Installation and Operation Manual

BETA UE-836Y

GROUP AMPLIFIER

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1. GENERAL INFORMATION

1.1. Introduction to manual

This manual contains information needed to properly install and operate VECTOR's BETA UE-836Y Group Amplifier.
The instructions in this manual do not cover all details on the equipment it supports, nor do they provide for all circumstances that could arise during equipment maintenance. The instructions included are intended to be performed only by an experienced CATV service technician.

The information in the manual is subject to change without notice.

If you have any questions or remarks regarding this publication, please contact

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or your nearest VECTOR's representative.

1.2. General installation conditions.

VECTOR guarantees proper working of the BETA amplifiers if proceeding accordingly to this manual. All instructions in the manual should be reviewed carefully before any procedures are performed.
VECTOR is not responsible for any personal injuries or equipment damage caused by improper installation or operation of the units.
Modifications or alterations of VECTOR products (including but not limited to installation of non-VECTOR equipment) except as performed by VECTOR will void the warranty.

1.3. Receiving the unit and inspection

Before shipment, VECTOR packs and inspects all items carefully. Nevertheless, damage may occur during shipment. Inspection must be performed when unpacking the equipment prior to installation (do not destroy shipping cartons until installation is complete, when possible retain it for future equipment reshipment or storage).
Inspect unit for:

- damaged housing, cover or input/output ports
- missing parts – in the carton should be 3 universal mounting brackets attached; other parts (plug-in configuration modules and fuses) should be inside the amplifier's housing

If any problems arise during inventory, or if for any reason equipment needs to be returned to manufacturer please contact VECTOR's sales office for assistance.

1.4. Storage

BETA amplifier can be stored by the customer not more than 18 months after manufacturing date without any degradation of its parameters. It must be kept in the standard atmospheric conditions accordingly to ISE 68.1 norm: temp. 15 - 35 °C, humidity 25 – 70%, pressure 860 – 1060 hPa.

1.5. Amplifier's general description.

BETA UE-836Y is a high performance group amplifier designed for use in a trunk or distribution network of modern, bi-directional CATV and telecommunication systems. Due to high quality and reliability, monitoring-readiness and up-to-date technology BETA amplifiers guarantee high network's availability required by interactive services.

New GaAs-FET technology used in the Power Doubling forward path output stage provides extremely high output signal's level, reducing at the same time amplifier's power consumption. Together with wide supply voltage's range it reduces significantly operational and powering costs making the amplifier very effective.

Flexible return channel configuration due to plug-in diplex filters, return path Push-Pull amplifier or adjustable passive module and return channel wink-switch provides optimal choice for operator's requirements.

This amplifier is prepared for status monitoring. There are interfaces for connection to NMS modem installed inside the housing. The modem will enable to control amplifier's main parameters and to solve return path noise and ingress problems. The amplifier is also prepared for passing Lon Talk system's signals.

The amplifier may be powered through any one of the three RF ports or additional local powering port. The power supply section accepts quasi-square wave inputs from 20 to 65 VAC and generates all necessary DC voltages required by the amplifier's electronics.

The BETA UE-836Y amplifier meets CENELEC technical requirements EN 50083-1÷3. It complies with EN 50083-3 quality level 1 and guarantees electromagnetic compatibility.

2. TECHNICAL DESCRIPTION.

2.1. BETA UE-836Y specifications

2.1.1. Forward path

Bandwidth	85 ÷862 MHz
Flatness	± 0.7 dB
Group delay, Δf= 5,5 MHz:	85 ÷ 90.5 MHz < 28 ns 90.5 ÷ 96 MHz < 12 ns 96 ÷ 101.5 MHz < 7 ns > 107 MHz < 2.5 ns
Gain (single output)	≥ 36,5 dB
Adjustment (plug-in modules): • gain • slope	 AT – fixed attenuator (0 - 21 dB, step 1 dB) or AV – variable attenuator (0 - 18 dB) EQ – fixed equalizer (0 – 24 dB, step 1 dB) EV – variable equalizer (0 – 18 dB) or CS – fixed cable simulator (3,6dB)
Noise figure	≤ 7,5 dB typical

Output level [dBμV]	DIN 45004-B Typical	CTB*				CSO*			
		(0 dB slope)		(9 dB slope)		(0 dB slope)		(9 dB slope)	
		Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.
Single output	126	109	111,5	112	114,5	112	117	114	119
2 identical outputs	122,5	105,5	108	108,5	111	108,5	113,5	110,5	115,5

** 42 channels CENELEC typical value.*

2.1.2. Reverse path

PLUG-IN PASSIVE MODULE RP 600	
Bandwidth	5 ÷65 MHz
Flatness	± 0.7 dB
Attenuation: • single output • 2 identical outputs	 < 3.5 dB < 7 dB
Group delay, Δf= 5,5 MHz:	65 ÷ 59.5 MHz < 28 ns 59.5 ÷ 54 MHz < 12 ns < 54 MHz < 6 ns
Gain control – variable	0 – 18 dB
Slope control – variable	0 – 10 dB
Input test point	- 20 dB directional

PLUG-IN ACTIVE MODULE RA 65	
Bandwidth	5 ÷65 MHz
Gain • single output to input • each of 2 outputs (identical) to input	 23 dB 19,5 dB
Noise figure	≤ 7,5 dB typical
Gain control – variable	0 – 18 dB
Slope control – variable	0 – 10 dB
Input test point	- 20 dB directional
Output level DIN 45004-B (-60 dB)	115 dBμV

2.1.3. Input and outputs

Number of RF ports	1 / 2
Connectors input / outputs	IEC 14M / 75Ω
Return loss	≥18 dB (f ≤ 40 MHz) ≥ 18 dB -1,5 dB /oct. (f > 40 MHz)
Test-point input, bi-directional	-20 dB (< ±1,5 dB)
Test-point each output, bi-directional	-20 dB (< ±1,0 dB)
Hum modulation	≥ 65 dB

2.1.4. NMS – monitoring features

- AC voltage
- DC voltage (15 V)
- DC voltage (24 V)
- DC current (15 V)
- DC current (24 V)
- Temperature (sensor in modem)
- External contact 1
- External contact 2
- RF level (measured in modem)
- Return channel switch / attenuator (0, 6 dB, off)

2.1.5. Switched mode power supply

Powering remote & local (recommended)	24 – 60 V AC
Power consumption: • with RA module • without RA module	 ≤ 15 W ≤ 13 W

Current consumption	(without RA module / with RA module)
• 24 V AC	0,66 A / 0,86 A
• 36 V AC	0,45 A / 0,59 A
• 48 V AC	0,36 A / 0,46 A
• 60 V AC	0,31 A / 0,39 A

2.1.6. Housing

Degree of protection	IP 66
Dimensions: • Width • Length • Height	 Main body width 215 mm overall width (with hinge and screwholders) 245 mm 195 mm with flat cover 95 mm with optional modem cover 125 mm
Temperature range: • within specifications • without loss of operations	 -15 ÷ +55 °C -25 ÷ +70 °C

Specification subject to change without notice.

2.2 Block diagram

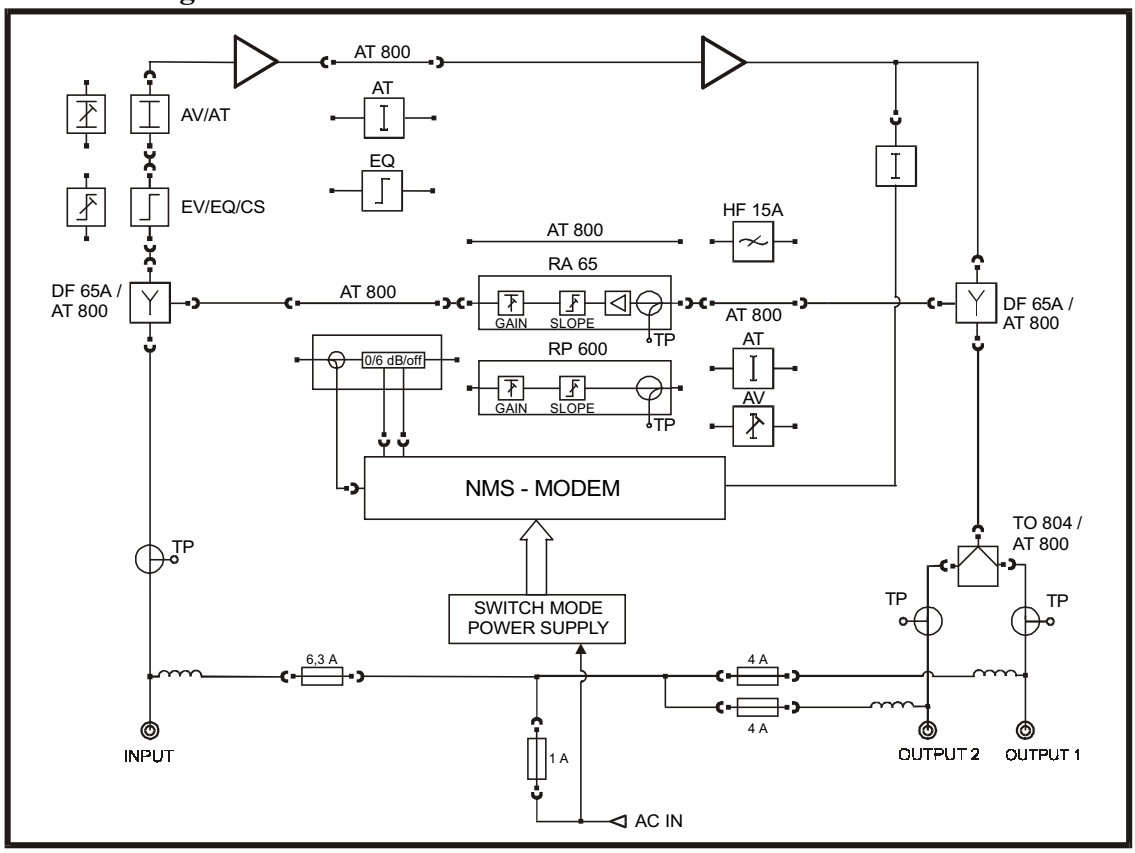

Fig. 1. BETA UE-836Y functional block diagram.

2.2. Housing's overview.

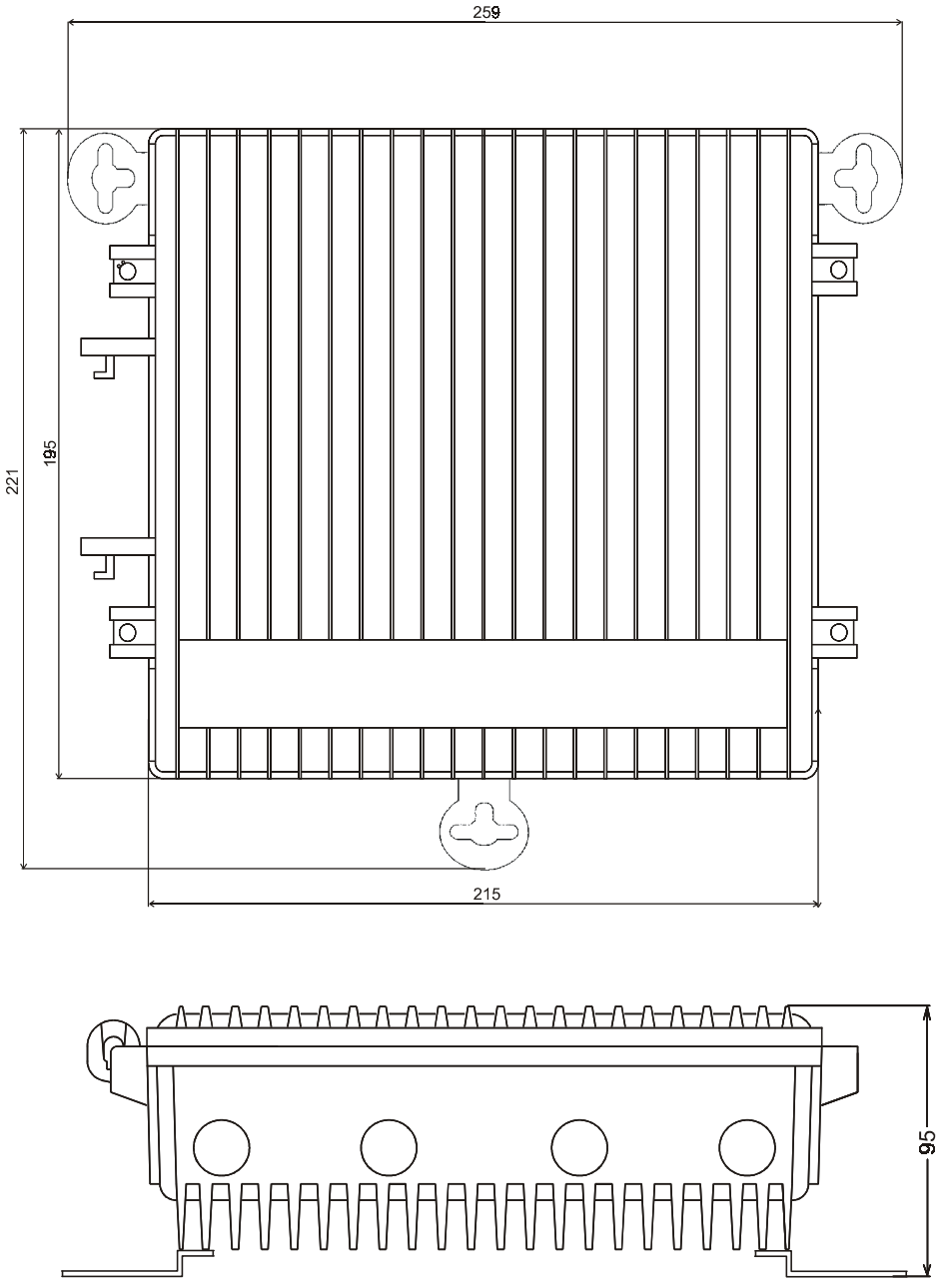

Fig. 2. An overview of BETA amplifier's housing.

2.3. Inside overview.

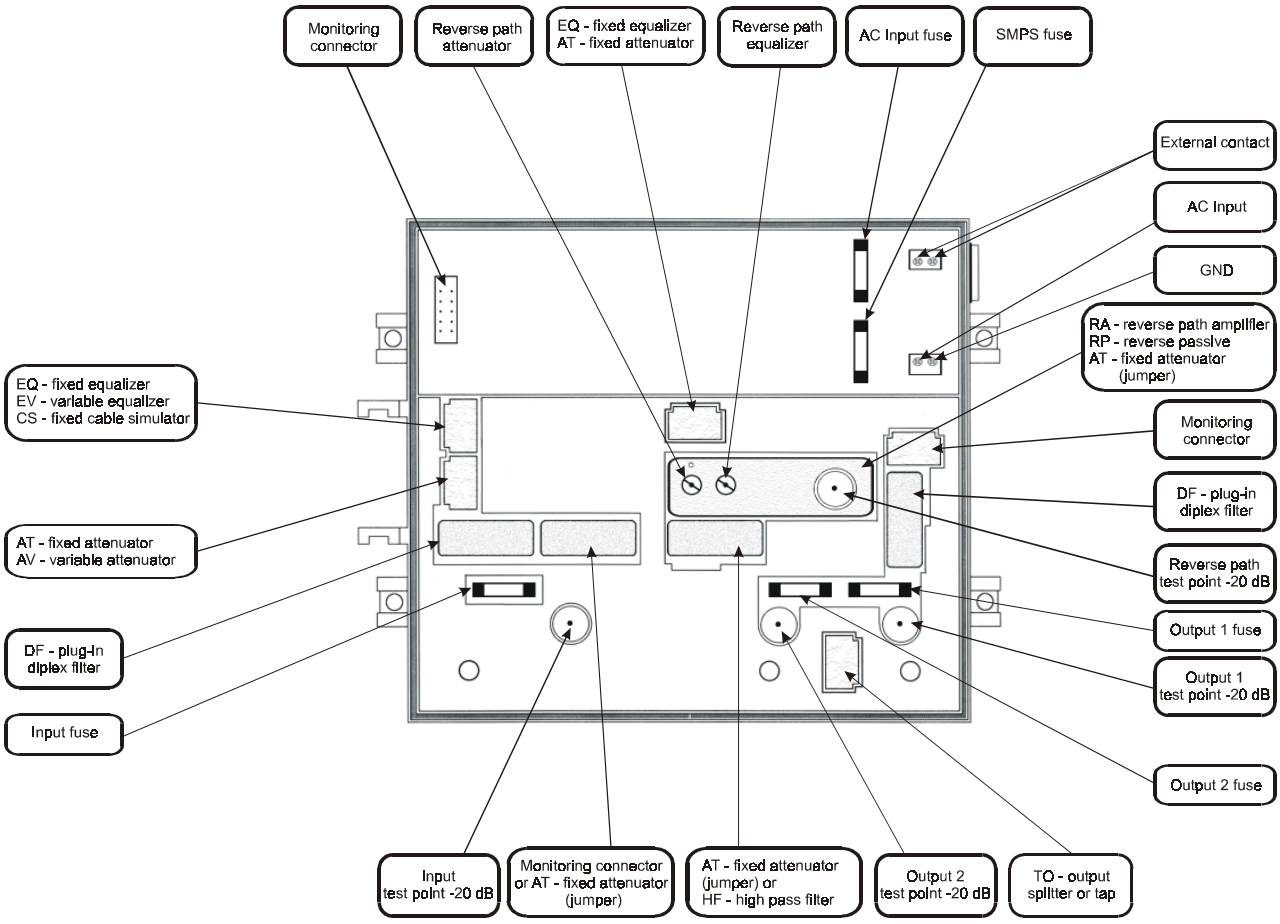

Fig. 3. BETA UE-836Y elements' arrangement.

3. FUNCTIONAL DESCRIPTION

The BETA UE-836Y group amplifier is composed of the following major sub-assemblies:

- forward path amplifier based on Power-Doubling GaAs-FET output stage with interstage adjustment and two outputs
- return path amplifier based on Push-Pull technology with plug-in diplex filters and signal's adjustment both at the amplifier's input and output
- 20-65 VAC high efficiency switched mode power supply
- 3+1 port housing assembly with a replaceable cover
- NMS modem for monitoring

3.1. Forward path

The forward path section provides amplification of RF signals received from the amplifier's input port. It performs input adjustment of signal attenuation and cable slope compensation as well as interstage pre-equalisation or signal's level control. After amplification the forward RF signal to final output level, it is directed toward two output ports. Location of the main forward path elements is presented on the Fig. 3 page 10.

3.1.1. Forward path amplifier

Modern GaAs-FET technology is used in the BETA U-836Y group amplifier. The forward path RF amplifier consists of two input stages followed by a hybrid Power-Doubling GaAs-FET output stage. It enables extremely high output signal's level, while at the same time reducing power consumption comparing to standard Si technology. Low noise input stage provides low noise figure NF of the amplifier and high carrier to noise ratio C/N. Very high gain (≥36,5dB) corresponds to the high output level.

3.1.2. Input signal's adjustment

Forward RF signal received from the cable enters the amplifier through input RF port. Then it is attenuated and equalised in order to establish proper level and flat characteristic at the input stage of the amplifier. Both attenuation and slope control is achieved by plug-in modules. **Attenuator module** is available in two versions: fixed **AT** and - very convenient - variable **AV**, providing the attenuation in a range 0-18 dB. Also **equaliser module** is available as a fixed one - **EQ** or variable - **EV**. When the input signal has an inverted slope (pre-equalisation in the previous amplifier) you should use a **cable simulator CS module**
All the equaliser and cable simulator modules are available for different forward path ranges. There are 450, 606, 750 or 862 MHz upper frequency versions. It enables in a simply way to change the amplifier's forward path range if necessary.

3.1.3. Interstage adjustment

In the interstage position there is a possibility to adjust output signal's level and slope using plug-in modules: **fixed attenuator AT** or **fixed equaliser EQ** (the same modules as for input adjustment). If interstage adjustment is not used, AT 800 (0dB jumper) module must be installed in this place.
Interstage pre-equalisation allows to increase amplifier's output level (at the highest frequency) without any degradation of CTB/CSO. In a table below you can find an influence of pre-equaliser value on BETA amplifier's output level (at 862 MHz) and noise figure. Figures are valid for 42 channels CENELEC.

Interstage pre-equaliser value	Output level's increase at CTB/CSO=60dB const.	Noise figure's increase
0 dB	0 dB	0 dB
6 dB	2 dB	0,2 dB
9 dB	3 dB	0,4 dB
12 dB	4 dB	0,6 dB

Table 1. Interstage pre-equalisation vs. amplifier's parameters.

Interstage attenuation, on the other hand, allows to lower amplifier's gain when still keeping C/N high.
Noise figure of the BETA amplifier is kept almost without degradation. However, a small decrease of output level can be observed. In the Table 2 an influence of the interstage attenuation on the amplifier's parameters is well shown.

Interstage attenuator	Noise figure's increase	CTB/CSO output level's reduction	DIN output level's reduction
0 dB	0 dB	0 dB	0 dB
1 dB	0 dB	0,3 dB	0,1 dB
2 dB	0 dB	0,5 dB	0,2 dB
3 dB	0,1 dB	0,8 dB	0,4 dB
4 dB	0,2 dB	1 dB	0,5 dB

Table 2. Interstage attenuator vs. amplifier's parameters.

3.1.4. Output

After amplification in the output stage a RF signal is directed toward the output ports. There are two output ports in BETA amplifier. Signal is divided between these two ports by plug-in TO output module. As a standard it'll be splitter with symmetrical two legs, however a tap can be installed as well.

3.1.5. Test points

At each input and output a test point is provided. There are three bi-directional, -20dB test points with typical F-connectors. Easy accessible, they enable precise measurements of both forward and reverse path signals.
REMEMBER: Bi-directional test points' frequency response characteristic depends very much on a return loss of connected input/output cable lines.

3.2. Return path

The return path RF section accepts inputs from each of two ports (output ports in the forward direction). The reverse RF signals are directed on a path separate from the forward RF signals. Separation is made by plug-in diplex filter at the amplifier's output. The reverse signal may be amplified or allowed to pass through without amplification (passive). In both situation it is possible to adjust reverse signal slope compensation and attenuation to establish unity gain. After adjustment the signal is directed to the second diplex filter, then diplexed into the incoming forward signal path and passed via the input cable to the next amplifier. Location of all elements is presented on the Fig. 3 page 10.

3.2.1. Diplex filters

In the BETA amplifier plug-in diplex filters modules DF are used to provide separate forward and return path frequency bands. DF modules are installed at the amplifier's input and output (betweenoutput stage and output splitter). Plug-in solution provides flexible return path configuration – free choice of return path frequency range.
If return path is not used jumper modules AT 800 can be installed in the place of DF modules.

3.2.2. Return amplifier

Return path amplifier provides amplification and adjustment of reverse path signals incoming from two output ports. The amplifier is available as a plug-in module RA. Push-Pull architecture utilised here provides very high output level 115 dBμV (DIN 45004 B) and high gain 23 dB (measured from amplifier's single output to the input) .
If reverse signal amplification is not necessary a passive return module can be installed instead. There is a possibility to install RP module with signal adjustment possibility or AT 800 jumper module.

3.2.3. Signal adjustment

Return path modules RA and RP are equipped with output adjustment: 0-18 dB variable attenuator for level adjustment and 0-10 dB variable equaliser for cable slope compensation. The outgoing signal should be compensated to establish unity gain in the reverse path.

Additionally you have a possibility to adjust incoming reverse signal level by plug-in pad AT preceding the return module RA/RP. There is also a high pass module HF 15A available to install in this place. It can be used for blocking the lowest part of return path (beneath 15 MHz) where many undesirable interference appear.
Programmable return channel "wink switch" (three position switch-attenuator 0/ 6dB/ off) with monitoring connector is a special diagnostic tool necessary to solve return channel's ingress problems. It helps to locate a distortion source area by remote adding 6dB attenuation in reverse legs and to switch off the selected return amplifier until accomplishing the ingress troubleshooting by a technical staff.

3.2.4. Test point

At the reverse path module RA/RP input there is a directional –20dB test point is located. It enables to measure incoming return signals directly at the input of the reverse amplifier. Easy accessible F-connector enables quick and convenient measurements.

3.3. Powering

The BETA UE-836Y group amplifier may be powered through any one of the three RF ports: one input and two outputs. Also additional local powering port (at the right side of a power supply section) may be used to power the unit. Quasi-square wave input voltage in a very wide range 20-65 VAC is accepted. A switched mode power supply (SMPS) provides proper DC input to the electronics.
A main SMPS fuse protect power supply. It must be installed to enable amplifier's powering.
The amplifier can be configured to pass AC power (4A) through input/output RF ports to other amplifiers in any direction. It is possible also to pass the power through additional AC port (max.1A) to another amplifier located nearby. The input/output port and AC port fuses determine the powering scheme.
Surge arrestors at all input/output ports provide over-voltage protection and highly increase amplifier's reliability.
All the fuses are "slow blow" type. Their values are presented in the next section "Configuration and setup".

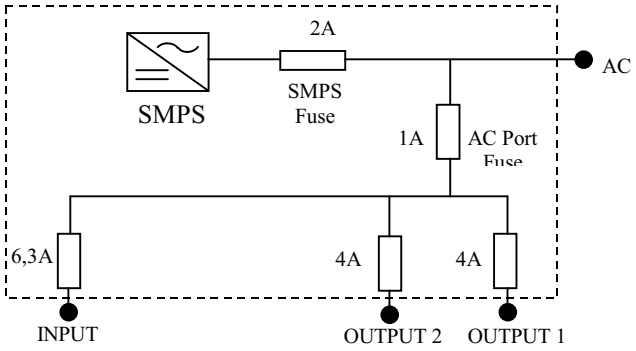

Fig. 4. Power distribution block diagram.

Technological solutions, utilised in SMPS architecture, provide high efficiency and very low power consumption. Very wide range of input voltages is accepted. Recommended voltage range is 24-60 VAC, but SMPS proper working is guaranteed within 20-65 VAC range. Low current consumption in such wide voltage range reduces number and cost of the entire CATV system's remote power supply devices.

Table 3 below present BETA amplifier current consumption and voltage level dependence.

Amplifier	Power consumption [W]	Current consumption [A]			
		24 VAC	36 VAC	48 VAC	60 VAC
BETA UE-836Y without RA module	13	0,66	0,45	0,36	0,31
BETA UE-836Y with RA module	15	0,86	0,59	0,46	0,39

Table 3. BETA UE-836Y amplifier's power consumption.

3.4. Housing

The housing provides both environmental protection and heat dissipation for the amplifier. Durable, weatherproof, die-cast aluminium housing with large radiator allows operating in a wide ambient temperature range (-15 ÷ +55°C within specification and (-25 ÷ +70°C without loss of operations). Very high protection class IP 66 enables installation and operation even in a heavy environmental conditions. A silicone rubber gasket provides a hermetic seal, while a metal gasket provides electromagnetic compatibility.
BETA amplifier's compact housing requires little mounting place and can be installed in most of typical street cabinets. An overview of the housing is presented on the figure

Fig. 2, page 9. Three universal mounting brackets enable easy installation of the housing.
BETA UE-836Y amplifier is equipped with three RF ports on the bottom side of the housing and one additional AC port on the right side. RF ports provide IEC14M type cable connectors.
The amplifier is equipped with easy removable cover. A standard flat cover can be replaced in future to a deeper one prepared for NMS modem installation.

3.5. NMS modem for monitoring

BETA amplifier is prepared for status monitoring. It is equipped with three monitoring connectors (see

Fig. 2, page 10).

At the connector located in the SMPS section you can monitor following signals:

- AC input voltage level
- DC voltage levels (15 / 24 VDC)
- DC current levels (15 / 24 VDC)
- External contacts 1 / 2

AC voltage is measured on an internal resistance 20 kΩ.
DC current is measured as a voltage drop on the resistors 100 mΩ : $I_{DC}[A]=10*U_{measured}[V]$
External contacts are directly connected to the monitoring connector. Measured current value should not exceed 500mA.

Two monitoring connectors are located on the RF plate:

- at the output of forward amplifier's final stage – for monitoring forward RF signal level: RF output signal is tapped to the NMS modem and then measured;
- at the output of reverse path module – for controlling reverse RF signals and for troubleshooting return path ingress problem ("wink-switch" programmable switch/attenuator as described in the paragraph *Return path 3.2.3 Signal adjustment, page 12*). It enables also to send monitoring signals from the NMS modem via return path or via Lon Talk system to the headend and monitoring server.

Until NMS monitoring is not supported, AT800 jumper modules must be installed in place of the monitoring connector in the amplifier's reverse path.

BETA UE-836Y amplifier is prepared for passing Lon Talk monitoring signals. Lon Talk system sends signals on the 132,5 kHz frequency. The signals are filtered together with AC power and fed to NMS modem via monitoring connector.

ATTENTION:
An attention must be paid while installing themodules because of AC voltage present on the monitoring connectors' pins.

3.6. Plug-in modules

There is a wide range of additional plug-in modules available for BETA amplifier. Easy in installation, they allow optimal configuration of each amplifier accordingly to individual CATV network's needs and requirements. The BETA plug-in modules are standardised elements used also in other amplifiers manufactured by VECTOR

Below you can find plug-in modules' list and specifications.

- **EQ**
  Fixed equaliser – for line equalisation in a forward channel or as interstage slope adjustment to improve system distortions' performance. Designed for different frequency ranges provides a forward frequency range flexible (it can be changed to e.g. 862, 606 MHz).

Type	Freq. range	Attenuation @ 47 MHz
EQ 8xx	47 – 862 MHz	0-24 dB, step 1 dB
EQ 7xx	47 – 750 MHz	0-24 dB, step 1 dB
EQ 6xx	47 – 606 MHz	0-24 dB, step 1 dB
EQ 4xx	47 – 450 MHz	0-24 dB, step 1 dB

Attention: *xx symbols correspond to attenuation at 47 MHz*
Example: *EQ806 – Equaliser 6dB, 47- 862 MHz*

- **EV**
  Variable equaliser – for continuous forward path's equalisation. Designed for different frequency ranges, provides a forward frequency range flexible (it can be changed to e.g. 862, 606 MHz).

Type	Freq. range	Attenuation @ 47 MHz
EV 818	47 – 862 MHz	0-18 dB
EV 718	47 – 750 MHz	0-18 dB
EV 618	47 – 606 MHz	0-18 dB
EV 418	47 – 450 MHz	0-18 dB

- **CS**
  Cable simulator – used instead of an input equaliser module if an input signal's slope is inverted. Designed for different frequency ranges, provides a forward frequency range flexible.

Type	Freq. Range	Attenuation at upper frequency
CS 80x	47 – 862 MHz	3 / 6 dB
CS 70x	47 – 750 MHz	3 / 6 dB
CS 60x	47 – 606 MHz	3 / 6 dB
CS 40x	47 – 450 MHz	3 / 6 dB

Attention: *x symbol correspond to attenuation at high frequency*
Example: *CS806 – Cable simulator 6dB for bandwidth 862 MHz*

- **AT**
  Fixed attenuator – for interstage level adjustment without noise performance's degradation.

Type	Freq. range	Attenuation
AT 8xx	47 – 862 MHz	0-21 dB, step 1 dB

Attention: *xx symbols correspond to attenuation*
Example: *AT806 – Attenuator 6dB, 47- 862 MHz*

- **DF**
  Diplex filters – divide forward and return channels frequencies, enable free choice of return channel bandwidth.

Type	Upper frequency of the return path	Lower frequency of the forward path
DF30A	30 MHz	47 MHz
DF65A	65 MHz	85 MHz

- **RA**
  Return path amplifier – Push-Pull technology guarantees high gain and output level. Equipped with a measuring point –20dB at an input, 0-18dB level and 0-10dB slope adjustment at an output – enables optimal control and return path's setup in an entire system.

Type	Frequency range	Gain (from single output port to input port)	Output level [DIN 45004-B]
RA 65	5-65 MHz	23 dB	115dBµV

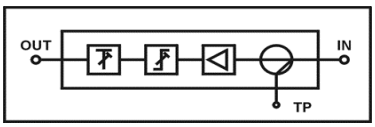

Fig. 5. RA module block diagram.

- **RP**
  Return path passive module– Equipped with a measuring point, level and slope adjustment (the same as in RA module) – enables signal control and return path's setup in an entire system

Type	Frequency range	Attenuation (from single output port to input port)
RP 300	5-30 MHz	< 3,5 dB
RP 600	5-65 MHz	< 3,5 dB

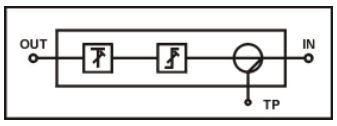

Fig. 6. RP module block diagram.

- **HF**
  High pass filter – used to block the lowest part of return path frequency band and to cut undesirable interference. Mounted at the position preceding return path plug-in module

Type	Frequency range	Attenuation	Group delay Δf=5,5MHz
HF 15A	15-65 MHz	5 MHz - 45dB	15 MHz 62 ns
		11,7 MHz - 30dB	16 – 18 MHz < 40 ns
		15 MHz - 0,5dB	18 – 21 MHz < 20 ns
		65 MHz - 0,5dB	21 – 24 MHz < 10 ns
			24 – 45 MHz < 7 ns
			> 45 MHz < 1 ns

- **AT 800**
  0 dB jumper must be placed instead of any unused module (especially instead of diplex filters DF or interstage module EQ/AT if they are not used). 0 dB jumpers are factory installed instead monitoring plug-in modules on the amplifier's RF plate.

4. MOUNTING:

4.1. Preparing for amplifier installation.

Inspect the outside of the unit. Check the convection fins, cable entry ports, cover bolts for damage. Ensure that each unit has its mounting hardware package. It should contain three universal mounting brackets.

4.2. Installation.

An amplifier should be mounted vertically, cable connectors downward. To mount an amplifier attach universal mounting brackets (included with amplifier) to the housing using the screws on the back side of the housing. Then screw down housing to the wall or pedestal using universal brackets with help of three screws max. ∅6mm. A correctly affixed amplifier can secure best operating temperature conditions.

4.3. Grounding:

To guarantee amplifier's operational safety its housing must be grounded. 4mm^2 copper wire should be well connected to the connector on the right side of the housing.

4.4. Cable attachment

Turn off all power sources feeding into the unit before installing the cable and connectors. If one of the output ports is not used it should be terminated (terminator 75 Ω). Connect coax cables with IEC14M connectors (Fig. 7) to the RF input and output ports. It is recommended to use heat-shrink boot to cover the cable entry port insert and the entire assembled connector. Be sure that the boot is long enough, at least 5cm beyond the cable jacket edge.

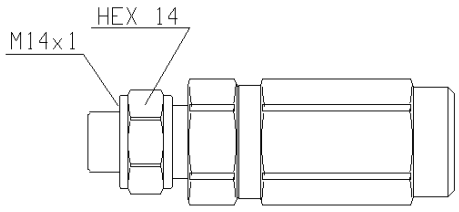

Fig. 7. IEC14M cable connector.

5. CONFIGURATION AND SETUP.

5.1. Fusing.

Check a system map for through power fusing or power stop in the powering scheme. The powering can be supplied locally through additional AC input or remotely from the RF input or output ports (see *Fig. 1. BETA UE-836Y functional block diagram.*, page 8). In this case adequate fuse must be installed. Check that the through power fuses (RF ports and AC port) are installed if specified by the system map and that SMPS fuse is installed. If not, install the right fuses. Please refer to Fig. 4. *Power distribution block diagram.*, page 13.

Fuse values for the BETA UE-836Y amplifier are listed below in Table 4. Some fuses are already installed by VECTOR (configuration for a remote powering from the input). This is marked in the last column. The rest of fuses can be installed by a customer.

No	Fuse type	Location	Installed
1	6,3A 250V slow-blow	Input fuse	YES
2	4A 250V slow-blow	Output 1 fuse	NO
3	4A 250V slow-blow	Output 2 fuse	NO
4	1A 250V slow-blow	AC Input fuse	YES
5	2A 250V slow-blow	SMPS fuse	YES

Table 4. Fuse values for BETA UE-836Y amplifier.

ATTENTION:

Improper fuse installation can:

- damage amplifier
- fail to power the amplifier
- fail to distribute through power

Use only the same fuse type while replacement!

5.2. Configuration – plug-in modules

5.2.1. Forward channel plug-in modules:

Check plug-in modules installed in the amplifier. The right forward path configuration must contain following plug-in modules (See Fig. 1 and Fig. 3):

- input diplex filter (**DF**)
- input attenuator fixed (**AT**) or variable (**AV**) – installed by a customer
- input equaliser fixed (**EQ**) or variable (**EV**) or cable simulator (**CS**) – installed by a customer
- interstage module: fixed equaliser (**EQ**) or fixed attenuator (**AT**)
- output diplex filter (**DF**)
- output splitter or tap (**TO**).

You must use jumpers instead of unused modules: diplex filters, attenuators or equalisers, output splitter/tap.

Input attenuator and equaliser positions are not fitted out. It must be done by an operator. A rest of modules is fitted out by VECTOR in accordance with a customer's order.

ATTENTION:
An amplifier does not work if any of modules' position in forward path is not fitted out.

5.2.2. Return channel plug-in modules:

Active return path

- Return path amplifier plug-in module (**RA**) with designed frequency range and gain. Return path adjustment is made by variable attenuator and equaliser at the RA output.

Passive reverse path:

- Passive return path plug-in module (**RP**) with designed frequency range or fixed attenuator (jumper). RP module is equipped with variable attenuator and equaliser

Additional for both active and passive:

- Fixed attenuator or jumper (**AT**) or high pass filter (**HF**) preceding RA/RP position
- "Wink switch" module (for monitoring) or jumper (**AT**) following the RA/RP position

Factory configuration contains all the modules necessary for amplifier's proper working, in accordance with a customer's order.

5.3. Setup.

5.3.1. Forward channel.

Follow the procedure bellow:

1. Insert interstage jumper.
2. Input test point can be used to measure input signal.
3. Insert input attenuator and equaliser with designed value of attenuation and equalisation.
4. Connect CATV meter to output test point and check if output signal has designed level and its slope is flat.
5. Output signal level should be adjusted using input attenuator.
6. Install interstage attenuator or equaliser with designed value of attenuation and equalisation.

5.3.2. Reverse channel (RA and RP modules).

Follow the procedure bellow:

1. If reverse path is used input and output diplex filters must be installed.
2. Choose reverse path module RA or RP with designed frequency range and gain (RA only).
3. Insert (if necessary) high pass filter (HF) or variable attenuator (jumper) preceding the RA/RP module.
4. Return signal adjustment can be made by variable attenuator and equaliser at the plug-in module's output.
5. Adjust output return signal to get desired signal at an input of the next return path amplifier (unity gain).
6. Reverse path test point at the RA and RP modules' input can be used to measure incoming return signals (from subscriber)
7. Amplifier output test points can be used to connect signal generator during adjustment of return path in an entire network

5.4. Cover closing.

After connecting coax cables and finishing amplifier's configuration close the housing cover and tighten the cover bolts following the sequence: screw 1, 2, 3, 4 or 3, 4, 1, 2 (Fig. 8).

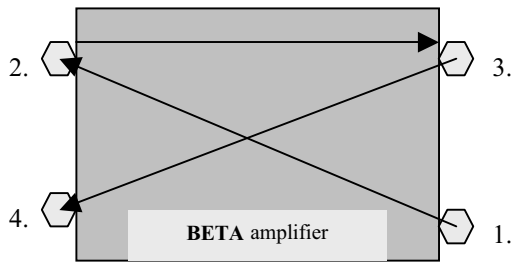

Fig. 8. Amplifier cover closing and tightening diagram.