/2,4,6...14,16 dB
Adjustable equalizers	E862/0-16 dB
Rev. Channel equalizer/attenuator	RCEQ Z 65

Block Diagram MAX236G



5.4.25 HMAX030G

HMAX030G House Amplifier

Part Number

Key Features:

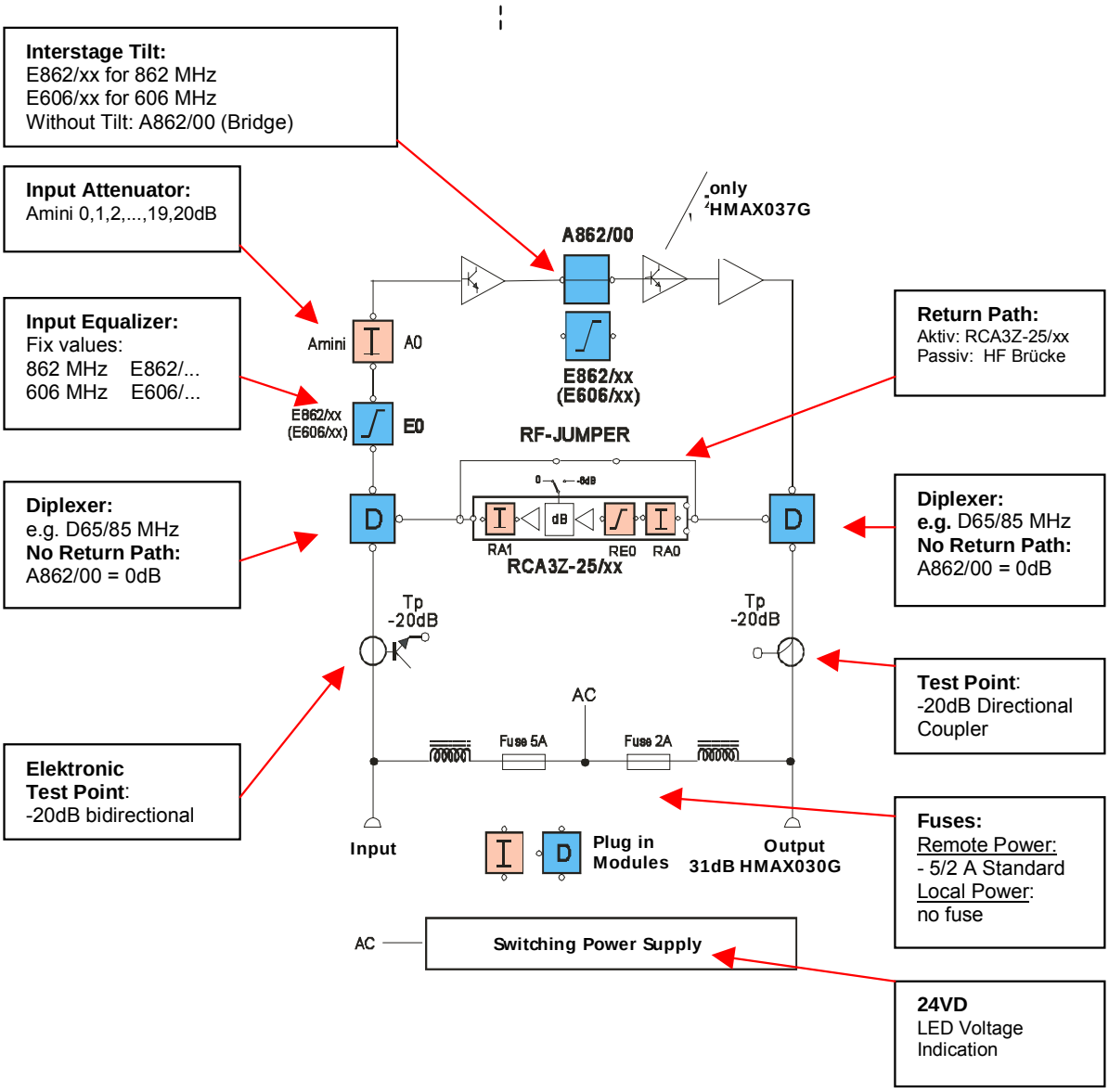
- Compact housing
- 1 GHz platform
- Modular design
- Active high level, high performance outputs
- Directional RF test point at output
- Active RF test point at input with insertion loss < 0.1 dB

Technical Data

Forward path:	
Frequency	Up to 862 MHz
Ripple	± 1.0 dB (type ± 0.75 dB)
Noise figure type	7 dB
Return loss	>18 dB (47 MHz) –1.5 dB/Oct
Gain	31 dB
Hum	-70 dB
Connectors	PG11, IEC, 5/8 UNEF, F, 3,5/12
Impedance	75 Ohm
Test point Output	-20 dB ± 1 dB – directional coupler
Input	Electronic test point –20 dB
Output level (CENELEC 42 and 8 dB tilt – with diplexer):	
CTB @ 110 dBµV (50 dBmV)	≤58 dB
CSO @ 110 dBµV (50 dBmV)	≤58 dB
Performance level:	
Remote power feeding @ $50V_{AC}$:	
Amplifier (general)	12.5 W
Amplifier incl. return channel amplifier	14.0 W
Local power feeding @ $230V_{AC}$:	

Amplifier (general)		14.0 W
Amplifier incl. return channel amplifier		15.5 W
Power Supply		
Local power feeding		90 – 250 VAC / 50-60 Hz
Remote power feeding		28 VAC to 65 VAC / 50 Hz
Wattage	Input	4 A max. (coaxial cable)
	Output	2 A max. (coaxial cable)
Temperature:		
Environmental temperature		-40°C to +70°C
Working temperature		-20°C to +60°C
Protection according to IEC 529		IP 55, IP 67 optional

Block Diagram HMAX030G



5.4.26 RCA 3 Z

Return Amplifier RCA 3 Z 65 MHz for (H)MAX Type Amplifiers

Part Number

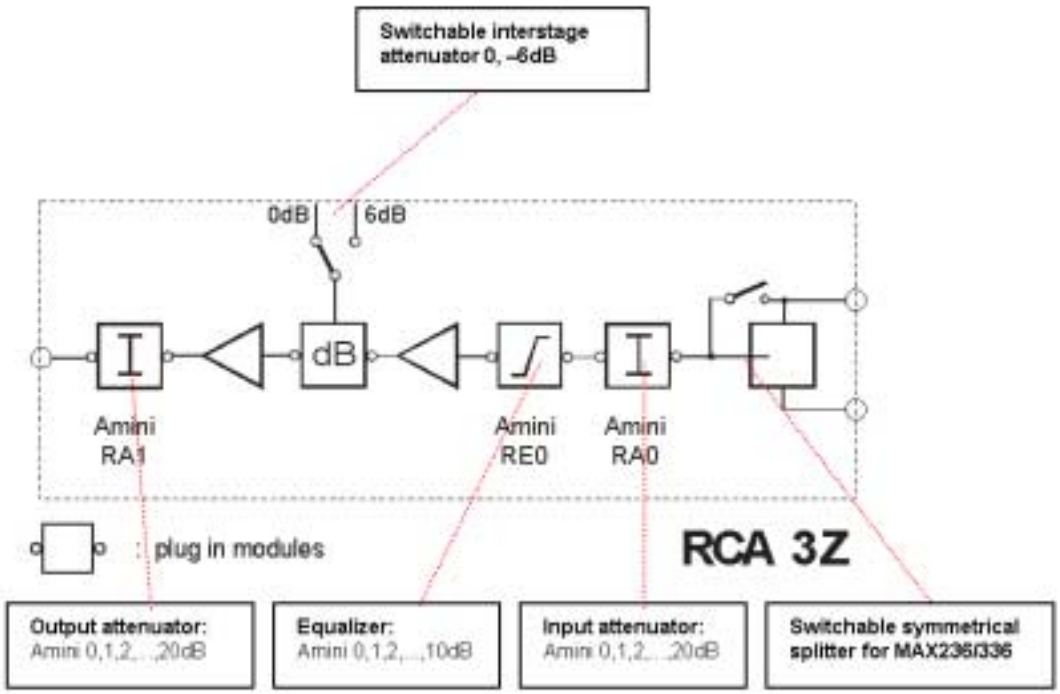
Functional Description:

- The module RCA3Z is a universal reverse path amplifier suited for the MAX amplifier range from ADC. The functional adjustment possibilities enable a universal usage in HFC networks. All adjustments can be performed by Amini pads. A switchable attenuator enables a reduction of the gain by –6dB. The roll off caused by the diplex filters is compensated by a special circuit. The gain at the higher frequency is increased by 1,5dB.

Technical Data

Forward path:	
Gain	25 dB
Flatness	± 0.25 dB
Noise	<6 dB
Return loss	>20 dB @5-30/42/65 MHz
Connector	2 pcs. 10-pole connector unit
Impedance	75 Ω
Output Level:	
According to measurement method IM2 at -60 dBc	110 dBµV
Recommended Output Level:	
Depending upon allocation	70 – 90 dBµV
Performance Level:	
Amplifier (general)	< 2 Watt with efficiency power supply unit
Power Supply:	
Feeding voltage	24 V DC from local power supply unit
Power consumption	60 mA
Temperature:	
Working temperature	- 20°C to + 75°C
Plug-in modules:	
Pluggable attenuators (orange)	Amini 0,1,2,3...20 dB

Block Diagram Return Amplifier RCA 3 Z



5.4.27 MBOAA

MFN RF Booster Amplifier

Functional Description

- The module contains two independent booster amplifier circuits
- The gain and slope of each booster amplifier is independently adjustable
- The output of each booster amplifier is equipped with a pluggable diplex filter for return path signal separation
- Each booster amplifier supervises its output level
- Each booster amplifier provides a test port

Technical Data

Impedance	75 Ω
Frequency range	86 ... 870 MHz
Nominal input level	93.5 dBµV
Gain and frequency response	≥ 16.5 dB ± 1.0 dB
Adjustable attenuation	0 … 18 dB
Adjustable slope	0 … 15 dB
Noise figure	≤ 10 dB (47 … 600 MHz) ≤ 11 dB (600 … 870 MHz)
Return loss	≥ 20 dB (@40 MHz) – 1 dB/oct, min. 16 dB
Test port attenuation referred to output	20 dB ±0.5 dB
Return path frequency range	5 … 65 MHz
Return path return loss	≥ 18 dB
Return path attenuation	≤ 1.5 dB
Power consumption	≤ 21 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.28 MBOB

BK862 Booster Amplifier for A/B Level

Part Number

Functional Description:

- If a fibre or coax node is in need of more than 2 A/B level outputs (or when the A/B level outputs are needed to feed MOC amplifier modules), it is necessary to plug in a MBOB amplifier to extend the number of A/B level outputs.

Technical Data

Impedance	75 Ω
Frequency range	47...862 MHz
Return loss	20 dB – 1 dB / Oct.; min. 16 dB
Nominal input level	81 dBµV
Pilot frequency	610 MHz
Nominal output level	96 dBµV
Preemphasis (47 … 862 MHz)	7 dB
Frequency response tolerance (incl. temperature)	±0.8 dB
Noise level	< 9.5dB (type 8.5 dB)
Extraction loss of the test output	20 dB
Power consumption	≤ 8 W (type 7 W)
BK equipment practice	Module width 1

5.4.29 MBOC

BK862 Booster Amplifier for C Level

Part Number 3EC 20560 XXXX

Functional Description

- C level booster amplifier to provide very high C level output power. Output pre-emphasis can be adjusted manually or by element management.

Technical Data

Impedance	75 Ω
Frequency range	Distribution path: 85...862 MHz Upstream channel: 5 … 65 MHz
Return loss	19 dB – 1 dB / Oct.; but min. 16 dB
Nominal input level	96 dBµV (7dB preemphasis)
Pilot frequency	610 MHz
Nominal output level	125 dBµV
Skew (47 … 862 MHz)	Adjustable (16 dB, 19 dB, 22 dB)
Frequency response tolerance (incl. temperature)	±1.0 dB
Noise level	Type 30 dB @ 85 MHz, 17 dB @ 862 MHz
Extraction loss at the test output	20 dB
Power consumption	≤ 18.5 W (type 17.5 W)
BK equipment practice	Module width 1

5.4.30 MIAC

BK862 Interstage Amplifier Pilot Controlled for A/B Level

Part Number 3EC 20558 XXXX

Functional Description

MIAC:

- Interstage amplifier for coax node amplifies the MORR signal into a fixed, pilot controlled output signal to reach in defined A/B level output and pre-emphasis. The amplifier has a pluggable input equalizer (6dB, 10 dB, 14 dB, 18 dB, 22 dB and 25 dB) to adapt to different coax cable lengths. Fine-tuning of input equalizing is performed by an automatic regulation that compensates for temperature variations of the coax cable characteristics.

Technical Data

Impedance	75 Ω
Frequency range	47...862 MHz
Return loss	20 dB – 1 dB / Oct.; but min. 16 dB
Minimum input level (virtual after automatic equalization of the remaining skew and loss of the equalizer	69 dBµV
Pluggable equalizer for 6, 10, 14, 18, 22 and 25dB cable loss	EQ06MI, EQ10MI, EQ14MI, EQ18MI, EQ22MI and EQ25MI
Pilot frequency	610 MHz
Nominal output level	96 dBµV
Skew (47 … 862 MHz)	7 dB
Frequency response tolerance (incl. Temperature)	±1.0 dB
Noise level	< 7.5 dB
Extraction loss of the test output	20 dB
Power consumption	≤ 13 W (type 11 W)
BK housing	Module width 1

5.4.31 MIAF

BK862 Interstage Amplifier Pilot Controlled for A/B Level

Part Number 3EC 20557 XXXX

Functional Description:

MIAF:

- Interstage amplifier for fibre node amplifies the MOTR signal into a fixed, pilot controlled output signal to reach in defined A/B level output and pre-emphasis. The amplifier has an automatic input switch to connect two MOTR modules for equipment and path redundancy.

Technical Data

Impedance	75 Ω
Frequency range	47...862 MHz
Return loss	20 dB – 1 dB / Oct.; but min. 16 dB
Nominal input level	91 dBµV
Pilot frequency	610 MHz
Nominal output level	96 dBµV
Skew (47 … 862 MHz)	7 dB
Frequency response tolerance (incl. temperature)	±1.0 dB
Noise level	<24 dB @ 111 MHz, <19 dB @ 862 MHz
Extraction loss at the test output	20 dB
Power consumption	≤ 7.2 W
BK equipment practice	Module width 1

5.4.32 MISAA

MFN RF Interstage Amplifier

Functional description

- Input switch to select one out of two RF signals for redundancy purposes
- Four outputs
- Additional output for supervision
- Output test port

Technical Data

Impedance	75 Ω
Frequency range	47 ... 870 MHz
Return loss	> 16 dB
Nominal input level	92 dBµV
Gain	1.5 dB
Supervision input attenuation referred to input	20 dB ±1.5 dB
Test port attenuation referred to output	20 dB ±1.5 dB
Noise figure	≤ 13 dB (47 … 600 MHz) ≤ 14 dB (600 … 870 MHz)
Power consumption	≤ 6 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.33 MOTRA/E

MFN Optical Receiver and Transmission Module

Part Number 3EC 20551 AAAA

Functional Description

- Receiver: opto/electrical conversion and RF amplification of broadband signals
- Transmitter: RF amplification and opto/electrical conversion of return path signals
- DFB and DWDM DFB laser type options for transmitter
- Test ports for receiver and transmitter

Technical Data

Wavelength	1280...1580 nm
Optical input level	-4...+3 dBm
Optical return loss	> 45 dB
Nominal output level (OMI = 3.5%)	92 dBµV
Frequency range	47 or 85... 870 MHz
Frequency response	± 2 dB
Impedance	75 Ω
Test port attenuation	20 dB ±1.5 dB (not direction sensitive)
Technical data upstream:	
Impedance	75 Ω
Frequency range	5 ... 200 MHz
Nominal input level (for OMI= 3.75%)	87 dBµV
Frequency response	± 0.5 dB
Test port attenuation	20 dB ±1.5 dB (not direction sensitive)
Optical wavelength	
MOTRA	1310 nm ± 30 nm (DFB option)
MOTRE1470, MOTRF1470	1470 nm (CWDM option)
MOTRE1490, MOTRF1490	1490 nm (CWDM option)
MOTRE1510, MOTRF1530	1510 nm (CWDM option)
MOTRE1530, MOTRF1530	1530 nm (CWDM option)
MOTRE1550, MOTRF1550	1550 nm (CWDM option)
MOTRE1570, MOTRF1570	1570 nm (CWDM option)
MOTRE1590, MOTRF1590	1590 nm (CWDM option)

MOTRE1610, MOTRF1610	1610 nm (CWDM option)
Optical output power	
MOTRA	-2 ... +2 dBm (DFB option)
MOTREnnnn	-2 … +2 dBm (CWDM option)
MOTRFnnnn	+1 … +5 dBm (CWDM option)

General technical data:

Power consumption	≤ 18 W ≤ 2 W (standby mode)
Dimensions of BK equipment practice	Module width 1
Weight	~1.2 kg

5.4.34 MOTRD

BK862 Optical Receiver and Transmission Module

Part Number 3EC 20551 ADAA

Functional Description

- Opto/electrical conversion of the BB signal
- Amplification of the BB signal and internal splitting to two outputs
- Opto/electrical conversion of the return path signals
- Optical return path transmitter (DFB) with 1310 nm wavelength
- Test point for return path transmitter

Technical Data

Wavelength	1280...1580 nm
Optical input level with stable output level	-4...+2 dBm
Optical input level with release of output level less than 1 dB	-5...+3 dBm
Optical return loss	> 45 dB
Nominal output level (OMI=3.3%, module)	89 dBµV
Frequency range	47 or 85... 870 MHz
Frequency response	± 2 dB
Impedance	75 Ω
Technical data upstream:	
Frequency range	5...65 MHz
Nominal input level (for OMI= 5.0%)	84 dBµV
Frequency range	± 0.5 dB
Impedance	75 Ω
Test point attenuation	20 dB ±1.5 dB (not direction sensitive)
Optical wavelength	1310 nm ± 30 nm
Optical output power	-2...+2 dBm
General technical data:	
Power consumption	≤ 15.0 W (type 13.5 W)
(Standby-Mode with switched-off receiver but switched-on transmitter)	≤ 4.5 W (type 3.8 W)
BK equipment practice	Module width 1

5.4.35 MPSC

MFN Power Converter Module

Part Number 1AF 01513 XXXX

Functional Description

- Converts a AC or DC input voltage into 24 V DC
- Filtering of input voltage
- Redundancy option (2 modules working simultaneously in hot standby)

Technical Data

DC input voltage	40 .... 115 V
AC input voltage	38 ... 65 V
Short circuit current limit for input	< 6 A
Output voltage	24 V (DC)
Output current	0.2 … 3.8 A
Short circuit current limit for output	< 6.0 A
Efficiency (3.8 A)	75% at DC Input Voltage
	71% at AC Input Voltage
Dimensions of BK equipment practice	Module width 1
Weight	~1.2 kg

5.4.36 MTRS

BK862 Transponder Supervision Module HMS

Part Number

Functional Description

- The controller module collects data (alarms, messages, measurement values ...) of the plugged node modules and manages the node modules by backplane bus. The controller module performs communication with the HFC element management system and (optionally) with a connected local management terminal.

Technical Data:

Modulation scheme	FSK, ∆f=50kHz, 38.4kbit/s
Receiver frequency range	Range 1: 85.0 … 87.5 MHz Range 2: 108.0 … 111.0 MHz
Receiver input level	40 … 80 dBµV (type. 60 dBµV)
Transmitter frequency range	5.0 … 10.0 MHz (steps of 100 kHz)
Transmitter output level	85 … 105 dBµV (nominal level 99 dBµV)
Power consumption	type 3.0 W
BK equipment practice	Module width 1

5.4.37 MUPAA

MFN Return Path Amplifier

Part Number 3EC 20553 XXXX

Functional Description

- 4 inputs (RF combination of up to four return path signals) with adjustable gain
- Additional inputs for supervision signal and signal injection
- Plug-in low-pass, high-pass and notch filter to suppress distortions like ingress
- Gain adjustment for optical return path transmitter OMI (optical modulation index)
- Output switch for realizing redundancy

Technical Data

Impedance	75 Ω
Frequency range	5 ... 70 MHz
Nominal input level	73 dBµV
Continuous attenuation adjustment at inputs	0 ... 10 dB
Adjustable step attenuation	0, 2, 4, ...12 dB
Nominal output level (at continuous attenuation 0 dB, step attenuation 12 dB)	87 dBµV
Slope	0 dB
Noise figure	< 18 dB
Frequency response (incl. optical transmitter and optical hub receiver HUCHP)	± 2.0 dB
Return loss	> 16 dB
Power consumption	≤ 6 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.2 kg

5.4.38 MUPAC

BK862 Return Path Amplifier

Part Number 3EC 20553 XXXX

Functional Description

- Concentration of up to five return path signals
- ICS (Ingress Control Switch) at each of the five inputs for signal attenuation (0 dB, 8 dB, >45 dB)
- Low-pass, high-pass and notch filter to suppress distortions
- Combiner to inject supervision signals
- Combiner to provide signal insertion (for redundancy applications)
- Adjustment of amplification and preemphasis for signal preemphasis (coaxial cable feeding) and OMI (optical return path transmitter) adaptation
- Two outputs (for redundancy applications) and additional EMS output

Technical Data

Impedance	75 Ω
Frequency range	5...65 MHz
Return loss 5 … 10 MHz 10 … 65 MHz	 > 16 dB > 20 dB
Nominal input level	75 dBµV
Ingress Control Switch	0 dB, (8.0 ±0.5) dB, >45 dB
Adjustable attenuation level	0, 2, 4, ...14 dB
Nominal output level Modular fibre node with 10 dB attenuation Modular coaxial node with preemphasis	 84 dBµV 76 … 83 dBµV
Noise figure	< 21 dB (@ 75 dBµV input level) < 16 dB (@ 80 dBµV input level)
Frequency response tolerance (measured in Modular Fibre Node including optical transmitter and receiver in the Distr. Hub)	± 1.2 dB (15 … 61 MHz) ± 2.0 dB (5 … 15 and 61 … 65 MHz)
Power consumption	≤ 6.3 W (type 6.1 W)
BK equipment practice	Module width 1

5.4.39 MUPAE

Return Path Amplifier for Headend and HUB

Part Number 3EC 20553 XXXX

Functional Description

- 4 inputs (RF combination of input signals)
- Low-pass and high-pass filter to plug-in
- Additional input for signal insertion
- Gain and slope adjustment

Technical Data

Impedance	75 Ω
Frequency range	5 ... 65 MHz
Return loss 5 … 65 MHz	 > 16 dB
Nominal input level	90 dBµV
Gain adjustment	0 ... 20 dB
Slope adjustment	0 … 6 dB
Noise figure	< 20 dB (including RF input combiner!)
Power consumption	≤ 5 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.2 kg

5.4.40 NECH, NECUH

Network Element Controller HMS

Part Number 3EC 23636 XXXX
3EC 23637 XXXX

Functional Description

- Network element controller NECH with HMS protocol to supervise the distribution path modules
- Network element controller NECUH with HMS protocol to supervise the return path modules
- Communication of the controllers with the modules with a powerful serial Bus (LON bus)
- Supervision and configuration of modules, administration of modules and storage of configuration data
- Communication of network element controller and the HEC via RS485 and HMS protocol
- Possibility to connect a LMT (Local Management Terminal) for local system diagnosis

Technical Data:

F-Interface	EIA RS 232
Plug connector type	9-pin Sub-D
Electrical Q2-Interface	EIA RS 485
Plug connector type	15-pin Sub-D
Power consumption	≤ 4.0 W (NECUH)
	≤ 8.4 W (NECH)
Dimensions	
NECH : BK equipment practice	Module width 1
NECUH: S9 equipment practice	210 mm x 21 mm x 233 mm
Weight	
NECH:	~1.3 kg
NECUH	~1.0 kg

5.4.41 OAHx

Analog Optical Amplifier

Functional Description

- Optical amplification of the optical signal to +13 dBm or +16 dBm per output using an Erbium-doped fiber amplifier (EDFA)
- Optical output test port (2 dBm)
  for testing and further amplifier cascading
- Supervision of the optical input level, optical output level and pump laser current
- Automatic switch-off in case of non sufficient optical input power (to prevent optical PIN diode receivers from damage)
- Standby mode

Technical Data:

Wavelength	1540 ... 1560 nm
Input level	-2 ... +8 dBm
Output power:	
OAH01x13, OAH01X16	1 output 13/16 dBm
OAH02x13, OAH02x16	2 outputs 13/16 dBm each
OAH03x16	3 outputs 16 dBm each
OAH04x13, OAH04X16	4 outputs 13/16 dBm each
OAH06x13	6 outputs 13 dBm each
OAH08x13	8 outputs 13 dBm each
Output power tolerance	± 0.5 dB (1551 … 1556 nm) ± 0.8 dB (1548 … 1560 nm)
Test port output power	2.0 dBm ±1.5 dB
Noise figure (0 dBm input power)	≤ 4.8 dB
Power consumption:	
OAH01x13, OAH01x16	≤ 20 W
OAH02x13, OAH04x13, OAH02x16	≤ 30 W
OAH06x13, OAH03x16, OAH04x16	≤ 40 W
OAH08x13	≤ 45 W
Dimensions of BK equipment practice	Module width 3
Weight	~4.0 kg

5.4.42 ODFx

Optical Distribution Frame Family

Part Number 3AG 1643x/16292 XXXX

Functional Description

- Passive optical splitters

Technical Data:

Wavelength	
1310 nm range	1310 nm ± 40 nm
1550 nm range	1550 nm ± 40 nm
Insertion loss incl. 2 opt. connectors:	
ODFD2x (2x 1:2)	≤ 4.5 dB
ODFD3x (2x 1:3)	≤ 6.8 dB
ODF4x (1:4)	≤ 8.0 dB
ODF8x (1:8)	≤ 9.1...11.3 dB
Return loss input	≥ 50 dB
Return loss output	≥ 50 dB
Power consumption:	≤ 2 W
BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.43 OSxxPP

Optical Splitter Cassette Multi-input

Part Number 1AB 11530 XXXX

Functional Description

- Passive optical splitters
- Used for optical service injection (SI)
- One input is used for the BB signal and the second input for the service injection signal
- Housed in cassettes
- A fibre tray (FBT) is needed for installation

Technical Data:

Wavelength	
1310 nm range	1310 nm ± 20 nm
1550 nm range	1550 nm ± 20 nm
Insertion loss:	
OS02PP (2:2)	3.3±0.4 dB (2 inputs level 1)
OS04PP ((2+2):4)	6.3±0.8 dB (2 inputs level 1) 3.3±0.4 dB (2 inputs level 2)
OS08PP ((2+6):8)	9.4±1.1 dB (2 inputs level 1) 6.3±0.8 dB (2 inputs level 2) 3.3±0.4 dB (4 inputs level 3)
OS12PP ((1+10):12))	11.3±1.7 dB (1 input level 1) 9.4±1.1 dB (1 inputs level 2) 6.3±0.8 dB (3 inputs level 3) 3.3±0.4 dB (6 inputs level 4)
OS16PP ((2+14):16)	12.5±1.4 dB (2 inputs level 1) 9.4±1.1 dB (2 inputs level 2) 6.3±0.8 dB (4 inputs level 3) 3.3±0.4 dB (8 inputs level 4)
Return loss input	≥ 50 dB
Return loss output	≥ 50 dB
Dimensions (h x w x d)	25 mm x 92 mm x 155 mm
Weight	~0.3 kg

5.4.44 OSCx

Optical Splitter Cassette Family

Part Number 3AG 1629x/16522

3EC 20507/2068x/2006x

1AB 11530 005x

Functional Description

- Passive optical splitters
- Housed in cassettes
- A fibre tray is needed for installation

Technical Data:

Wavelength	
1310 nm range	1310 nm ± 40 nm
1550 nm range	1550 nm ± 40 nm
Insertion loss:	
OSC8 (1:8)	8.9...11.6 dB
OSC16 (1:16)	11.8...14.8 dB
OSC32 (1:32)	14.5...18.9 dB
Return loss input	≥ 50 dB
Return loss output	≥ 50 dB
Dimensions (h x w x d)	9.5 mm x 92 mm x 155 mm
Weight	~0.3 kg

5.4.45 OTXD813

**Optical Transmitter 1310 nm,
Directly Modulated**

Part Number 3AG 16337 XXXX

Functional Description:

- Electrical/optical converter with 8, 11 or 13 dBm output power and internal CSO compensation
- Optionally preceding driver amplifier LCA800 for automatic gain control (load controlled amplification)
- RF input test port
- Supervision of optical output power, laser current and Peltier element current
- Standby mode

Technical Data:

Impedance	75 Ω
Frequency range	47 ... 870 MHz
Input level (OMI = 5%)	93 dBµV
Return loss	> 20 dB (@47 MHz) – 1.5 dB/oct, min. 15 dB
Output power	
OTXD813A	+11 dBm
OTXD813B	+8 dBm
OTXD813C	+13 dBm
Output power tolerance	± 0.5 dB
Wavelength	1290 ... 1330 nm
Return loss	> 50 dB
Power consumption	≤ 18 W
Dimensions of BK equipment practice	Module width 2
Weight	~2.7 kg

5.4.46 OTXE090

Optical Transmitter 1550 nm, Externally Modulated

Part Number 3AG 20367 XXXX

Functional Description:

- Amplification and opto/electrical conversion of a broadband signal to an optical 1550 nm signal by external intensity modulation of a laser diode with LiNb03 modulator
- RF input test port
- 2 optical outputs
- Up to 90 km transmission distance
- Supervision of RF input, laser bias voltage and laser temperature
- Integrated AGC (load controlled amplifier)

Technical Data:

Impedance	75 Ω
Frequency range	47 ... 870 MHz
Frequency response 47...606 MHz 607.... 870 MHz	 ± 0.5 dB ± 0.75 dB
Input level range (OMI = 4,5%)	89 dBµV ± 4 dB
Number of outputs	2
Optical output power OTXE090B	 2x +7 dBm
Wavelength	1551...1560 nm
Power consumption	≤ 50 W ≤ 15 W (standby mode)
Dimensions of BK equipment practice	Module width 4
Weight	~3.9 kg

5.4.47 PSO24-B

Power Supply

Part Number 3AG 16084 XXXX

Functional Description

- Generates the 24 V DC voltage for the transmission units assembled in the BK subracks
- Test socket for checking the output voltage on the front panel
- Alarm signalling in the event of under voltage
- Can be installed as a redundant unit and can be changed during operation (hot insertion)

Technical Data:

Input voltage	38.4...75 V DC
Output voltage	24 V= ± 2%
Output current	0.2...3 A
Output power	≤ 72 W
Shorting current	≤ 4 A
Over voltage protection	
Static	≤ 26.4 V
Dynamic	≤ 28 V
Power dissipation	
at I = 3 A	≤ 16 W
at I = 0 A	≤ 4 W
Efficiency	
at I = 1 A	72%
at I = 3 A	82%
BK equipment practice	Module width 1
Weight	1.3 kg

5.4.48 RFSC

RF Service Combiner

Part Number 3EC 20057 XXXX

Functional Description

- 4 input ports (RF combination of up to 4 inputs)
- Attenuation adjustment for each individual input port
- Amplification of combined signal
- Output test port

Technical Data:

Impedance	75 Ω
Frequency range	47...862 MHz
Nominal input power	83 ... 102 dBµV
Adjustable gain	-10 … +9 dB
Frequency flatness	± 1.5 dB
Return loss	18 dB (@ 47 MHz) - 1.5 dB/oct, min.15 dB
Power consumption	≤ 15 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.1 kg

5.4.49 SCUAx, SCUXx

Optical Switch

Part Number 3AG 16512 XXXX

Functional Description

- SCUA: automatic and forced switch-over from operating to standby equipment (for 1+1 redundancy), 2 inputs, 1 output
- SCUX: automatic and forced switch-over from operating to standby equipment (for n+1 redundancy) 2 inputs, 2 outputs
- Input signal detection
- Switch-over activated via the network management or by internal input signal detection

Technical Data:

Wavelength	
1310 nm range	1310 nm ± 40 nm
1550 nm range	1550 nm ± 40 nm
Insertion loss incl. 2 opt. connectors	≤ 1.5 dB
Maximum optical power	24.0 dBm
Switching time	< 50 ms
Power consumption	≤ 5.3 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.0 kg

5.4.50 SWALP

Switch for Return Path Link Protection

Part Number 3EC 20568 XXXX

Functional Description:

- The SWALP is foreseen to switch the high level outputs between the nominal HUCHP board and the related redundant HUCHP board
- The SWALP module consists of four switches
- Each internal switch provides a high level (-1 dB) and a low level (-14 dB) output

Technical Data:

Impedance	75 Ω
Frequency range	5 … 200 MHz
Input	
Number of inputs	8
Nominal input level	87 dBµV
Outputs	
Number of outputs	4 high level and 4 low level
High level output loss	-1 dB
Low level output loss	–14 dB
Connector type	1.0/2.3
Power consumption	≤ 1 W
Equipment practice	Specially adapted housing

5.4.51 UCC

Return Path Combiner

Part Number 3EC 20566 XXXX

Functional Description

- RF combiner of return path signals originating from the HUCHP or HUCUPP module
- RF combination levels 1x 16:1, 2x 8:1 and 4x 4:1
- Plug-in high-pass- and low-pass filters for each combined outputs
- Each input can be switched on, attenuated or switched off by network management
- Output test port

Technical Data:

Impedance	75 Ω
Frequency range	5 ... 200 MHz (may be band limited by plug-in filters)
Nominal input level	87 dBµV
Number of identical inputs	16
Number of outputs	
16:1 combination	1
8:1 combination	2
4:1 combination	4
Gain	
Interdiction switch state “On”	0 dB
Interdiction switch state “Attenuated”	6 dB
Interdiction switch state “Off”	> 45 dB (5 … 70 MHz), >35 dB (>70MHz)
Power consumption	≤ 9 W
Dimensions of S9 equipment practice	252 mm x 30 mm x 235 mm
Weight	~0.6 kg

5.4.52 WD1315x

WDM-Wavelength Multiplexer and Demultiplexer for 1310/1550nm

Part Number WD1315A/B 3EC 20817 AAAA/ABAA
WD1315B 3EC 20755 AAAA

Functional Description:

- WD1315A:
  Single WDM-Wavelength (De)Multiplexer for 1310/1550nm (3EC 20817AAAA) and double multiplexer (3EC 20817ABAA)
- WD1315B:
  Single WDM-Wavelength (De)Multiplexer for 1310/1550nm (3EC 20755AAAA) in a fibre tray
- Remark:
  WD1315A and either DWDM815A or DWDM815B may be housed together in one fibre tray

WD1315A and DWDM815x

Technical Data:

Optical Wavelength	1260 … 1360 nm and 1480 … 1600 nm
Insertion loss (including 1 connector)	< 1.3 dB
Isolation	
1260 – 1335 nm	>50 dB
1335 – 1360 nm	>45 dB
1480 – 1600 nm	>55 dB
Optical return loss	>45 dB
Optical input power	<20 dBm
Connector	SC/APC 8°

5.4.53 XCON

Network Element Concentrator

Part Number 3EC 20761 XXXX

Functional Description

- Network element concentrator XCONA for concentrating several RS485 signals with HMS protocol
- RS485 interface for converting RS485 signals to HMS-RF signals and either HMS-RF or HMS-optical signals to RS485 signals
- LMT interface (RS232) for local management
- Optical and RF input; return path RF output
-

Technical Data:

RS232 (EIA, F) interface	9-pin Sub-D (male)
RS485 interface	15-pin Sub-D (male)
Optical input	
Wavelength	1280 … 1580 nm, typical 1555 nm
Input power	–3 … +3 dBm
Connector	SC/APC 8°slant
RF Input	
Frequency range	50 … 120 MHz (<10 kHz steps)
RF level	55 … 95 dBµV, typical 75 dBµV
RF Output	
Frequency range	5.5 … 42 MHz (<10 kHz steps)
RF level	75, 77, 79 … 105 dBµV and 60, 62, 64, … 90 dBµV (typical 74 dBµV)
Level tolerance	± 3 dB
Impedance	75 Ω
Modulation scheme	FSK, ± 67 kHz, 38.4 kbit/s
Power consumption	≤ 8 W
Dimensions of BK equipment practice	Module width 1
Weight	~1.1 kg

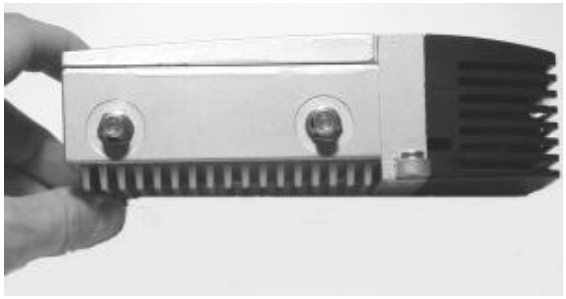
5.4.54 BKD862/30

Inhouse Amplifier

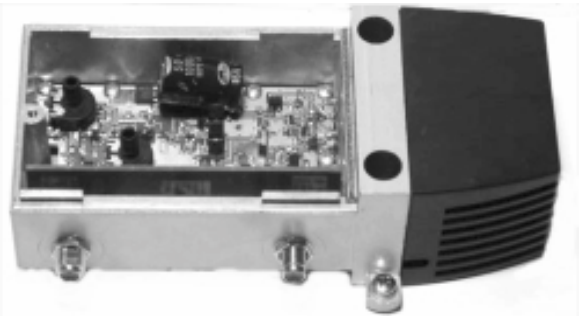
Part Number

Functional Description

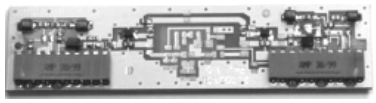
- Frequency range up to 862 MHz
- Plug able return way
- Plug able return amplifier
- Switch able gain 30 dB or 22 dB
- Level attenuator, Equalizer
- Very small dimension
- Earth bonding clamp
- Easy mount system (optional)
- Die-cast housing



BKD 862

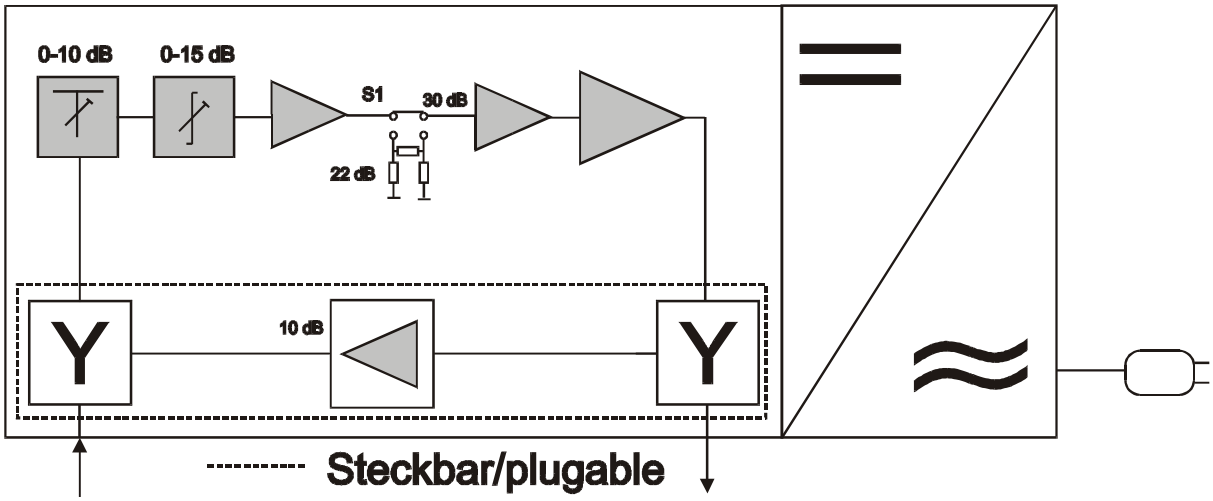


Open BKD 862



Diplexer / return path amplifier

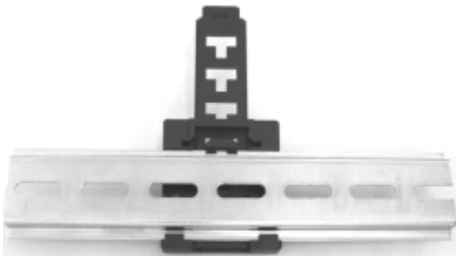
Application:



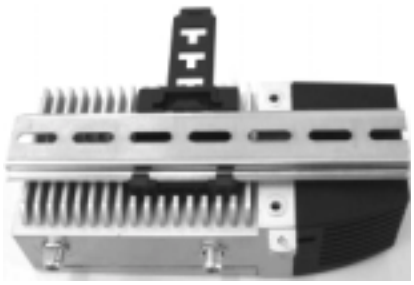
Block diagram BKD 862/30

Technical Data:

Type		BKD 862/30	RK 65d	RV 65-10d
Description		Amplifier	Diplexer	Diplexer amplifier
Gain	dB	23/31	- 1.0	- 1.0
Switchable		yes		
Frequency range	MHz	5-862	5-65/88-862	5-65/88-862
Gain return way	dB	-	- 2.5	10
Ripple	dB	0.7	-	-
Plug in				
Return way		yes		
Return ampl.		yes		
Output level 3rd	30/65 MHz		-	110
DIN 45004B	450 MHz	117	-	-
dBµV	606 MHz	116	-	-
	862 MHz	115	-	-
Output level 2nd	30/65 MHz	-	-	92
dBµV	450 MHz	107	-	-
	606 MHz	106	-	-
	862 MHz	104	-	-
Noise	type dB	8		7
Attenuator	dB	0...10	-	-
Equaliser	862 MHz	1...15 dB	-	-
Connectors		F	-	-
Power supply		230 VAC	-	-
Power consumption	*VA*	approx. 7.5 VA	-	-
Dimension	mm	175x85x50	-	-
Weight	kg	approx. 1,1	-	-
Accessories:				
Easyclip wall bracket clip for BKD 862				
Order-No		10026229		
Remark: optional: Easy mount system including Huth wall bracket clip				



Wall bracket clip



Amplifier with wall bracket

5.4.55 VT xx86-A

Power Inserter,
2way / 3way Outdoor Splitter

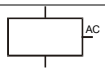
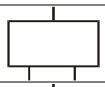
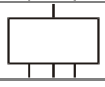
Part Number please see table below

VT xx86-A

Functional Description

- Frequency range up to 1000 MHz
- Die-cast body
- Power pass 10A/60VAC for power supplying
- HUM isolation: >66 dB/10A. All lines passive have a built-in fuse holder for power pass control
- Aerial or pedestal installation with 5/8” port entry
- Provide uninterrupted power and RF service when the faceplate is removed
- The 100dB RFI integrity is maintained by the use of tongue and groove design and with a stainless steel mesh RFI gasket
- Units are sealed with neoprene rubber, gasket on the lid and entry port plugs. ACC. IP65

Technical Data:

Description	Symbol	Type	Insertion loss dB		Isolation dB	Return Loss dB	Part No.
			5-470 MHz	470-862 MHz			
Power Inserter		PI 0186-A 100260xx	1.0	1.0	>50 AC/RF	> 18	
2way Splitter		VT 0286-A 100260xx	4.5	5.0	> 25	> 18	3EC 20930 AAAA
3way Splitter		VT 0386-A 100260xx	6.8	7.0	> 25	> 18	3EC 20930 ABAA

5.4.56 BK-POTx-x

Outdoor Multi Terminal Taps

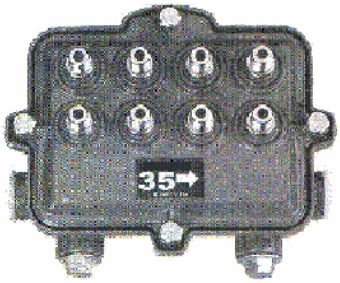
Part Number please see table below

Functional Description

- Frequency range 5-1000 MHz
- Die-cast body
- Power pass 7A
- HUM isolation: >62 dB/6A.
- Aerial or pedestal installation with 5/8”-24 female port entry
- Neoprene sealed brass female “F” connector ports
- Woven metallic gasket for RFI shielding requirement
- Full weather seal with strand clamp for outdoor application
- Dimensions (LxWxH in mm: 96x93x73
- Weight: 0.3kg per piece

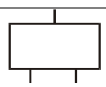
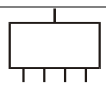
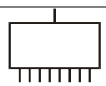
BK-POT2-4

BK-POT4-8



BK-POT8-11

Technical Data:

Description (BKtel Part No)	Symbol	Type No	Tap Loss dB 5-1000 MHz	Tap loss Tolerance dB 5-470 MHz	Tap loss Tolerance dB 470-862 MHz	Isolation dB	Return Loss dB
2way terminal tap (XXXX XXXX XXXX)		BK-POT2-4 100044	4	± 1.5	± 1.5	>20 5-30MHz >22 30-750MHz >20 750-1000MHz	>16 5-30MHz >18 30-550MHz >16 550-750MHz >15 750-1000MHz
4way terminal tap (XXXX XXXX XXXX)		BK-POT4-8 100 48	8	± 1.5	± 1.5	>20 5-30MHz >22 30-750MHz >20 750-1000MHz	>16 5-30MHz >18 30-550MHz >16 550-750MHz >15 750-1000MHz
8way terminal tap (XXXX XXXX XXXX)		BK-POT8-11 100064	11	± 1.8	± 1.8	>20 5-30MHz >22 30-750MHz >20 750-1000MHz	>16 5-30MHz >18 30-550MHz >16 550-750MHz >15 750-1000MHz

5.4.57 STA xx86-xxA

Outdoor Taps

Part Number please see table below

STA 0186-14A*

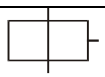
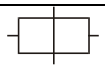
STA xx86-xxA

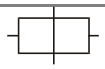
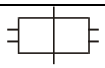
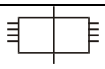
Functional Description

- Frequency range up to 1000 MHz
- Die-cast body
- Power pass 6A/60VAC for power supplying between input and output
- HUM isolation: >66 dB/6A.
- Aerial or pedestal installation with 5/8” port entry
- Provide uninterrupted power and RF service when faceplate is removed
- The 100 dB RFI integrity is maintained by the use of tongue and groove design and with a stainless steel mesh RFI gasket
- Units are sealed with a neoprene rubber, gasket on the lid and entry port plugs. Acc. IP 65

***** 10A remote power pass

Technical Data:

Description	Symbol	Type	Trough loss dB		Tap loss dB		Isolation dB	Return Loss dB	BKtel Part No.
			5-470 MHz	470-862 MHz	5-470 MHz	470-862 MHz			
1way Tap-Coupler		STA 0186-8A 100260xx *	2.5	4.0	8±1.0	8±1.5	> 25	> 16	
		STA 0186-12A 100260xx *	1.8	2.5	12±1.0	12±1.5	> 25	> 16	
		STA 0186-14A 100260xx *	1.8	2.2	14±1.0	14±1.5	> 25	> 16	3EC 20931 AAAA
		STA 0186-16A 100260xx *	1.6	2.2	16±1.0	16±1.5	> 25	> 16	
		STA 0186-20A 100260xx *	1.6	2.2	20±1.0	20±1.5	> 25	> 16	
2way Tap		STA 0286-8A 100260xx	5.0	5.3	8±1.2	8±1.5	>25	>18	3EC 20931 ABAA
		STA 0286-11A 100260xx	3.0	4.2	11±1.2	11±1.5	>25	>18	
		STA 0286-14A 100260xx	1.8	2.8	14±1.5	14±1.5	>25	>18	3EC 20931 ACAA
		STA 0286-17A 100260xx	1.5	2.3	17±1.5	17±1.5	>25	>18	
		STA 0286-20A 100260xx	1.3	2.0	20±1.5	20±1.5	>25	>18	3EC 20931 ADAA

Descrip-tion	Symbol	Type	Trough loss dB		Tap loss dB		Isolation dB	Return Loss dB	BKtel Part No.
			5-470 MHz	470-862 MHz	5-470 MHz	470-862 MHz			
		STA 0286-23A 100260xx	1.3	2.0	23±1.5	23±1.5	>25	>18	
2way Tap		STA 0286-26A 100260xx	1.3	2.0	26±1.5	26±1.5	>25	>18	
		STA 0286-29A 100260xx	1.3	2.0	29±1.5	29±1.5	>28	>18	
		STA 0286-32A 100260xx	1.3	2.0	32±1.5	32±1.5	>28	>18	
4way Tap		STA 0486-11A 100260xx	4.8	5.2	11±1.5	11±2.0	>24	>18	3EC 20931 AEAA
		STA 0486-14A 100260xx	3.0	4.5	14±1.5	14±1.5	>25	>18	3EC 20931 AFAA
		STA 0486-17A 100260xx	1.8	4.0	17±1.5	17±1.5	>25	>18	
		STA 0486-20A 100260xx	1.5	2.3	20±1.5	20±1.5	>25	>18	3EC 20931 AGAA
		STA 0486-23A 100260xx	1.3	2.0	23±1.5	23±1.5	>25	>18	
		STA 0486-26A 100260xx	1.3	2.0	26±1.5	26±2.0	>25	>18	
		STA 0486-29A 100260xx	1.3	2.0	29±1.5	29±2.0	>25	>18	
		STA 0486-32A 100260xx	1.3	2.0	32±1.5	32±2.0	>25	>18	
8way Tap		STA 0886-14A 100260xx	4.5	5.0	14±1.5	14±1.5	>25	>18	3EC 20931 AHAA
		STA 0886-17A 100260xx	2.8	3.8	17±1.5	17±1.5	>25	>18	
		STA 0886-20A 100260xx	1.8	3.0	20±1.5	20±1.5	>25	>18	
		STA 0886-23A 100260xx	1.5	2.3	23±1.5	23±1.5	>25	>18	
		STA 0886-26A 100260xx	1.3	2.0	26±1.5	26±1.5	>25	>18	
		STA 0886-29A 100260xx	1.3	2.0	29±1.5	29±2.0	>25	>18	
		STA 0886-32A 100260xx	1.3	2.0	32±1.5	32±2.0	>25	>18	

5.4.58 VT xx86-F

Indoor Splitter

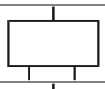
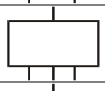
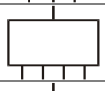
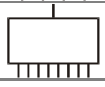
Part Number please see table below

VT xx86-F

Functional Description

- Frequency range 5-1000 MHz
- Die-cast body
- F connector ports
- Earth bonding clamp
- 100 dB RFI integrity
- Indoor mounting

Technical Data:

Description	Symbol	Type	Trough loss dB		Isolation dB	Return Loss dB	BKtel Part No.
			5-470 MHz	470-862 MHz			
2way Splitter		VT 0286-F 100260xx	3.7	3.8	*> 25*	> 20	
3way Splitter		VT 0386-F 100260xx	5.8	6.3	>25	> 18	
4way Splitter		VT 0486-F 100260xx	7.0	7.8	*>25*	>18	
8way Splitter		VT 0886-F 100260xx	11.2	11.5	>25	>18	

5.4.59 STA xx86-TF

Indoor Multi Terminal Taps

Part Number please see table below

STA xx86-TF

Functional Description

- Frequency range 5-1000 MHz
- Die-cast body
- F-connector ports
- Earth bonding clamp
- Indoor mounting

Technical Data:

Description	Type	Tap loss dB 5 – 1000 MHz				Tap loss Tolerance dB 5-470 MHz	Tap loss Tolerance dB 470-862 MHz	Isolation dB	Return Loss dB	BKtel Part No.
4-way *terminal tap*	STA 0486-TF 10026xxx	Out1 13	Out2 13.5	Out3 14.5	Out4 15.5	± 1	± 1	> 30	> 16	
6-way *terminal tap*	STA 0686-TF 10026xxx	Out1 13 Out5 16.5	Out2 13.5 Out6 17.5	Out3 14.5 -	Out4 15.5 -	± 1	± 1	> 30	> 16	
8-way *terminal tap*	STA 0886-TF 10026xxx	Out1 13 Out5 17	Out2 14 Out6 18	Out3 15 Out7 19	Out4 16 Out8 20	± 1	± 1	> 30	> 16	
12-way *terminal tap*	STA 1286-TF 10026xxx	Out1 13 Out5 16 Out9 19.5	Out2 13.5 Out6 16.5 Out10 20	Out3 15 Out7 18 Out11 21.5	Out4 15.5 Out8 19 Out12 22	± 1.5	± 1.5	> 30	> 16	
16-way *terminal tap*	STA 1686-TF 10026xxx	Out1 13 Out5 16 Out9 19.5 Out13 23.5	Out2 13.5 Out6 16.5 Out10 20 Out14 24	Out3 15 Out7 18 Out11 21.5 Out15 25	Out4 15.5 Out8 19 Out12 22.5 Out16 25.5	± 1.5	± 1.5	> 30	> 16	

5.4.60 STA xx86-xxF

Indoor Taps

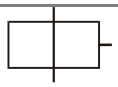
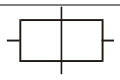
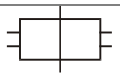
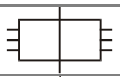
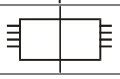
Part Number please see table below

STA xx86-xxF

Functional Description

- Frequency range 5-1000 MHz
- Die-cast body
- F connector ports
- Earth bonding clamp
- 100 dB RFI integrity
- Indoor mounting

Technical Data:

Description	Symbol	Type	Trough loss dB		Tap Loss dB		Isolation dB	Return Loss dB	BKtel Part No.
			5-470 MHz	470-862 MHz					
Tap		STA 0186-6F 100260xx	2.8	3.0	6±1.0	6±1.0	> 23	> 18	3EC 20933 AAAA
		STA 0186-8F 100260xx	2.0	2.0	8±1.0	8±1.0	> 25	> 20	3EC 20933 ABAA
		STA 0186-12F 100260xx	0.8	1.0	12±1.0	12±1.0	> 26	> 20	3EC 20933 ACAA
		STA 0186-16F 100260xx	0.8	1.0	16±1.0	16±1.0	> 28	> 20	3EC 20933 ADAA
		STA 0186-20F 100260xx	0.8	1.0	20±1.0	20±1.0	> 32	> 20	3EC 20933 AEAA
2way Tap		STA 0286-8F 100260xx	3.8	4.2	8±1.0	8±1.0	>28	>20	3EC 20933 AFAA
		STA 0286-12F 100260xx	1.8	2.0	12±1.0	12±1.0	>27	>20	3EC 20933 AGAA
		STA 0286-16F 100260xx	0.8	1.5	16±1.0	16±1.0	>30	>20	3EC 20933 AHAA
		STA 0286-20F 100260xx	0.8	1.0	20±1.0	20±1.0	>30	>20	3EC 20933 AJAA
4way Tap		STA 0486-12F 100260xx	3.5	4.0	12±1.0	12±1.0	>23	>20	3EC 20933 AKAA
		STA 0486-16F 100260xx	2.0	2.5	16±1.0	16±1.0	>28	>20	3EC 20933 ALAA
		STA 0486-20F 100260xx	1.0	1.5	20±1.0	20±1.0	>28	>20	3EC 20933 AMAA
6way Tap		STA 0686-16F	2.8	3.0	16±1.0	16±1.0	>25	>18	3EC 20933 ANAA
8way Tap		STA 0886-16F 100260xx	3.5	4.2	16±1.2	16±1.5	>25	>18	3EC 20933 APAA

5.4.61 RFCC

RF Connection Cables

Part Number

Functional Description

- Various lengths available
- Compliant with
  - German Telecom TS-Nr. 0131/96
  - EN 50117-1/2 (cable), IEC 60169-2 (connector)
  - EN50083-3/4 (EMC, ESD)
- Very high screening factor
- More flexible (bend radius 3 cm)

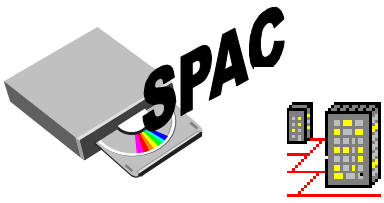
Technical Data:

Available lengths	150, 200, 250, 350, 450, 600, 900, 1200, 1500, 2000 mm
Frequency range	1 - 1000 MHz
Impedance	75 ± 3 Ω
Maximum attenuation at f = 1000 MHz	≤ 0.3 dB
Return loss (cable including angle plug) f = 450 MHz	≥ 26 dB
450 MHz < f = 1000 MHz	≥ 22 dB
Loss	
at f = 50 MHz	≤ 9 dB/100m
at f = 100 MHz	≤ 11 dB/100m
at f = 200 MHz	≤ 15 dB/100m
at f = 500 MHz	≤ 23 dB/100m
at f = 800 MHz	≤ 29 dB/100m
at f = 1000 MHz	≤ 32 dB/100m
Screening factor	
5 MHz < f ≤ 30 >MHz	≥ 85 dB
30 MHz ≤ f ≤ 1000 >MHz	≥ 90 dB
DC resistance loop between inside and outside conductor	≤ 42 Ω/km
Isolation resistance at $U_{=}$ = 500 V	≥ 10^{10} Ω
Voltage resistance (effective value) at f = 50 Hz und t = 2 s	2 kV

5.5 Network Planning Tool SPAC

SPAC (System Performance Analysis for CATV Systems) is a planning tool for evaluating the performance of CATV distribution networks. The program can simulate hybrid transmission systems, consisting of coaxial and optical components such as optical transmitters, Optical Amplifiers, optical receivers and coaxial amplifiers. Simulation is made for CSO, CTB and CNR contributions and bit error rate (BER) simulations for digital services can be done.
The integrated Inter-Modulation (IM) Simulator calculates CSO and CTB. For the IM simulation the user can choose between standard default channel allocations, or he can define his own channel tables. The results of the IM simulation are also graphically shown like the display of a spectrum analyzer.

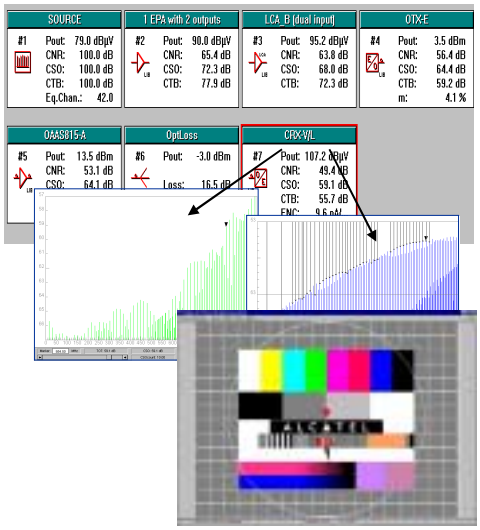
SPAC



Simulation tool for HFC networks;
SPAC – system performance analysis for CATV systems

Part Number

Functional Description:



- Simulation of HFC network components including actives (opt. transmitters, opt. amplifiers and opt. receivers, RF amplifiers) and passives (coax and fibre cable effects)
- Simulation of distribution paths and return path (equipment, cables, ingress noise models)
- Simulation of analogue and digital signal quality for analogue (AMVSB, FM) and digital modulated (FSK, PSK, QPSK, 16QAM, 64QAM) signals:
- Performance calculation of
    - o noise CNR, SNR
    - o nonlinearity CSO, CTB
    - o digital quality BER, MER
    - o pictures for subjective quality impression

Technical Data:

Software features	GUI, WINDOWS compliant	
	CNR, SNR simulation performance	±1.5 dB
	CSO, CTB simulation performance	±3.0 dB
	BER simulation performance	$10^{X\pm1.5}$
System software requirements	MS WINDOWS 9x or NT4.0	
System hardware requirements	IBM compatible PC	
	Pentium 133 MHz, 64 MB (minimum)	
	CDROM required	
	VGA true colour recommended	
Copy protection	Dongle	

5.6 Reliability

Module	MTBF [years] (Mean Time between Failures)	FIT Rate [fit] (Average Failures in Time)
AORX800	63	1800
CONV3.1	76	1500
CRXLD	47	2450
CRXLD with BUCHP	28	4100
DAHE8	190	600
DWTX315	62 (path), 54 (module)	1850 (path), 2100 (module)
EPA800	134	850
FSTAC1A	67 (path), 50 (module)	1700 (path), 2300 (module)
FDSTAC1A	67 (path), 46 (module)	1700 (path), 2500 (module)
HUCHP, HUCUPP	127 (path)	900 (path),
LONI	57	2000
MAX030G, MAX037G, MAX236G	50	2300
MBOAA	114 (path)	1000 (path)
MISAA	104	1100
MOTRA	88 (receiver part) 67 (transmitter part)	1300 (receiver part) 1700 (transmitter part)
MUPAA	104	1100
MPSCA	95	1200
MSUPA	57	2000
NEC / NECH	57	2000
NECU / NECUH	25	4600
OAH01x13 OAH02x13 and OAH01x16 OAH04x13 and OAH02x16 OAH06x13 and OAH03x16 OAH08x13 and OAH04x16	28.5 26.5 19 18 14	4000 4300 6000 6400 8000
OTXD813	26	4450
OTXE090	19	6000
PSO24	95	1200
QCON / MCON	27	4250
RFSC	163	700
SCUA	81	1400
SWALPA	1140	100
UCC	67	1700
UCTDH	32	3600
UCTHE	40	2850

6 SYSTEM DESCRIPTION MECT NETWORK MANAGEMENT

For the network operator it is very easy to manage the 1570BB system. There are two alternatives:

1. Using a centralized terminal, the Master Equipment Craft Terminal (MECT), alarms and messages of all modules can be supervised. For local management, error handling and the Equipment Craft Terminal (ECT) is foreseen.
   It is possible to use a mediation device (CABLEwatch MD) to adapt head end signalling to SNMP based operating systems like CABLEwatch EMS.
   This option is especially interesting for customers already having implemented BKtel equipment and BKtel Equipment Craft Terminal controller and software.
2. Using head end controller (HEC) based on hybrid management system (HMS) protocol, alarms and messages of all modules can be supervised. Additionally, any third party equipment using HMS based element management can be supervised.
   This option is especially interesting for customers planning to implement newest BKtel equipment.

The MECT system is described in this chapter, whereas the HMS system is described in the next chapter.

Figure 6-1shows the supervision of small and medium networks by a Master Equipment Craft Terminal (MECT). The MECT is connected to the F-Interface of the Master Concentrator (MCON) in the Head End. The MECT is a NECTAS (Network Element Craft Terminal Application Software) based application for a PC. It provides an overview of all network elements of the subnet and provides zooming to a single network element. Zooming represents the element in the same way as a locally connected ECT.

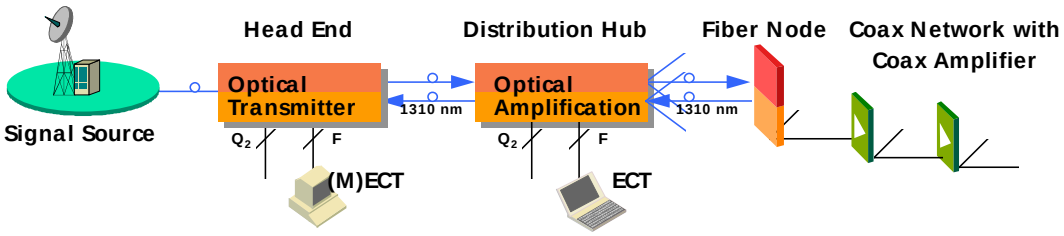


Figure 6-1: Operation and Management System in small and medium networks

To manage large 1570BB networks several sub networks can be collocated via Mediation Devices CABLEwatch MD and the Local Communication Network (LCN). The Mediation Devices are connected to the central Operating System (OS) via the Data Communication Network (DCN). The Element Manager CABLEwatch EMS manages the network and sub networks.

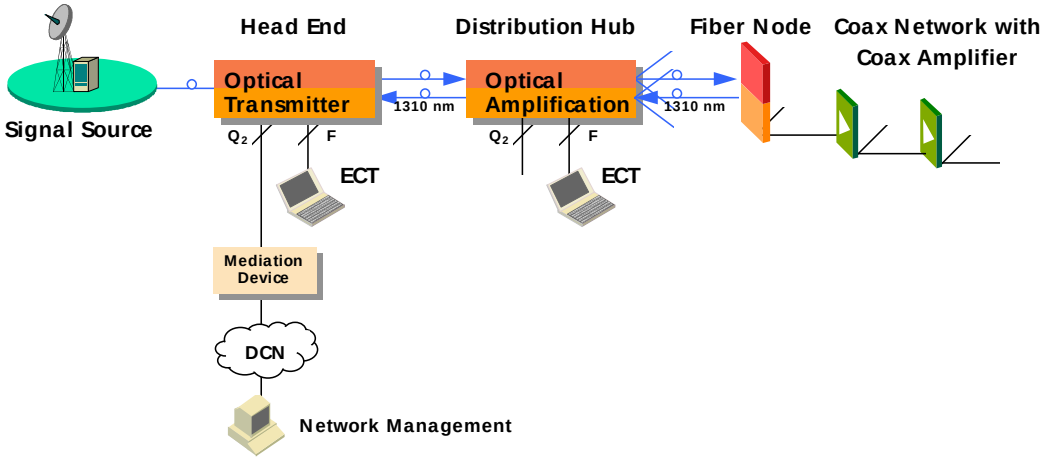


Figure 6-2: Operation and Management System in large networks

The Equipment Craft Terminal (ECT) allows local supervision of a network element and trouble shooting. It is a NECTAS based application for a PC with the following functionality:

- Alarm Management
- Performance Management
- Configuration Management
- Remote Inventory

The Alarm & Status window displays the logical signal flow and physical layout within the rack.

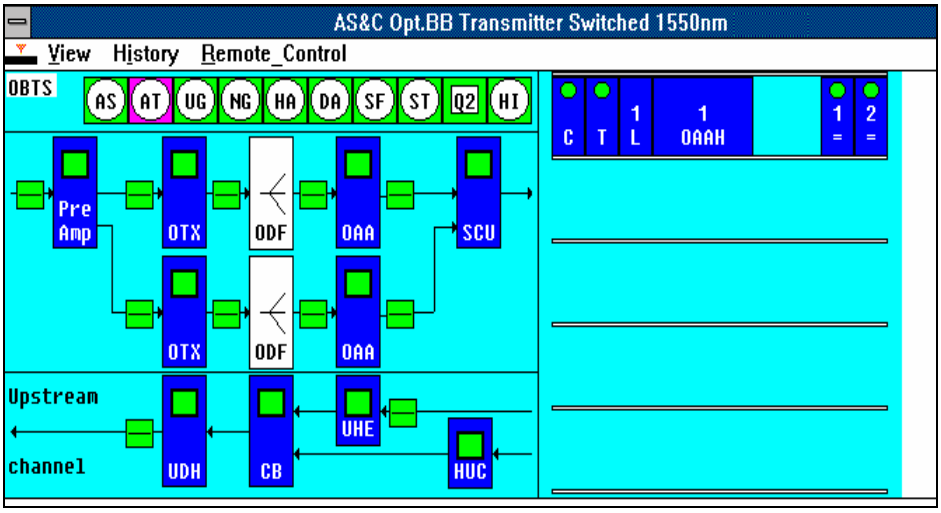


Figure 6-3: Example of the Alarm & Status window

Figure 6-4 displays the performance values (optical in- and output level etc.) of an Optical Amplifier and the physical view of the rack as an example.

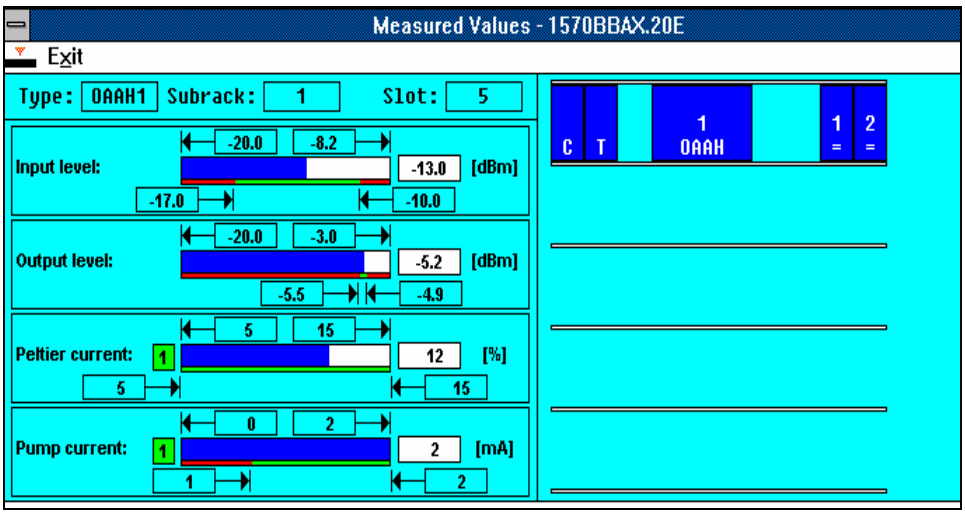


Figure 6-4: Example of the Optical Amplifier measured values

Every module contains remote inventory data including the part number, description, serial number, date etc. These remote inventory data can be requested via the MECT.

7 LIST OF ABBREVIATIONS

AC	Alternating Current
ALOHA	Upstream transmission procedure for MPP
AM	Amplitude Modulation
AMVSB	Amplitude Modulation-Vestigial Side Band
BB	Broadband
BK	Broadband Cable ("Breitband Kabel")
BRA	Basic Rate Access (ISDN)
BUC	Return Path Module in the Fibre Node
CATV	Cable Television
CB	Combiner module
CDMA	Code Division Multiple Access
CE	Consumer Electronics, Conformité Européen
CEV	Centre d'Emission Vidéo
CFN	Compact Fibre Node
CMTS	Cable Modem Termination System
C/N	Carrier-to-Noise Ratio
CNR	Carrier-to-Noise Ratio
CONV	Converter
CRXLD	Compact Fibre Node
CSO	Composite Second Order
CTB	Composite Triple Beat Distortion
DC	Direct Current
DFB	Distributed Feedback
DH	Distribution Hub
DQPSK	Differential Quadrature Phase Shift Keying
DVB	Digital Video Broadcast
DWDM	Dense Wavelength Division Multiplexing
DWTX	DWDM Transmitter
ECT	Equipment Craft Terminal
EDFA	Erbium Doped Fibre-Optic Amplifier
EIA	Electronic Industries Association
EMC	Electromagnetic Compatibility
EMS	Element Management System
EN	European Standard
EPA	Equalizer Preamplifier
F	Local management interface type
FBT	Fibre Tray
FDSTACK	Frequency Destacker
FIT	Failure in Time
FM	Frequency Modulation
FP	Fabry Perot
FSK	Frequency Shift Keying
FSTACK	Frequency Stacker
FTTB	Fibre to the Building
FTTC	Fibre to the Curb
FTTLA	Fibre to the Last Amplifier

FTTSA	Fibre to the Serving Area
HE	Head End
HEC	Head End Controller
HDT	Host Digital Terminal
HFC	Hybrid Fibre Coax
HMS	Hybrid Management Sub-Layer
HUC	Return Path Receiver Module
HUCAP	HUC Access Panel (HUC subrack)
IEC	International Electrotechnical Commission
IM	Inter-Modulation
ISDN	Integrated Services Digital Network
ITU-T	International Telecommunications Union - Telecommunication standard
LCA	Load Controlled Amplifier
LCN	Local Communication Network
LA	Line Amplifier
LED	Light-emitting Diode
LES	Line Amplifier Supervision
LMT	Local Management Terminal
LONI	Local Operating Network Interface
LRO	Local de répartition Optique
LSN	Local Signalling Network
MD	Mediation Device
MECT	Master Equipment Craft Terminal
NE	Network Element
NECO	Network Element Controller Optical
NECU	Network Element Controller Upstream module
NECTAS	Network Element Craft Terminal Application Software
OAAS	Optical Analogue Amplifier Standard
OAH	Optical Amplifier Highpower
OCT	Office Craft Terminal, station management device
ODF	Optical Distribution Frame
OMI	Optical Modulation Index
O&M	Operation and Maintenance
OS	Operating System
OSC	Optical Splitter Cassette
OTN	Optical Transition Node
OTX	Optical Transmitter
PC	Personal Computer
PFG	Pilot Frequency Generator
PON	Passive Optical Network
PRA	Primary Rate Access (ISDN)
PSK	Phase Shift Keying
PSO	Power Supply
Q2, Q3	TMN interface types
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
REP	Reference Entry Point
RF	Radio Frequency
RFP	Request for Proposal
S9	Alcatel mechanical equipment practice

SCP	Service Connection Point
SCUA	Standby Connection Unit Active
SCUP	Standby Connection Unit Passive
SI	Service Injection
SIP	Signal Interface Panel
SM	Single Mode
SNMP	Simple Network Management Protocol
SPAC	System Performance Analysis for CATV systems
STB	Set Top Box
SWALP	Switch for Access Link Protection
TDM	Time Division Multiplex
TDMA	Time Division Multiple Access
TMN	Telecommunication Management Network
TNV	Telecommunication Network Voltage
TRU	Top Rack Unit
TV	Television
UCC	Return Path Combiner
UPP	Unidirectional Point-to-Point return path
WDM	Wave Division Multiplexing
WWW	World Wide Web