

User Manual
for
AZ110 Broadcast Satellite
Modulator with ASI interface

version 3.2

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COMPLIANCY STATEMENTS

TO WHOM IT MAY CONCERN

EC DECLARATION OF CONFORMITY

We,

Newtec Cy N.V.

declare that our product AZ110

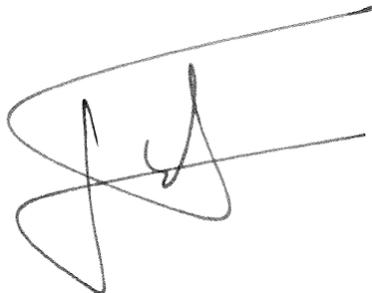
with type identifiers:

NTC2277

NTC2280

to which this declaration relates is in conformity with the essential requirements of European Union Directive 1999/5/EC Radio and Telecommunication Terminal Equipment Directive Essential Requirement 3.1(a), 3.1 (b), 3.2.

Done at St-Niklaas, on Monday, 4 July 2011



Serge Van Herck, CEO

TO WHOM IT MAY CONCERN

Restriction of Hazardous Substances Directive (RoHS) (Directive 2002/95/EC)

The undersigned hereby confirms the following statement:

We hereby declare that this equipment is compliant to the RoHS Directive 2002/95/EC.

Done at St-Niklaas, on 04 July, 2011



Serge Van Herck,

CEO

Registration, Evaluation and Authorization of Chemicals (REACH)

European Regulation N°1907/2006 "REACH" (Registration, Evaluation, and Authorization of Chemicals), came into force on June 1st, 2007. It aims at regulating the use of the chemical substances within the European Union.

We are committed to meeting our legal obligations under REACH, as a manufacturer of articles and as a downstream user of chemicals products.

In order to comply with the REACH regulation, Newtec Cy N.V. has put into place processes and procedures to ensure implementation and compliance with the regulation, especially the assessment of the presence of Substances of Very High Concern (SVHC's) and communication along the supply chain to both suppliers and customers.

All products manufactured by Newtec Cy N.V. fall under the category of Articles within the REACH Regulation and none of them present the notion of intentional release of SVHC's, therefore no obligation of registration applies.



Serge Van Herck,

CEO

SAFETY REGULATIONS

Please read this chapter before you install and use this equipment.

To ensure your safety, the equipment has been designed to comply with the following safety standard:



IEC 60950 Safety of Information Technology Equipment

Before you start to install and operate the device, please make sure you observe the following points:

- The equipment described in this manual is designed to be used by properly trained personnel only. Only qualified personnel who are aware of hazards involved shall carry out adjustment, maintenance and repair of the exposed equipment.



No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

- To use the equipment correctly and safely, it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual. Warning and caution statements and/or symbols are marked on the equipment when necessary.
- Whenever it is likely that safety protection is impaired, immediately switch off the equipment and secure it against unintended operation. Inform the appropriate servicing authority about the problem. For example, safety is likely to be impaired if the equipment fails to perform the intended measurements or shows visible damage.



Caution 1:

FOR CONTINUED PROTECTION AGAINST FIRE, REPLACE LINE FUSES ONLY WITH SAME TYPE AND RATING (5 X 20mm T3.15 A/250v TYPE T OR SLOW-BLOW);

Caution 2:

THERE IS RISK OF EXPLOSION IF THE BATTERY IS REPLACED WITH AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.



Additional safety requirements for Finland, Norway and Sweden

Telecommunication connections and cable distribution system.

Special conditions apply to the use of this equipment in Finland, Sweden and Norway due to different earthing arrangements in these countries. Therefore it is essential that the installation is done by authorized personnel and according to the national requirements only.

This equipment is specified for use in a restricted access location only, where equipotential bonding has been applied and which has provision for a permanently connected protective earthing conductor.

A protective earthing conductor must be installed by a Service Person.



Additional safety requirements for Norway and Sweden

Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing - and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11)." NOTE: In Norway, due to regulation for installations of cable distribution systems, and in Sweden, a galvanic isolator shall provide electrical insulation below 5 MHz. The insulation shall withstand a dielectric strength of 1,5 kV r.m.s., 50 Hz or 60 Hz, for 1 min.

Translation to Norwegian:

Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr - og er tilkoplet et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel-TV nettet.

Translation to Swedish:

"Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet."

Laser Safety Statement



This statement is valid when option AG02 (ASI + Optical ASI) is ordered. Refer to the section Options on page 'xiii'.

The product is a class 1 laser product in accordance with:

- IEC 60825-1, amendment 2, 2001
"Radiation safety of laser products"

This product is a Class 1 laser product in accordance with:

- FDA 21CFR Ch.1 §1040: 1998
(US department of Health and Human Service, Code of Federal Regulations).

Instruction for safe use

To avoid possible exposure to hazardous laser radiation, connect cable to laser output or put protective plastics on laser output, prior to powering up the product.



Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Label:

CLASS 1 LASER PRODUCT
(per CDRH, 21 CFR 1040)
(per IEC 60825-1 amendment 2, 2001)

EMC Information

Relevant EMC information (to FCC rules)

This equipment has been tested and was found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and radiates radio frequency energy. If not installed and used in accordance with the instruction manual, it may cause harmful interference to radio communications.

Do not operate this equipment in a residential area, as it is likely to cause harmful interference. When this is the case, you will be required to correct the interference at your own expense.

Environmental

Operating the equipment in an environment other than that stated in the specifications also invalidates the safety compliance.

Do not use the equipment in an environment in which the unit is exposed to:

- Unpressurised altitudes higher than 2,000 metres;
- Extreme temperatures outside the stated operating range;
- Operating temperature range 0 to + 40 °C;
- Excessive dust;
- Moist or humid atmosphere above 95% RH;
- Excessive vibration;
- Flammable gases;
- Corrosive or explosive atmospheres;
- Direct sunlight.

(*): DC power supply - Operating temperature range 0 to + 30 °C.

Use a slightly damp cloth to clean the casing of the equipment. Do not use any cleaning liquids containing alcohol, methylated spirit or ammonia etc.

MAINTENANCE

Standard Warranty

Newtec guarantees the durability and satisfactory electrical and mechanical performance of the equipment to a maximum period of one (1) year from the date of delivery, unless otherwise agreed to, in writing. The warranty applies only to manufacturing defects and provided that handling, installation, maintenance and adjustment of the equipment are carried out in line with the instructions provided by Newtec and in line with good practice. The warranty does not apply to items, normally consumed in operation, or which have a normal lifetime inherently shorter than the warranty stated above, such as, without limitation, fuses or lamps. Any defect due to normal wear and tear, or caused by transportation or Force Majeure events, or attributable to the Customer's improper use, neglect, storage, operation handling or maintenance of the goods or any part thereof, are excluded from the warranty. During the warranty period, Newtec shall, at its sole discretion, replace or repair the defective subparts or units at the source factory. All transportation costs shall be borne and prepaid by the Customer.

Care Pack

Guidelines

Order a Care Pack

Care Pack is to be purchased along with Newtec professional equipments. The Care Pack coverage starts from the date of shipment. Please contact sales@newtec.eu for more details.

Register a Care Pack

After purchase the customer needs to register his Care Pack. On the Newtec equipment, the customer will find a registration label inviting him to self-register on portal www.newtec.eu/support

ABOUT THIS MANUAL

This document provides a quick overview on how to easily set up the AZ110 with ASI interface for the most common use cases.

This document is intended to help first time users:

- Find your way around the GUI;
- To understand the different possibilities of the AZ110 modulator;
- To configure the AZ110 for your specific configurations.

Cautions and Symbols

The following symbols appear in this manual:



A caution message indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. It may also refer to a procedure or practice that, if not correctly followed, could result in equipment damage or destruction.



A hint message indicates information for the proper operation of your equipment, including helpful hints, shortcuts or important reminders.



A reference message is used to direct to;

- An internal reference within the document;
- A related document or a web-link.

Version History and Applicability

Document version	Date	Subject	Comments
Version 2.0	December 2 th 2009	AZ110 ASI	Release 7
Version 3.0	December 2010	AZ110 ASI	AES, DC-BUC power, GUI update, REACH
Version 3.1	February 2011	AZ110 ASI	Update, Alarm interfaces, back panel information, rack mounting information

Version 3.2	June 2011	AZ110 ASI	Add warnings to DC output power 48V and UL feedback information. Added safety regulations for Norway and Sweden.
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Related documentation

- The Reference Manual describes all parameters that can be set or monitored on the AZ110. There are separate reference manuals for the AZ110 with ASI interface and for the AZ110 with ASI and Gigabit Ethernet interface (DualFlow Interface);
- Equalink User Manual: this manual describes the linear and non-linear predistortion.
- Device leaflet (we refer to <http://www.newtec.eu>)



The RMCP and SNMP manual explain how Newtec devices can be remotely monitored and controlled via the serial port or via Ethernet. These manuals are delivered on CD-ROM together with the device.

Applicability

Product Range

Azimuth

Software ID

M&C ntc6241

Software Versions

Release 8

Options

AZ 110 Broadcast Satellite Modulator		Ordering n°
Default Configuration		
DVB Modulator, SNMP		AZ110
Modulation & Baud rate: DVB-S 5Mbaud		
Input interface: ASI interface + Rate adaptor		
Output interface: L-band (950-1750 MHz)		
Configuration Options		
Category		Max. 1 option per category
Input Interface	ASI	Default
	ASI + Optical ASI	AG-02
Output Interface	L-band (950-1750 MHz)	Default
	IF (50-180 MHz)	AA-02
	L-band + 10MHz for BUC	AA-03
	L-band + 10MHz + 24Vdc for BUC	AA-12
	L-band + 10MHz + 48Vdc for BUC	AA-13
	Extended L-band (950-2150 MHz)	AA-18
	IF+ L-band	AA-06
	L + C-band (5,85-7,05 GHz)	AA-14
	L+ Ku-band (12,75-13,25 GHz)	AA-08
	L+ Ku-band (13,75-14,50 GHz)	AA-09
	L + DBS-band (17,30-18,10 GHz)	AA-10
	L + DBS-band (17,60-18,40 GHz)	AA-11
Additional Options		Max. 1 option per category
10MHz reference In/Out	High stability	GR-01
	Very high stability	GR-02
Predistortion	Equalink *	AC-01
Encryption	BISS (**)	AD-01
	BISSM (**)	AD-02
Security	AES 64 bit encryption *	AS-01
Input frame	Baseband frame (only with Ethernet interface)	AV-01

Modulation & Baud rate	DVB-S Q/8PSK, 16QAM 5Mbaud	Default
	DVB-S Q/8PSK, 16QAM 15Mbaud*	AB-02
	DVB-S Q/8PSK, 16QAM 30Mbaud*	AB-03
	DVB-S Q/8PSK, 16QAM 45Mbaud*	AB-04
	DVB-S/S2 QPSK 5Mbaud*	AB-25
	DVB-S/S2 QPSK 15Mbaud*	AB-26
	DVB-S/S2 QPSK 30Mbaud*	AB-27
	DVB-S/S2 QPSK 45Mbaud*	AB-28
	DVB-S/S2 Q/8PSK 5Mbaud*	AB-05
	DVB-S/S2 Q/8PSK 15Mbaud*	AB-06
	DVB-S/S2 Q/8PSK 30Mbaud*	AB-07
	DVB-S/S2 Q/8PSK 45Mbaud*	AB-08
	DVB-S/S2 Q/8PSK, 16QAM, 16APSK 5Mbaud*	AB-09
	DVB-S/S2 Q/8PSK, 16QAM, 16APSK 15Mbaud*	AB-10
	DVB-S/S2 Q/8PSK, 16QAM, 16APSK 30Mbaud*	AB-11
	DVB-S/S2 Q/8PSK, 16QAM, 16APSK 45Mbaud*	AB-12
	DVB-S/S2 Q/8PSK, 16QAM, 16/32APSK 5Mbaud*	AB-13
DVB-S/S2 Q/8PSK, 16QAM, 16/32APSK 15Mbaud*	AB-14	
DVB-S/S2 Q/8PSK, 16QAM, 16/32APSK 30Mbaud*	AB-15	
DVB-S/S2 Q/8PSK, 16QAM, 16/32APSK 45Mbaud*	AB-16	
Additional Options		
Category		Max. 1 option per category
10MHz reference In/Out	High stability	GR-01
	Very high stability	GR-02
Predistortion	Equalink *	AC-01
Encryption	BISS (**)	AD-01
	BISSM (**)	AD-02
Security	AES 64 bit encryption *	AG-01
Input frame	Baseband frame (only with Ethernet interface)	AV-01
Services		
Category		Max. 1 option per category
Assistance	Care Pack Basic	GA-06
	Care Pack Extended	GA-07
(*) upgrade via license key (**) Not available with DualFlow options		

Option AA-06 IF+Lband: Switching the IF frequency from 70 to 140MHz or 140MHz to 70MHz has no impact on the L-band frequency.

Feedback

Newtec encourages your comments concerning this document. We are committed to providing documentation that meets your needs.

Please send any comments by contacting us at documentation@newtec.eu

Please include document and any comment, error found or suggestion for improvement you have concerning this document.

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1 INTRODUCTION

1.1 Description

The AZ110 is a state-of-the-art satellite modulator designed for broadcast contribution, DSNG and distribution applications over satellite in full compliance with the DVB standards. Depending on the applications and the activated features, the AZ110 can be used in conjunction with set-top boxes, professional integrated receivers/decoders or satellite demodulators such as the AZ910.

In its default configuration, the AZ110 is capable of transmitting one MPEG transport stream in DVB-S, DVB-DSNG or DVB-S2 mode. The AZ110 allows automatic or manual selection between two ASI inputs and has dual ASI monitoring outputs. Optionally, an optical ASI interface can be added.



To simplify the migration towards IP, the AZ110 is also available with DualFlow. Refer to the **User Manual for AZ110 Broadcast Satellite Modulator with Dualflow Option** for more information.

To protect the satellite transmission, the BISS/BISSM or AES option can be activated. BISS scrambles a single program transport stream, BISSM a multiple program transport stream available on the ASI interface. AES allows to encrypt with a high security level the content of all DVB-S2 streams. When activated, the per stream mode allows to encrypt up to four S2 streams with individual keys.

At the output of the modulator, the signal is available on an L-band interface. Extended L-band, IF- and RF-band as well as BUC power supply and reference frequency are available as configuration options, providing a compact and cost effective solution.

This modulator provides exceptional performance and bandwidth efficiency. When activated, the unique linear and non-linear predistortion option Equalink™ provides an additional link margin improvement of up to 2,5dB, truly unleashing the full efficiency of higher modulation schemes such as 16 and 32 APSK.

1.2 Key Features

- DVB-S2 and DVB-DSNG/S compliant;
- QPSK, 8PSK, 16APSK and 32APSK;
- Data rates up to 216 Mbit/s;
- ASI or optical ASI transport stream interfaces;
- L-band monitoring output;
- Programmable amplitude slope equalizer;
- Optional extended L-band (950 - 2150 MHz);
- Optional Baseband frame input support;
- Optional switchable BUC power supply on L-band output;
- Optional Multistream and/or VCM operation;
- Optional BISS / BISS scrambling or AES encryption;
- Optional integrated RF upconverter;
- Optional 10 MHz reference input/output;
- Optional Linear and non-linear predistortion (Equalink™);
- Feature-based pricing and software upgradability.

2 INSTALLATION

2.1 Rack Mounting

The equipment is designed to operate in a 19-inch rack system conforming to IEC 60297.

When mounted in a standard 19-inch equipment rack, the device must be sustained by L-profiles. (Refer to Figure 1)



Fixing the device with four front panel screws only will damage it and could result in injury!

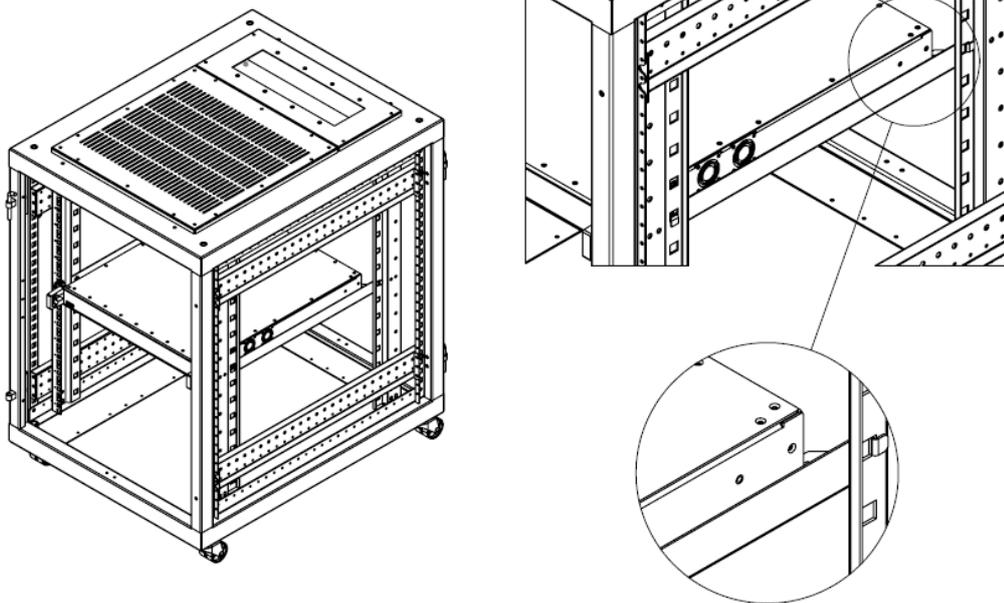


Figure 1 - Mounting with L-Profiles

It is allowed to operate the equipment in transportable installations and vehicles equipped with the means to provide a stable environment. Do not operate the equipment on vehicles, ships or aircraft without the means of environmental conditioning, as this may invalidate the safety compliance.

Mount the equipment in the rack in such a way that the amount of air flow required to safely operate the equipment is not compromised.

2.2 AC Power Supply

This equipment is provided with a protective earth incorporated in the power cord. Be careful to insert the mains plug only in a socket outlet provided with a protective earth contact (TN type power supply). Any interruption of the protective conductor inside or outside the equipment is likely to make the equipment dangerous. Intentional interruption is prohibited.

Install and connect the equipment to the mains power supply system in compliance with local or national wiring installation standards. Position the equipment so that the mains supply socket outlet for the equipment is near the equipment and can easily be accessed or that there are other suitable means to disconnect from the mains supply.

The power supply is set to operate from 100 to 240Vac to 47-63Hz.

2.3 Cable Distribution System

Install the equipment in accordance with the applicable provisions of NEC Article 810 for US and with CEC section 54 for Canada. Before connecting the coax to the equipment, make sure that the equipment is properly earthed. The screen of the used coax cable should be grounded according to the local regulations.

2.4 Technical Earthing

On the rear panel of the equipment a technical earth is available (an unmarked terminal on the right side of the equipment).

It is provided to:

- Ensure that all equipment chassis fixed within a rack are at the same technical earth potential. This is done by connecting a wire between the technical earth terminal and a suitable point on the rack.
- Eliminate the migration of stray charges when connecting between equipment.

3 PHYSICAL DESCRIPTION

3.1 Front Panel Description



Figure 2- Front Panel of the AZ 110 Broadcast Satellite Modulator

The device can be configured, controlled and monitored using the front panel. The front panel consists out of the following parts.

- Display:
The display consists of a 2 x 40 characters LCD screen. The top row indicates the path in the menu structure while the bottom row displays the selected item.

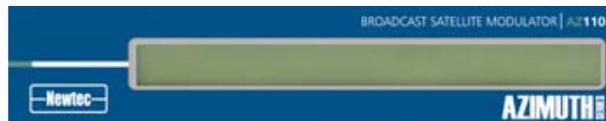


Figure 3 – Display

- Keypad:
The keypad consists out of 16 keys. Use them to navigate in the menus and change parameters.



Figure 4 - Keypad

- LEDs :
The LEDs provide a basic status overview of the device.



Figure 5 - Status LEDs

3.2 Back Panel Description

The back panel connections available depend on the specific hardware configuration of your device. The back panel consists of several hardware modules. In the next paragraphs these modules are described in more detail.

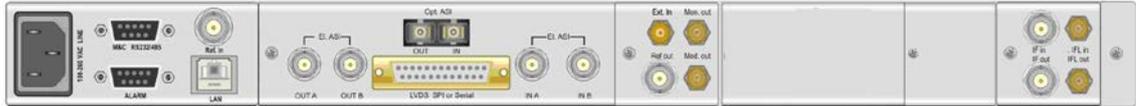


Figure 6 – AZ110 with ASI Interface Back Panel Connections

3.2.1 Power Supply Unit, M&C and External 10.0 MHz Input

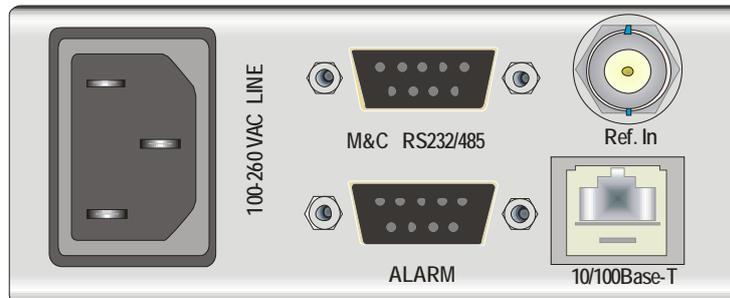


Figure 7 - Power Supply, Alarm and Monitoring and Control Connection Back Panel

Power Socket

This equipment is provided with a protective earthing ground incorporated in the power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor, inside or outside the instrument, is likely to make the instrument dangerous.

Serial Monitoring and Control via RS485/RS232

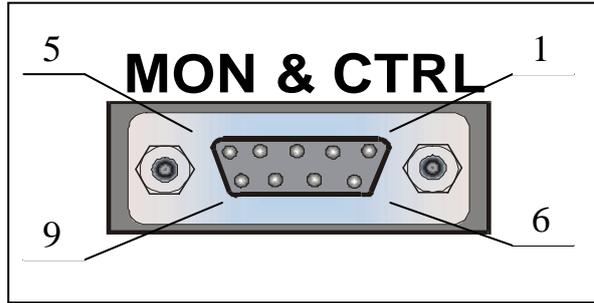


Figure 8 - Serial Monitoring and Control Connector

The modulator contains the hardware for the RS485 and RS232 interface.



Select the type of serial interface via the front panel or via the GUI, but not via the serial port itself.

RS485			RS232		
Pin	Name	Function	Pin	Name	Function
1	GND	Shield ground	1	GND	Shield ground
2		Not connected	2	Rx-D	Receive Data (input)
3	Tx-A	Send Data A (input)	3	Tx-D	Transmit Data (output)
4	Rx-A	Receive Data A (output)	4	DTR	Data Terminal Ready (output)
5	GND	Signal ground	5	GND	Signal ground
6	Rx-B	Receive Data B (output)	6		Not connected
7		Not connected	7	RTS	Request to send (output)
8		Not connected	8	CTS	Clear to send (input)
9	Tx-B	Send Data B (input)	9		Not connected

Table 1 - Pin Configuration

Contact Closure Alarm Outputs

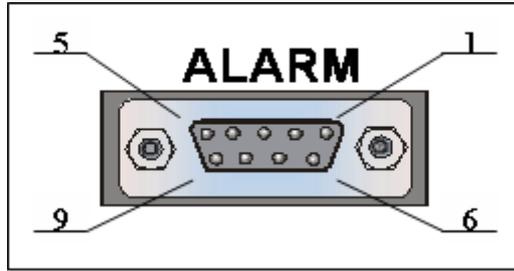


Figure 9 - Contact Closure Alarm Outputs

The dry contact closure alarm contacts can be used to connect to a redundancy switching system.

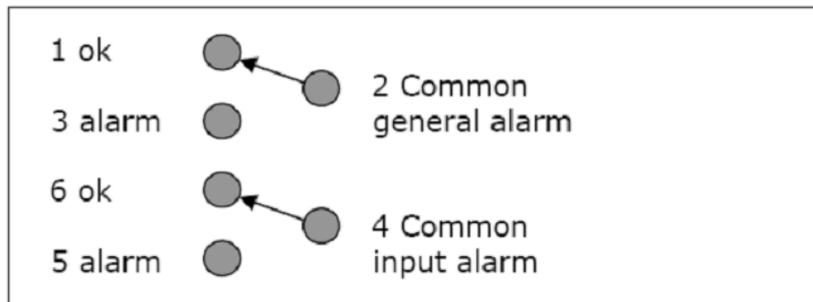


Figure 10- Modulator Alarm Connector Pin Connection

Pin 2 and 4 are either floating or tied to chassis ground.

- The common general alarm is active when the device is not working properly. For example: when the power supply fails.
- The common input alarm is active when the device does not receive an input signal.

10.0 MHz Reference Input

This input is used when you need a reference with enhanced stability or when you need several devices to be synchronised to the same clock source. The level should be 0 dBm, nominally. The 10.0 MHz reference input is only available if this one of the following options is installed.

- GR-01: 10MHz reference In/Out high stability;
- GR-02: 10 MHz reference In/Out very high stability.

Ethernet Connection

A standard RJ-45 connector provides connection to an Ethernet hub in a LAN (10/100BaseT). You can set the IP address and subnet mask from the front panel. The default IP address is: 10.0.0.1.

You can send RMCP (Remote Monitoring and Control Protocol) commands to the device using the Ethernet interface. The commands are sent as data in a TCP/IP stream. The used socket number is 5933. The RMCP protocol is exactly the same as for the serial interface, with one small exception: the receiving device ignores the RMCP address of the device (that is present in an RMCP command).



The RMCP general manual v1.6 explains how Newtec devices can be remotely monitored and controlled via the serial port or via Ethernet. This manual is delivered on CD-ROM together with the device.

3.2.2 Sub Back Panel Descriptions

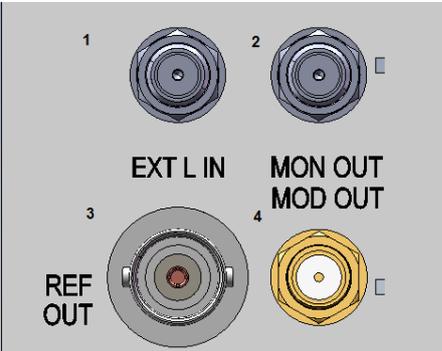
In this section the optional back panels are listed. Depending on the options ordered a combination of back panels is used.

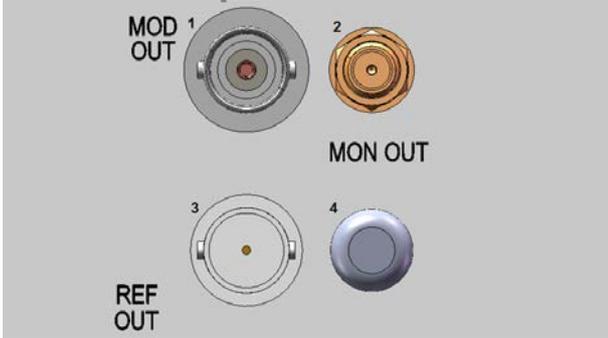
The different combinations per ordering option are described in the following section 3.2.3.

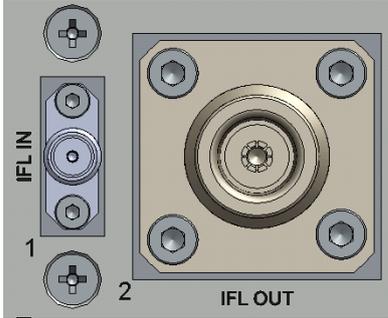


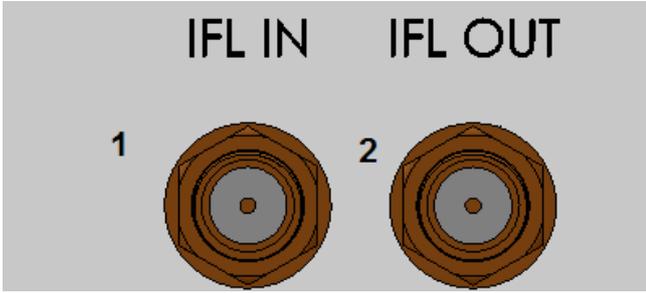
The connector REF OUT is used for option GR01 or GR02. When one of these options is selected the REF OUT connector is available on the first sub back panel that enables this option. In all other sub back panels this option is not used.

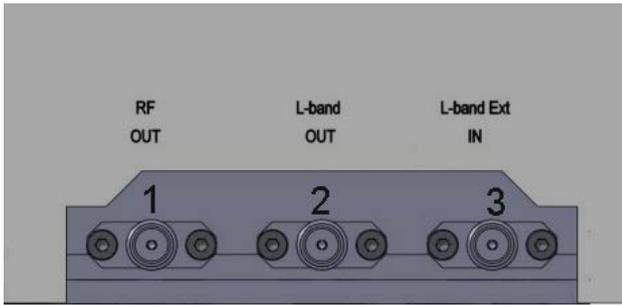
Back Panel 01 / Description		
Connector	Technical Specifications	Signalling Type
1. EI. ASI OUT A	BNC (Female) 50 Ohm	Output signal
2. EI. ASI OUT B	BNC (Female) 50 Ohm	Output signal
3. Opt. ASI OUT	Optical connector	ASI
4. Opt. ASI IN	Optical connector	ASI
5. EI. ASI IN A	BNC (Female) 50 Ohm	ASI
6. EI. ASI IN B	BNC (Female) 50 Ohm	ASI
7. LVDS SPI or Serial	Sub-D (Female) 25 Pins	

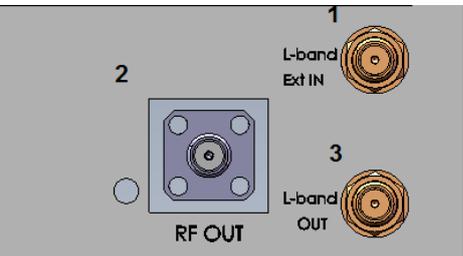
Back Panel 02 / Description		
		
Connector	Technical Specifications	Signalling Type
1. EXT L IN	Not used	
2. MON OUT	SMA (Female) 50 Ohm	L-band 1080MHz
3. MOD OUT	BNC (Female) 50 Ohm	L-band
4. REF OUT	SMA (Female) 50 Ohm	10MHz

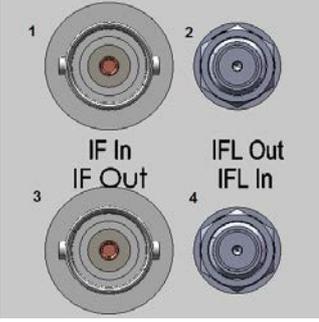
Back Panel 03 / Description		
		
Connector	Technical Specifications	Signalling Type
1. MOD OUT	SMA (Female) 50 Ohm	IF-band 70MHz – 140MHz
2. MON OUT	SMA (Female) 50 Ohm	L-band 1080MHz
3. REF OUT	BNC (Female) 50 Ohm	10MHz
4.	Not used	

Back Panel 04 / Description		
		
Connector	Technical Specifications	Signalling Type
1. IFIN	SMA (Female) 50 Ohm	L-band, is looped to Mod out of BP01
2. IFL OUT	N-Connector (Female) 50 Ohm	<p>L-band + 10MHz +DC (12V, 24V, 48V)</p> <p> Switch of the power of the device before connecting the coax cable. This to reduce the risk of personal injury from electric shock or damage to the device.</p> <p>The following DC voltages can be selected:</p> <ul style="list-style-type: none"> • 12V • 24V • 48V <p> The maximum current on this connector is 3A. Use a coax cable rated for the voltage and current marked on the device.</p> <p> The following parameters must be enabled in the device:</p> <ul style="list-style-type: none"> • ODU communication control • Outdoor power supply <p>Set the parameters on the following location. (Setting parameters refer to chapter 5.) AZ >> Unit >> Control >> Outdoor Unit</p>

Connector	Back Panel 05 / Description	
		
Connector	Technical Specifications	Signalling Type
1. IFL (IN)	SMA (Female) 50 Ohm	L-band (Input) to be looped to Mod OUT of BP01
2. IFL (OUT)	SMA (Female) 50 Ohm	L-band + 10MHz,

Back Panel 06/Description		
		
Connector	Technical Specifications	Signalling Type
1. RF OUT	SMA (Female) 50 Ohm	Lower Ku-band
2. L-band OUT	SMA (Female) 50 Ohm	L-band
3. L-band Ext IN	SMA (Female) 50 Ohm	L-band

Back Panel 07/Description		
		
Connector	Technical Specifications	Signalling Type
1. L-band Ext IN	SMA (Female) 50 Ohm	L-band
2. RF OUT	SMA (Female) 50 Ohm	C-band or Ku-band or DBS-band
3. L-band OUT	SMA (Female) 50 Ohm	L-band

Back Panel 08/Description		
		
Connector	Technical Specifications	Signalling Type
1. IF In	Not used	
2. IF Out	SMA (Female) 50 Ohm	L-band
3. IFL Out	Not used	
4. IFL In	Not used	

3.2.3 Back Panel interfaces

The sub back panels used per ordering option is listed in the following table.



Refer to page 'xiii' Options for ordering information. Refer to section 3.2.2 for the description of the different sub back panels.

Option	Back Panel Combination	Connectors Not Used BP-<number>/<connector>,<connector>
Default	BP 01	BP 01/3,4
AG-02	BP 01	
AA-01	BP 01 BP 02	BP 01/3,4 BP 02/1
AA-03	BP 01 BP 02 BP 05	BP 01/3,4 BP 02/1
AA-12	BP 01 BP 02 BP 04	BP 01/3,4 BP 02/1
AA-13	BP 01 BP 02 BP 04	BP 01/3,4 BP 02/1
AA-06	BP 01 BP 03 BP 08	BP 01/3,4 BP 03/4 BP 08/1,3,4
AA-07	BP 01 BP 02 BP 07	BP 01/3,4 BP 02/1,3,4
AA-08	BP 01 BP 02 BP 06	BP 01/3,4 BP 02/1,3,4
AA-09	BP 01 BP 02 BP 07	BP 01/3, 4 BP 02/1,3,4

Option	Back Panel Combination	Connectors Not Used BP-<number>/<connector>,<connector>
AA-10	BP 01 BP 02 BP 07	BP 01/3,4 BP 02/1,3,4
AA-11	BP 01 BP 02 BP 07	BP 01/3,4 BP 02/1,3,4
AA-18	BP 01 BP 02	BP 01/3,4 BP 02/1

For example:

When option AA-12 is ordered the following back panels are used to assemble the device:

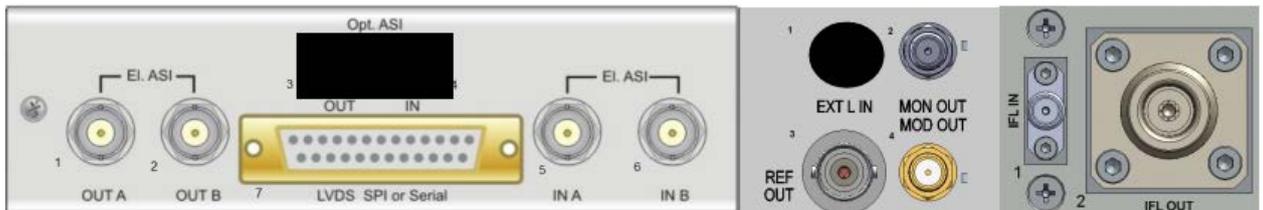


Figure 11 - Example Back Panel Combination

4 BLOCK DIAGRAM



This block diagram refers to the default configuration L-band.

4.1 Introduction

In this diagram the modem is split up into the following functionalities.

- Monitoring and Control;
- Modulator.

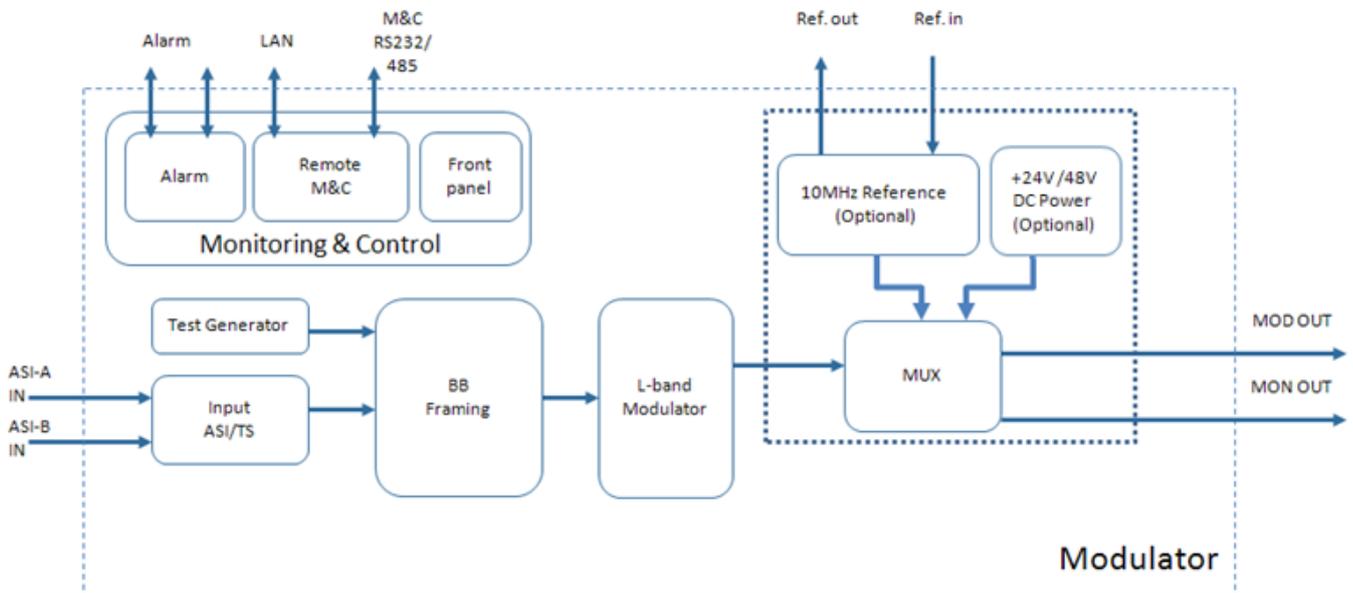


Figure 12 – Block Diagram of the AZ110 with ASI Interface

4.1.1 Monitor and Control

This block is used for monitoring and control of the device. For more information we refer to section 3. The following actions are available

- Alarm Output;
- Remote Monitoring and Control over LAN or RS232/RS485;
- Front Panel.

For more information we refer to section 5.2.

4.1.2 Modulator

In its default configuration, the AZ110 is capable of transmitting one MPEG transport stream in DVB-S, DVB-DSNG or DVB-S2 mode.

The AZ110 allows automatic or manual selection between two ASI inputs and has dual ASI monitoring outputs.

Optionally an optical ASI interface can be added. BISS scrambling options can be activated to scramble a single stream or multiple program streams (BISSM).

The ASI input is bundled into a TS (Transport Stream). The modulated (L-band) signal is then forwarded to a multiplexer, in this multiplexer the following options can be added:

- 10MHz reference (we refer to the section Options on page “xiii” for ordering information);
- +24V or 48V DC Power (we refer to the section Options “xiii” for ordering information).

After multiplexing the modulated L- band signal is available on the MOD OUT and monitoring MON OUT connectors.

Test Generator

The modulator is equipped with an ASI test generator. This generator can be used to simulate data.

Option IF OUT

Optionally the L-band modulator can be replaced by an IF-band modulator. When this option is available the IF signal is directly available on the output of the modem as IF OUT. In this case the multiplexer is not used.



This option is not shown in the block diagram.

For ordering information we refer to the section Options on page ‘xiii’.

5 HOW TO MANAGE

This section explains how the AZ110 Broadcast Satellite Modulator with ASI interface can be configured and how the parameters in the device are ordered and managed according to your needs.

The device can be managed using one of the following physical interfaces:

- The front panel;
- The Ethernet port;
- The serial port.

When the management is done using the Ethernet the Graphical User Interface is used to display the parameters on a management PC.

The following protocols are used to perform the communication between the management PC and the device.

- Remote Monitoring and Control Protocol
For more information, refer to section; 5.5.1
- Simple Network Management Protocol
For more information, refer to section 5.5.2.

5.1 Menu Tree

The variables that can be set in the device are set using the front panel buttons, or using the user interface.

The variables are structured in a logical way and presented in a menu tree.

The menu tree shows the organisation of the parameters in the device.

The menu structure of the GUI and the front panel are identical except for the **User Menu** which is programmable via the front panel.

Programming the User Menu is described in Appendix B of this document.

The details on the menu tree and the variables in the menu tree are described in the reference manual of this device.

AZ110		Broadcast Satellite Modulator with ASI interface	
Unit			
	Setup		
		Serial port settings	
		Ethernet settings	
		Display settings	
		SNMP settings	
		Web interface	
	Control		
		AES	
	Monitor		
	Architecture		
	Diagnostics		
Modulator			
	Control		
		Main	
		Baseband Framing	
		PHY	
		AES	
	Monitor		
	Actionkeys		
	Test		
		Packets	
		Frames	
	Converter		
Config			

Table 2 - Menu Tree of the AZ110 with ASI Interface

5.2 Front Panel Handling

5.2.1 Display

The first line of the display contains your current location in the menu tree of the modulator. The second line contains the parameter name and its value.

```
AZ110/unit/Setup
Device mode: Normal
```

5.2.2 Keypad



Figure 13 - Keypad Panel

With the 16 front panel keys you can navigate in the menus and change parameters.

Press “?” to open a pop-up help screen with more information on the selected item. Press **ESC** to exit this help screen.

Press “←” and “→” to highlight a menu item. Press **OK** to go one level deeper in the menu tree. When you arrive at the desired level, press **OK** again to select the desired item. Press **ESC** to move back up in the menu tree.

Press **CLR** to clear the numerical input fields.

Press the digit keys **0** up to **9** to enter numerical values. When you need to enter hexadecimal characters, press the **A - F** keys multiple times to bring up the desired hexadecimal character.

5.2.2.1 Read / Set the Device IP Address

The front panel can be used to set or read out the device IP address.

Open the following menu on the front panel:

```
Unit >> Setup >> Ethernet Settings >> Device IP address
Device IP Address: 10.0.0.1
```

5.2.2.2 For example change the Front Panel Screensaver

The front panel screensaver is useful to identify a number of units if you have more than one unit.

Activate the screensaver in the following menu:

```
AZ110 >>Unit>>Setup>>Display settings
```

- Enter the screensaver delay;
- Enter the screensaver message (for example Channel 01 Modulator 01).

Once the screensaver delay is reached without any key action on the front panel a message is displayed as follows.

```
AZ110
Channel 01      Modulator 01
```

5.2.2.3 How to Log in as Expert

Proceed as follows to log in as Expert:

- Open the following menu on the front panel

```
Unit >> Setup >> Device: Normal
```

- Press OK

```
Normal <=Expert>
```

- Press OK

```
Enter Password: * * *
```

- Enter the number of the device
- Press OK to confirm.

5.2.3 LEDs

The LEDs provide a basic status of the device.

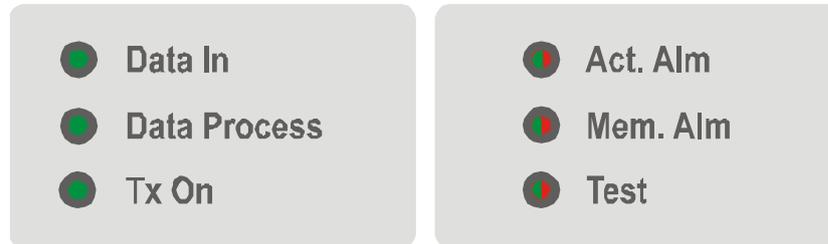


Figure 14- Front Panel LEDs

Data In:	green	At least 1 data input is active and valid
Data Process:	green	Data processed prior to transmission (rate adaptation, etc.)
Tx on:	green	Transmit on
Act. Alm:	red	Actual alarm(s) present
Mem. Alm:	red	Memorised alarm(s) present
Test:	orange	On if the modulator is in test mode

5.3 Management Using the Serial Interface

5.3.1 Cabling

The cable to connect via the serial interface must comply with the pin configurations as described in section 3.2.1.

5.3.2 Serial Port Settings

The modulator is set to RS485 by factory default. When you prefer RS232, choose:

AZ110 >> Unit >> Setup >> Serial port settings

➤ Select RS232 as serial interface type.

Default serial port settings:

- Serial interface type RS485
- Device RMCP address 100
- Serial baud rate 115200

Alternatively, use an RS232 to RS485 converter to connect the serial communication port of a PC to the Monitor and Control port. Pin layout on the converter can differ depending on the brand and type of the converter. Check the user manual of the converter to select an appropriate cable.

When using RS232, use a null-modem cable with the following layout:

PC	Demodulator	Signal
9 Pin D-types	9 Pin D-types	
2	3	TxD
3	2	RxD
5	5	GND

Table 3 - RS232 Cable Pin Layout

5.3.3 Serial Interface and PortSettings

The port settings for this serial interface are:

- Asynchronous data transfer;
- 1 start bit (logic "0");
- 7 data bits (LSB first on line);
- Even parity;
- 1 stop bit (logic "1");
- 4800, 9600, 19200, 38400, 57600 or 115200 baud.

To set the serial baud rate choose:

AZ110 >> Unit >> Setup >> Serial port settings.

There is no flow control on the serial interface. Apart from correctly formatted messages, the only significant character here is the SYNC-character (value 16 hex). The device sends this character to indicate that it is busy executing the command and preparing the response. This prevents other devices from taking control of the bus if the response cannot be given immediately.



The Remote Monitoring and Control Protocol is used over the serial interface.

5.4 Management Using the Ethernet Interface

5.4.1 Cabling

Use a crossed network cable for a direct connection between the Ethernet port of the modulator to the Ethernet port of a computer. In case connection to the modulator is done via a hub or switch, straight network cables are used.

5.4.2 Settings

The AzimuthError! Unknown document property name. platform is equipped with a powerful and easy-to-use graphical user interface (GUI) that allows you to remotely monitor and control your equipment through a web browser.

To use the web interface, adapt the TCP/IP properties of the computer and manually set an IP address that is within the range of the device IP address. For example: take IP address 10.0.0.2 on the computer and 10.0.0.1 on the device. Make sure that no pop-up blockers or firewall are active!

To adapt the TCP/IP properties on a typical Windows computer:

- Choose **Start > Connect To > Show all connections**;
- Right-click **Local Area Connection**;
- Click **Properties**;
- Scroll down and click **Internet Protocol (TCP/IP)**;
- Click **Properties**;
- Choose **Use the following IP address**;
- Enter the following data:
 - **IP address**, for example: 10.0.0.2;
 - **Subnet mask**, for example: 255.255.255.0.

5.5 Protocols used to Monitor and Control the Device

There are two protocols that can be used to manage Newtec devices.

- Remote Monitor and Control Protocol (RMCP);
- Simple Network Management Protocol (SNMP).

5.5.1 Remote Monitor and Control Protocol (RMCP)

This is possible via the serial interface (RS232/485) or over Ethernet. The commands are described in the Reference Manual of the device.



The **RMCP general manual v1.6** explains how Newtec devices can be remotely monitored and controlled via the serial port or via Ethernet.

This manual is delivered on CD-ROM together with the device.

5.5.1.1 RMCP over Ethernet

RMCP commands are sent towards the modulator via the Ethernet interface. The commands are sent as data in a TCP/IP stream. The used socket number is 5933. When RMCP commands are sent over Ethernet, the receiving device ignores the RMCP address of the device present in an RMCP command.

The Ethernet interface needs to be configured. Navigate to the following menu to configure the Ethernet settings:

AZ110 >> Unit >> Setup >> Ethernet settings

Device IP address:	192.168.255.166
Device IP mask:	255.255.255.0
Default gateway:	192.168.255.001
Transport protocol:	TCP+UDP
Device MAC address:	00:06:39:00:9A:71

Figure 15 - Ethernet Settings

5.5.1.2 Protocol Functioning

The control unit sends a “request” message to a device identified by its unique address. The addressed device interprets the message, performs the requested action and sends a “response” message back.

The receiving device rejects all messages with transmission errors without any further action.

The addressed device responds to all correct formatted messages – except for some special system messages – with an acknowledge message. Only in a few restricted cases does the device not respond to a request from the control unit. This is, for example, the case when a general device reset is requested.

Correctly received messages which the device cannot handle are refused via a no-acknowledge “error” message. This message contains the reason why the message is rejected.

A device never sends messages on its own initiative. It only responds to a request from the control unit. The total transmit time of a complete message may not exceed 250ms. If the message is not completed within this time, it is discarded.

5.5.2 Simple Network Management Protocol (SNMP)



The SNMP manual explains how the Newtec device can be managed using SNMP. of this device. This manual is delivered on CD-ROM together with the device.

6 GRAPHICAL USER INTERFACE (GUI)

6.1 Introduction

The graphical user interface (GUI) is a web application that gives remote access to the device and allows the client to remotely:

- Configure the device after physical installation;
- Monitor the status;
- Check past events;
- Adjust parameter settings;
- Change or create configurations.



The GUI is optimized for displays with a screen resolution of 1024 x 768 or higher.

6.2 Opening the GUI

Proceed as follows to open the GUI on your computer:

1. Open a web browser on your computer.



Newtec advises to use Firefox 3 (and higher) or Google Chrome as standard browser, but the GUI can also run on other compatible browsers like Internet Explorer 7, Safari, ...

2. Type the IP address of your device in the address bar of the browser. Do not forget to type **http://** in front of the IP address;
3. Press **Enter**;
4. If the user profile guest is:
 - a. Not disabled and not password protected, you are automatically logged in as a guest;
 - b. Disabled and/or password protected, you see a User identification dialog box. Enter your username and password.



The image shows a 'User identification' dialog box with a light blue background. At the top, it says 'User identification'. Below that, it says 'Please enter your username and password, then click Login.' There are two input fields: 'Username:' and 'Password:'. At the bottom right, there are two buttons: 'Login' and 'Cancel'.

Figure 16 – User Identification

5. Click **Login**;

The three possible user profiles are:

- **Guest:** The user has read-only access to the typical configuration and monitoring options.;
- **Normal:** The user has read-write access to the typical configuration options. The user can load a configuration but cannot save a configuration. The user can execute and see the commands of a custom action;
- **Expert:** The user has read-write access to all configuration options. You can load and save a configuration. The expert user can execute and create custom actions.

6.3 Main Windows of the GUI

When the GUI application opens five areas are visible.

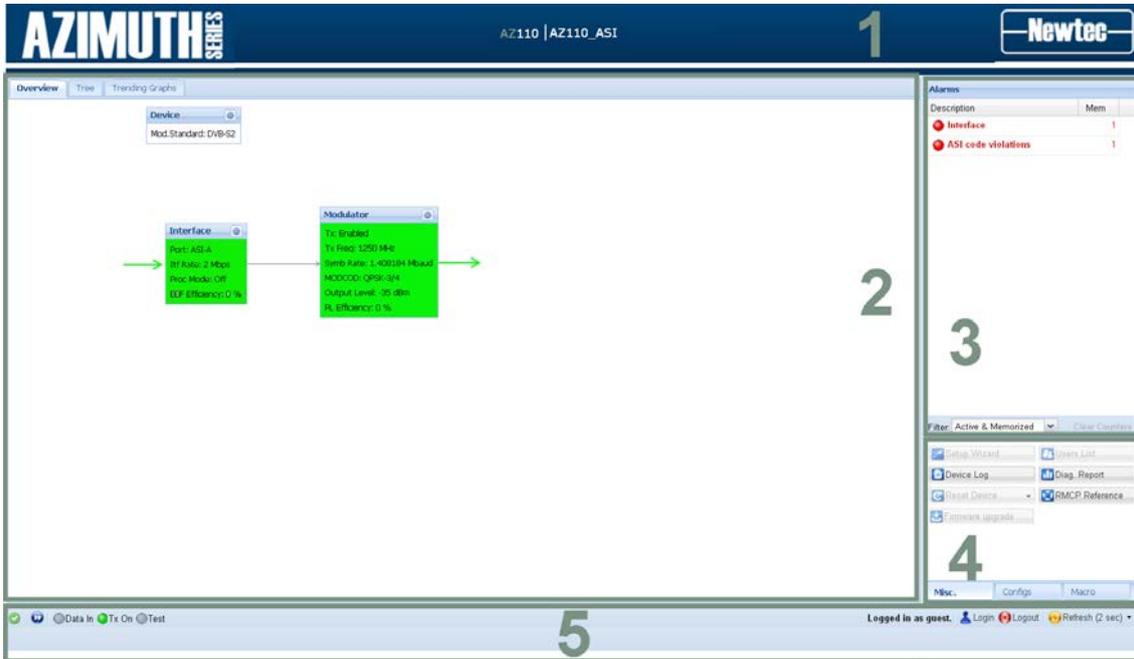


Figure 17 – GUI

The table below gives an overview of the areas of the GUI (see Figure 17).

Area No.	Area
1	Banner
2	Central stage window
3	Alarm list window
4	Function controls window
5	Status bar

Table 4 – General Monitor and Control Screen Areas

6.3.1 Banner

The banner contains an editable text field right of the product name. The user can use this text field to assign a unique identifier to the device. Double-click this text to edit the content.



The text displayed in the editable text field of the banner is the same as the screensaver message.

6.3.2 Central Stage Window

The central stage window contains by default three tabs:

- Overview;
- Tree;
- Trending Graphs.



Figure 18 – Default Tabs Central Stage Window

6.3.2.1 Overview Tab

The **Overview** tab contains a schematic representation of the signal flow in the device. The signal passes different functional blocks and each block contains a function name, basic settings and counters. The blocks are connected with arrows that illustrate the process flow.

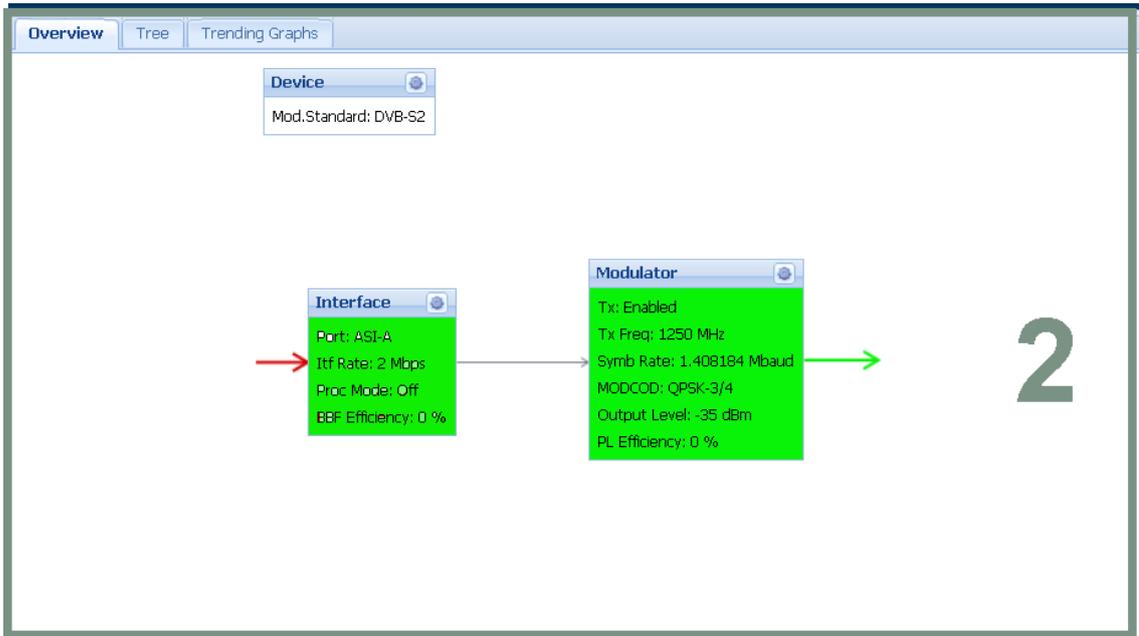


Figure 19 – Example of a Functional Overview

For every functional block of the device the following information is displayed:

- Arrows from and towards the functional block which indicates the signal flow;
- Relevant parameters;
- A link at the right top corner. Clicking this link opens the detailed view of that specific functional block.

The functional blocks and diagram arrows can change colour (red, yellow, green or grey) based on the current condition.

The following conditions can occur:

- **Error:** The block and/or arrow has a red colour. There is an alarm, at least one counter indicates an error .
- **Warning:** The block and/or arrow has a yellow colour. At least one counter does not change as expected.
- **OK & IN-USE:** The block and/or arrow has a green colour. This block behaves normal.
- **IDLE:** The block and/or arrow has a grey colour. This functional block is currently not in use.

Click the detailed view icon () on top of the functional block to open the detailed overview page of this block. A new tab containing the function details opens in the central stage area.



When a value changes in the central stage area it briefly gets a yellow background.

6.3.2.2 Tree Tab

The tree tab shows all device variables arranged in a tree structure. This tree structure is consistent with the structure of the menus accessed via the front panel. Only users with the expert profile can access and modify all variables in the menu pages of the tree structure. Other user profiles do not see all variables.



The tree structure in this GUI is equivalent with the tree structure in the previous user interface version for this device.

The tree structure contains different types of icons.

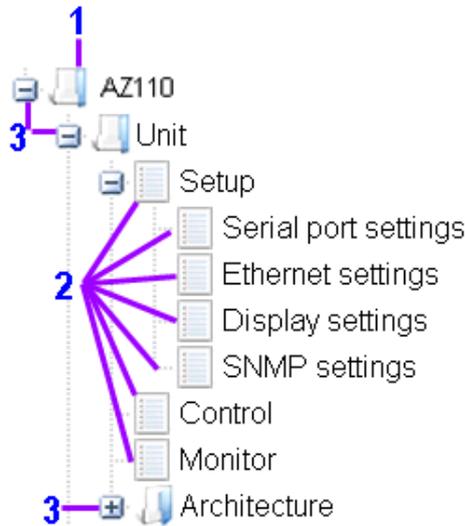


Figure 20 – Tree Navigation Icons

The following table describes the properties of each icon type in the tree structure (see Figure 20):

Icon type	Description
1	The folder icon indicates a node that is for navigation only. It does not have a corresponding parameter page.
2	The form icon indicates that the tree structure contains a parameter page on that level with editable parameters.
3	The expand icon (+) indicates that the tree structure can expand one or more levels (branches) below. Lower levels can contain other folders and/or parameter pages. The collapse icon (-) collapses the selected tree branch.

Table 5 - Tree navigation Icon Description

To navigate more easily in the tree structure, expand or collapse a branch of the tree or the complete tree with the buttons in the navigation bar above the tree.

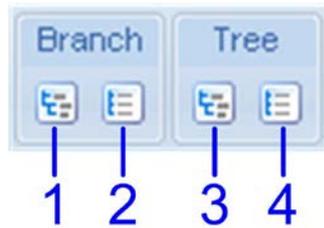


Figure 21 – Tree Navigation Bar

The following table describes the function of each button in the tree navigation bar (Refer to Figure 21):

Button No.	Button function	Description
1	Expand	Expands the selected branch of the tree structure.
2	Collapse	Collapses the selected branch of the tree structure.
3	Expand All	Expands the complete tree structure.
4	Collapse All	Collapses the complete tree structure.

Table 6 – Tree Navigation Bar Buttons

6.3.2.3 Trending Graphs Tab

This tab shows an overview of different graphs that can be used to monitor the device.

The following graphs can be displayed:

- Throughput
- Efficiency



Figure 22 - Trending Graphs

6.3.3 Alarm Window

The alarm window shows the alarms generated by the device. By default only active or memorized alarms that have not been masked by the user are visible. Alarms are sorted first by their activity and then by their severity (from critical alarms to warnings).

It is possible to apply filters to manage the number of alarms shown.

Description	Mem
General device	4
Interface	5
Reference clock	2
Ethernet IfA Link	1
ASI Rx 1 Input	1
Baseband frame sync	2
	2

Filter: Active & Memorized

Clear Counters

Figure 23 – Alarm Window

The alarm window contains the following information and controls (refer to Figure 23):

Area No.	Description
1	This area displays the alarm name.
2	This area displays the number of times an alarm was generated since it was last cleared.
3	This area contains drop-down list boxes in which you can select a filter to apply. You can filter on the alarm activity: <ul style="list-style-type: none">• Active & Memorized alarms;• Masked & Forced alarms;• All Alarms;
4	Clear the number of times an alarm was generated since it was last cleared. Active alarms can be cleared but the counter will still show one.

Table 7 – Alarm window areas

6.3.4 Function Control Window

The function control window contains three tabs:

- Miscellaneous (Misc.);
- Configs;
- Macro.



Figure 24 –Tabs Function Control Window

6.3.4.1 Miscellaneous Tab

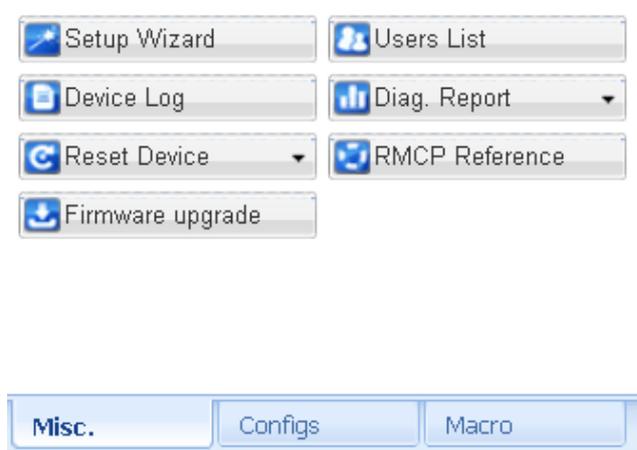


Figure 25 - Miscellaneous Tab

The miscellaneous tab (Misc.) contains seven buttons that allow to perform tasks, consult information or set access or interaction parameters. The following table describes briefly the function of each button:

Button	Description
Setup Wizard	This button opens an easy to use wizard dialog window which provides guidance during (initial) setup of the device. The wizard only displays relevant parameters for the connection to configure. Refer to section 6.4.3.
Device Log	This button is used to consult an event list. Events are e.g. alarms being set or cleared, cable disconnections.
Reset Device	The drop-down menu behind this button allows resetting the device. Different reset types are possible: <ul style="list-style-type: none"> • Soft: Resets the software; • Hard: Resets the software and the hardware; • Config: Clears the configuration of the device. The flash memory is empty but the management parameters are kept e.g. IP address. This can only be performed by expert user profiles. Refer to section 6.4.4
Firmware upgrade	Clicking this button allows to browse to a zip-file containing a firmware update. The application will automatically upgrade its firmware using this zip-file. Refer to section
Users List	This button opens a new Users List tab in the central stage region. It displays all users and makes it possible to change the user attributes (expert user profile is needed). It is also possible to add or remove users. Refer to section .6.4.6
Diagnostic Report	With this button different types of diagnostic reports can be generated: <ul style="list-style-type: none"> • Basic: The basic rapport shows all configuration parameters; • Full: The full rapport shows all configuration parameters and all debugging parameters. Refer to section .6.4.8
RMCP Reference	This button opens an overview of the RMCP commands the software supports on the device.

Table 8 – Miscellaneous Function Controls

6.3.4.2 Configuration Tab



Figure 26 - Configuration Function Controls Tab



After power up the boot configuration (the first configuration) is loaded on the device..

The icons behind the configuration names support to:

- **Save** the current configuration to persistent memory (). We refer also to the example;



If a configuration is not saved to persistent memory it will be lost when the device powers down.

- **Load** a stored configuration ();

The Import and Export buttons below the list of different configurations support to:

- **Import** configurations from a “.cfg” file from the local PC. Refer to paragraph 6.4.7;
- **Export** all saved configurations to a “.cfg” file to a local PC.

It is possible to **Edit** the name of an existing configuration by double clicking on the configuration name that must be renamed.

Example:

Suppose to save the current configuration of the device under the third configuration slot as Newtec_example.

1. Click the Configuration tab;
2. Click the Save button next to the third configuration slot;
3. Double-click the Name field of the third configuration slot. You can now enter a new name for the configuration;
4. Type Newtec_example and click outside the text field.

6.3.4.3 Macro Tab



Figure 27 - Custom Function Controls Tab

Use the buttons on the **Macro** tab to store sets of RMCP-commands. Manually insert and assign up to twenty RMCP-commands separated by a “;” to one button or change stored RMCP-command sets via the **Edit** option. Click the arrow next to the button to open the Edit option.



An overview of all allowed RMCP-commands can be found in the reference manual of your device.

6.3.5 Status Bar



The status bar informs on:

- Ongoing interaction with the device via the status field on the left;
- The current user profile.

Log in to or log out from the GUI of the device via the buttons in the status bar. When you click the:

- **Logout** button, the current user is logged out.
- **Login** button, to open the **User identification** dialog box.
- **Refresh** button to refresh the status of the device. Click the arrow to configure the time interval of refreshing the status of the device.

6.4 Configuring the Device via the GUI

6.4.1 Introduction

Configuration of the device is done by changing parameters. Accessing and editing the device parameters can be done via multiple paths in the GUI.

- Common used parameters are set using the functional blocks on the overview tab.
- Non-commonly used parameters can be set on the parameter pages of the tree structure. Experienced users of the device can set all parameters using the tree structure parameter pages.
- A configuration wizard is built into the GUI. This wizard is very useful for non-experienced users. It guides the user step by step through the configuration and gives extra information. The wizard can be accessed through the **Wizard** button on the **Miscellaneous** tab of the function controls.



It is strongly advised to use the wizard to configure the device parameters the first time the device is operated after physical installation.

6.4.2 Parameters in the GUI

6.4.2.1 Parameter Interface Types

The GUI contains different types of parameter dialog boxes to set up all parameters of a configuration.

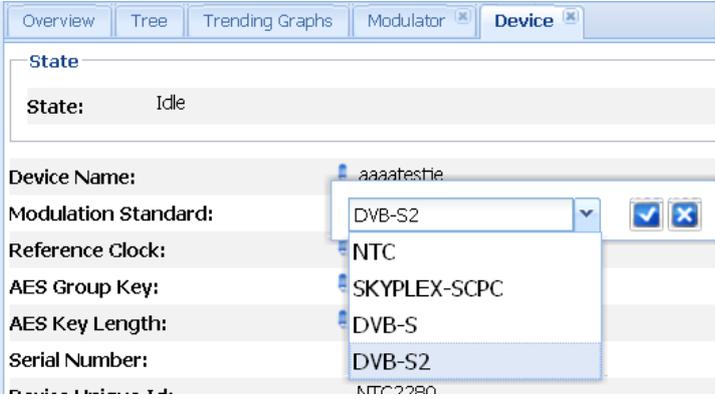
Dialog box type	Example																									
Drop-down list box																										
Data field	<p>Output frequency: <input type="text" value="1250.000000"/> MHz <input checked="" type="checkbox"/> <input type="checkbox"/></p>																									
Checkbox	<p>Tx Enabled: <input type="button" value="Disabled"/> <input checked="" type="checkbox"/> Enabled</p>																									
Table	<table border="1"> <thead> <tr> <th>Active</th> <th>Dest IP address</th> <th>IP netmask</th> <th>OUT Stream Id</th> <th>Packing delay</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> Enabled</td> <td>0.0.0.0</td> <td>0.0.0.0</td> <td>1</td> <td>10 ms</td> </tr> <tr> <td><input type="checkbox"/> Disabled</td> <td>0.0.0.0</td> <td></td> <td>1</td> <td>10 ms</td> </tr> <tr> <td><input type="checkbox"/> Disabled</td> <td>0.0.0.0</td> <td></td> <td>1</td> <td>10 ms</td> </tr> <tr> <td><input type="checkbox"/> Disabled</td> <td>0.0.0.0</td> <td>0.0.0.0</td> <td>1</td> <td>10 ms</td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Save <input type="checkbox"/> Cancel</p>	Active	Dest IP address	IP netmask	OUT Stream Id	Packing delay	<input checked="" type="checkbox"/> Enabled	0.0.0.0	0.0.0.0	1	10 ms	<input type="checkbox"/> Disabled	0.0.0.0		1	10 ms	<input type="checkbox"/> Disabled	0.0.0.0		1	10 ms	<input type="checkbox"/> Disabled	0.0.0.0	0.0.0.0	1	10 ms
Active	Dest IP address	IP netmask	OUT Stream Id	Packing delay																						
<input checked="" type="checkbox"/> Enabled	0.0.0.0	0.0.0.0	1	10 ms																						
<input type="checkbox"/> Disabled	0.0.0.0		1	10 ms																						
<input type="checkbox"/> Disabled	0.0.0.0		1	10 ms																						
<input type="checkbox"/> Disabled	0.0.0.0	0.0.0.0	1	10 ms																						
Functional group	<p>State</p> <p>State: OK</p> <p>Reason: Tx On</p>																									

Table 9 – Parameter Interface Type Examples



If you want to change one of the parameters in a functional group check and/or adjust all parameters in that group.



In the dialog box type table you can move table columns to another position in the table.

Depending on the parameter interface type you must confirm or reject the selected or inserted value for the parameter by clicking one of the following buttons:

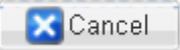
Button	Function
 or 	Save the parameter value.
 or 	Do not save the parameter value.

Table 10 – Parameter Save and Cancel Buttons



When a parameter value changes in the GUI, it briefly gets a yellow background.

6.4.2.2 Applicable Parameters

The number of parameters you see in the tree view and the detailed view of a block depends on your user profile and the current device configuration.



Parameter changes via the front panel or via the management interface are also visible in the GUI .

6.4.2.3 Invalid Values

The GUI does not allow the implementation of invalid values. While typing a value this value is validated. The user interface has several features that help to insert valid parameters:

- Place the mouse cursor above a field to be adjusted, the acceptable range is displayed in a tooltip;
- When typing an invalid value for a parameter, the edges of the parameter field turn red and a tooltip displays the reason why the value is invalid ;
- It is not possible to save values outside the defined ranges for the device.

6.4.2.4 Changing Parameters

To change parameters log in as administrator.

Use one of the following methods to change the parameters.

- Using the editable parameters in the functional blocks (used to edit the common used functions);
- Using the tree structure parameter pages.

To create a new configuration, the easiest way is to use the Wizard. The Wizard is only applicable for users with an expert profile. It is highly recommended to perform a configuration reset to clear the existing configuration before using the Wizard.

Experienced users can adjust parameters in the tree tab.

Proceed as follows to adjust parameters:

1. Click the **Overview** tab or the **Tree** tab;
2. Two possibilities:
 - The **Overview** tab, click the detailed view icon () of the functional block that contains the parameter(s) to be adjusted;
 - The **Tree** tab, navigate to the parameter page that contains the parameter(s) to be adjusted;
3. Click the **Editable** icon () next to the parameter;
4. Insert or choose the new parameter value;
5. Save the parameter value;
6. Edit more parameters in the same way if needed.
7. Save the new configuration.

6.4.3 Setup Wizard

The wizard helps to setup the device for the first time.

To start up the wizard proceed as follows:

- Click **Misc. > Wizards**

The following screens are displayed:



Figure 28 - Initializing Broadcast Setup Wizard

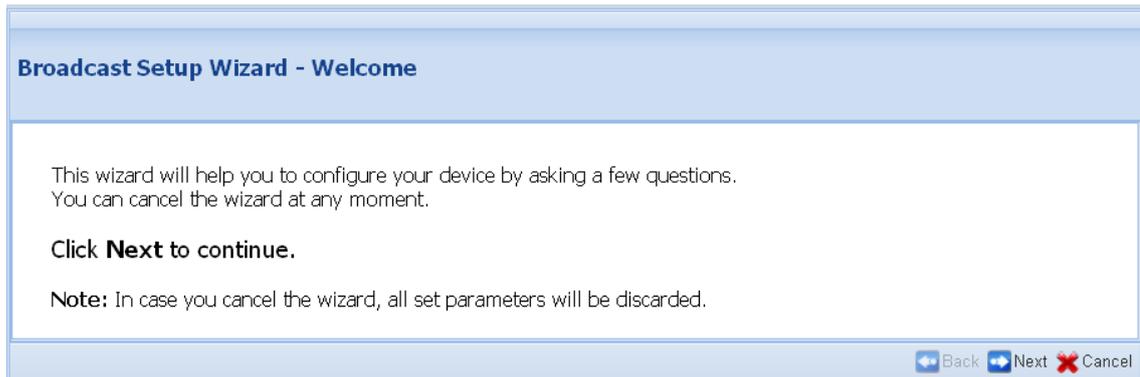


Figure 29 - Welcome

Complete the different steps of the wizard according to the required network settings. Refer to A for a complete example.

6.4.4 Reset Device

The device can be resetted when needed. A reset of a device can only be performed by expert user profiles.

The drop-down menu behind the **Reset Device** button



allows resetting the device.

Different reset types are possible:

- **Soft:** Resets the software;
- **Hard:** Resets the software and the hardware;
Perform a hardware reset after upgrading the capabilities of your device.
- **Config:** Clears the configuration of the device.
The flash memory is empty but the management parameters are kept e.g. IP address.
Perform a config reset before a configuring the device using the wizard.

6.4.5 Firmware Upgrade Procedure

To perform a firmware update do the following:

- Click **Misc.** tab;

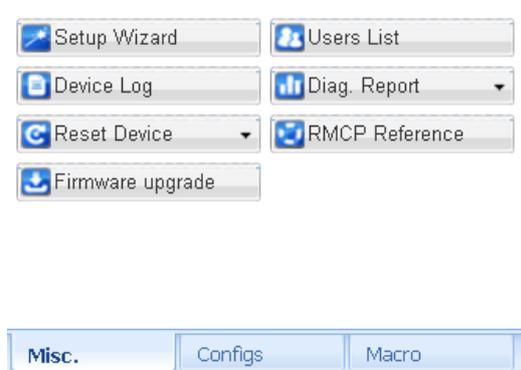


Figure 30 - Misc. Tab

- Click **Firmware upgrade**;
- Browse to the location where zip-file is stored;
- Select the zip-file;
- Click open;

The application will automatically upgrade its firmware using this zip-file.

6.4.6 Access Rights of GUI Users

6.4.6.1 Introduction

Click the **Users List** button on the **Miscellaneous** tab, the **Users List** tab opens in the central stage window. To remove the tab from the central stage window, press the -icon in the right upper corner of the tab.

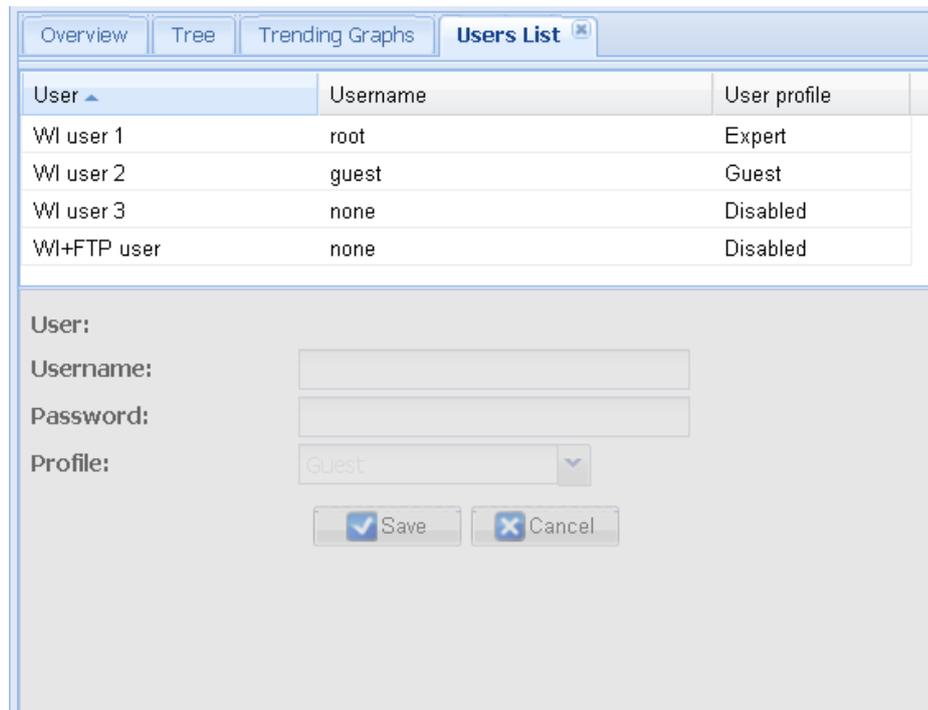


Figure 31 – Users List Tab

Four GUI user accounts with different access rights can be created. At least one user account with expert user profile must be defined. By default WI user 1 has username **root** and expert user profile.

Users with the user profile expert can:

- Change account passwords;
- Change the user profile for a user account (resulting in a change of the user's permissions).

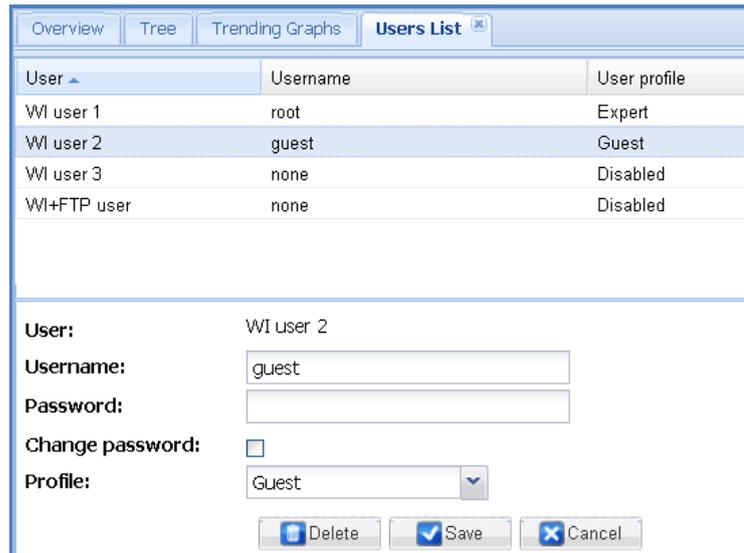


When the WI+FTP user is not defined or disabled, no password is required to connect to the ftp-server on the device.

6.4.6.2 Edit a User Account

Proceed as follows to create a new user account:

1. Click the **Users List** button on the **Miscellaneous** tab;
2. Select a user profile from the list.
The user properties fields can now be edited.



User	Username	User profile
WI user 1	root	Expert
WI user 2	guest	Guest
WI user 3	none	Disabled
WI+FTP user	none	Disabled

User: WI user 2

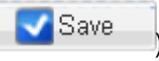
Username:

Password:

Change password:

Profile:

Figure 32 - Users List Tab with User Properties Fields

3. Type in the field:
 - **Username:** this is the username the user must use to log in. It is not allowed to duplicate user names.
 - **Password:** this is the password the user must use to log in.
4. Select the desired **Profile** from the drop-down list box;
 - **Guest:** the user has read-only access to the typical configuration and monitoring options;
 - **Normal:** The user has read-write access to the typical configuration options. The user can load a configuration but cannot save a configuration. The user can execute and see the commands of a custom action;
 - **Expert:** The user has read-write access to all configuration options. The user can load and save a configuration. The expert user can execute and create custom actions:
 - The **Save** button () if you want to save the user account;
 - The **Cancel** button () if you don't want to save the user account.

6.4.6.3 Disabling a User Account

Only users with the expert user profile can delete user accounts. If you delete a user account which is logged in from another session, its session is not cancelled but the user won't be able to log in again. A user cannot delete his own user account.

Proceed as follows to disable a user account:

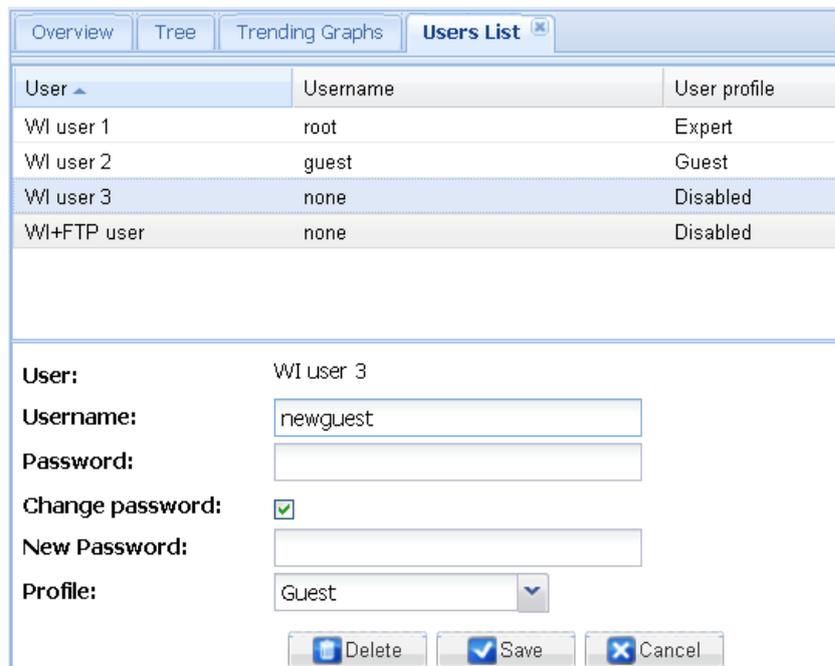
1. Click the **Users List** button on the **Miscellaneous** tab;
2. Select the user account you want to remove from the list;
3. Type in the **Password** field the password for the user account;
4. Click the **Delete** button ().

6.4.6.4 Change a User Account Password

A user can change the password of his own user account. Users with the expert profile can change the password of every user account provided. They know the current password of that user account.

Proceed as follows to change a user account password:

1. Click the **Users List** button on the **Miscellaneous** tab;
2. Select the user account for which to change the password;
3. Select the **Change password** checkbox.



User	Username	User profile
WI user 1	root	Expert
WI user 2	guest	Guest
WI user 3	none	Disabled
WI+FTP user	none	Disabled

User: WI user 3

Username:

Password:

Change password:

New Password:

Profile:

Figure 33 – New Password Field

4. Type in the field:
 - **Password:** the old user password;
 - **New password:** the new user password;
5. Click the **Save** button () to save the new password.

6.4.6.5 Change the User Profile of a User Account

Only users with the expert user profile can change the user profile for a user account. At least one user must contain the Expert profile. It is impossible to remove the last Expert user.

Proceed as follows to change the user profile for a user account:

1. Click the **Users List** button on the **Miscellaneous** tab;
2. Select the user account for which you want to change the user profile;
3. Type in the **Password** field the password for the user account;
4. Select a user profile from the **Profile** drop-down list box;

Click the **Save** button () to save the new user profile for the user account.

6.4.7 Copy a Configuration on a Different Device

It is possible to exchange a configuration between devices of the same product line (with the same capabilities and options) by exporting and importing configurations.

6.4.7.1 Exporting a Configuration

The possibility exists to export and store all 48 stored device configurations (a configuration set) as a ".cfg" file on a local computer.

Proceed as follows to export a configuration set:

1. Click the **Configs.** tab.
2. Click the **Export** button.
3. Browse to the location where to store the ".cfg" file (the browsing window depends on your browser configuration).
4. Click **Save**.

6.4.7.2 Importing a Configuration

The possibility exists to import all 48 device configurations as a “.cfg” file from a local computer.

Proceed as follows to import a configuration set:

1. Click the **Configs** Tab;
2. Click the **Import** button;
3. Browse to the location of the stored “.cfg” file;
4. Select the “.cfg” file and click **Open**. The stored configurations are loaded into the Newtec device.



You can load any of the 48 configurations to view or test them.

5. The user has two options:
 - The user can keep the imported configurations. In this case, the user must save the current imported configuration in bootconfiguration;
 - The user can decide to delete the imported configurations. In this case the user must restart the device. The device will start up using the same bootconfiguration as the previous start up.

6.4.8 Create a Diagnostics Report

Perform the following steps to create a diagnostics report.

- Click **Misc.** tab;
- Click **Diag. Report**



Figure 34 - Create a Diagnostic Report

Basic: The basic rapport shows all configuration parameters;

Full: The full rapport shows all configuration parameters and all debugging parameters.

- Click **Basic report** or **Full report**.

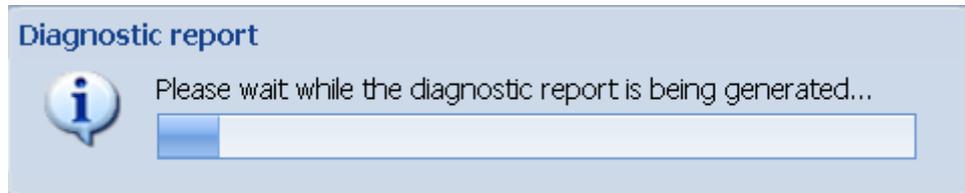


Figure 35 - Diagnostic Report Generation

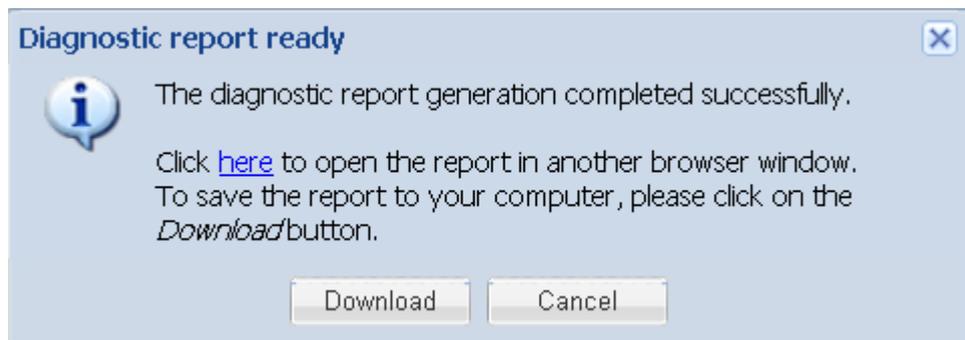


Figure 36 - Diagnostic Report Ready

- Click **download** to store the diagnostics report as an html file or click [here](#) to open the report in another browser window. The following screenshot displays an extract of a basic diagnostics report.

```
##### DIAGNOSTICS REPORT #####
AZ110/Unit/Setup
Device mode                1
RMCP version               v2.0
System time                08:45:56 18/11/2010
System uptime              0 day 23:07:35
User menu

AZ110/Unit/Setup/Serial port settings
Serial interf. type        RS485
Device RMCP address        100
Serial baudrate            115200
```

Figure 37 – Part Diagnostics Report

7 TECHNOLOGY

This chapter describes the DVB-S and DVB-S2 modulation standards and the processing modes of the AZ110 broadcast modulator.

7.1 Modulation Standards

7.1.1 DVB-S

DVB-S is the first generation of a standard for digital broadcasting via satellite.

DVB-S was designed to carry MPEG-2 transport streams over satellite. MPEG-2 transport streams typically carry one or several television or radio services multiplexed into a synchronous bit stream. All service components are divided in short packets of 188 bytes, each identified by a Program Identifier in the header of the packet.

Generic data can also be carried in MPEG transport streams, provided that it is first encapsulated in the transport stream packets. The most common way to encapsulate IP data into MPEG streams is called Multi Protocol Encapsulation (MPE) and is also specified by a DVB standard.

The total bit rate of the transport stream is constant but can typically be adjusted to match the needs of the satellite link. If the desired transport stream rate is greater than the sum of the carried components, null packets are added to the stream by the multiplexer or the modulator. This operation is called rate adaptation.

DVB-S uses QPSK modulation and concatenated error protection based on a convolutional Viterbi code and a shortened RS code.

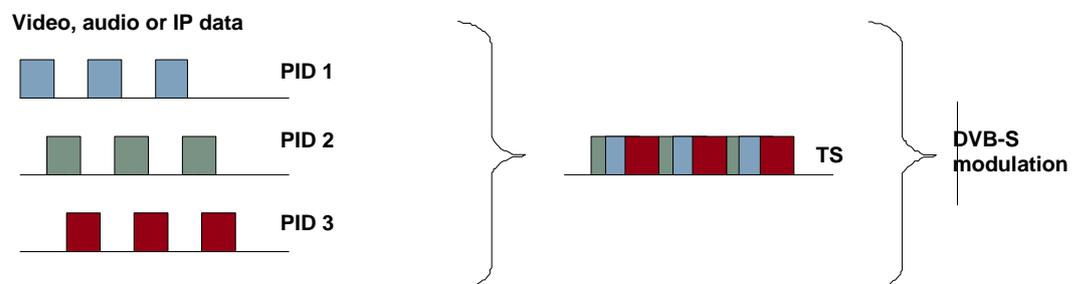


Figure 38- DVB-S Used to Carry Video, Audio and Data in an MPEG Transport Stream

7.1.2 DVB-DSNG

The DVB-DSNG standard is an extension to the DVB-S standard introduced for professional applications such as Digital Satellite News Gathering or television contribution services. DVB-DSNG introduces higher order modulation schemes (8PSK and 16QAM) and additional signal roll-off factors.

The transported signals are the same as for DVB-S.

7.1.3 DVB-S2

DVB-S2 is the second generation of the DVB standard for broadcast of satellite. It introduces new correction codes (BCH and LDPC) that are typically 30% more efficient than the codes used in DVB-S. The DVB-S2 standard also introduces a range of new features such as:

- Higher order modulation schemes 16 APSK and 32 APSK;
- Sharper roll-off factors;
- A new framing structure called “baseband frames”;
- The ability to vary the modulation parameters dynamically. This is used in modes called “Variable Coding and Modulation” and “Adaptive Coding and Modulation”;
- The ability to carry several signals on a single satellite carrier, without multiplexing in front of the modulator. This is called “multi-stream”;
- The ability to carry signals other than MPEG transport stream. This is called “Generic Stream”.

These features are further explained in the following sections:

7.1.3.1 DVB-S2 Framing Structure

DVB-S2 applies the error correction coding and the modulation to large frames of data called baseband frames. A DVB-S2 baseband frame is either 16200 bits (short frames) or 64800 bits (normal frames). The content of a frame can be a section of a transport stream, or any type of data, framed or unframed (Generic Stream).

Note that the DVB-S2 standard specifies how to encapsulate transport streams into baseband frames, but not how to encapsulate IP data into baseband frames.

Newtec has developed a proprietary encapsulation format called XPE (Extended Performance Encapsulation), which is much more efficient than MPE.

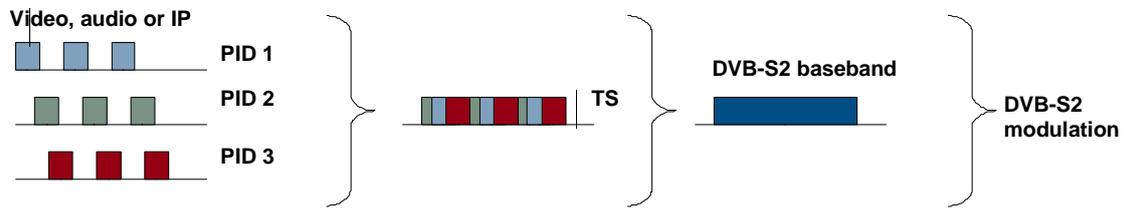


Figure 39 - Transport Stream Carried over DVB-S2

7.1.3.2 DVB-S2 Multi-Stream

A unique feature of DVB-S2 is the ability to carry different transport streams and/or generic streams into separate baseband frames, on the same satellite carrier. Each baseband frame is identified with an Input Stream Identifier. A sequence of DVB-S2 baseband frames with the same ISI number is called a DVB-S2 stream. A satellite carrier that transports several DVB-S2 streams is said to operate in Multi-stream mode.

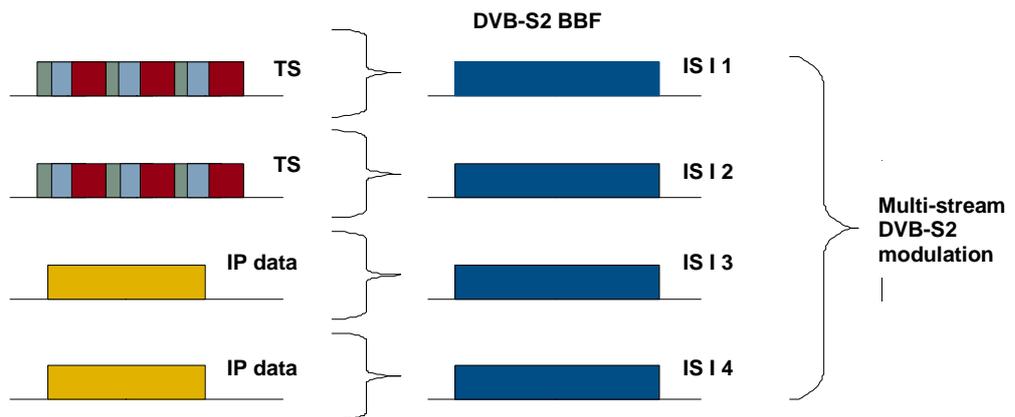


Figure 40 - DVB-S2 - Multi-Stream

7.1.3.3 DVB-S2 CCM, VCM and ACM

In DVB-S2 each baseband frame can be modulated with different error correction and modulation parameters (in short, ModCod, for example QPSK 4/5). A DVB-S2 modulator is capable of detecting these parameters on the fly, without losing synchronization from one frame to the next.

CCM

When the same modulation and coding is used for all frames of the DVB-S2 carrier, the mode of operation is called CCM (Constant Coding and Modulation).

A DVB-S2 CCM uplink signal must be dimensioned according to the smallest receiving station and the higher possible signal fading, to ensure adequate signal availability in all receiving stations.

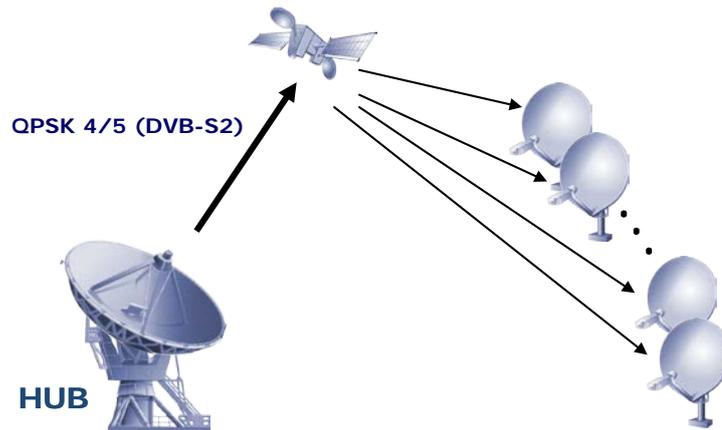


Figure 41 - CCM

VCM

Variable Coding and Modulation is a mode of operation that allows different modulation parameters to be applied to the different DVB-S2 streams of a multi-stream signal. If each of the stream is intended for a different receiving site, VCM allows optimizing the parameters of each stream to get the best performance for each receive station, instead of dimensioning the whole link according to the smallest station.

ACM

In Adaptive Coding and Modulation mode, the modulation parameters of the Baseband frames can vary over time, according to the instantaneous receiving conditions of the site where the frame will be received. In ACM there is a feedback mechanism between the demodulator and the modulator. This feedback mechanism dynamically tells the modulator which modulation parameters to use for each baseband frame. ACM allows operating satellite links with almost no margin, since the system adapts automatically to fading or interference conditions.

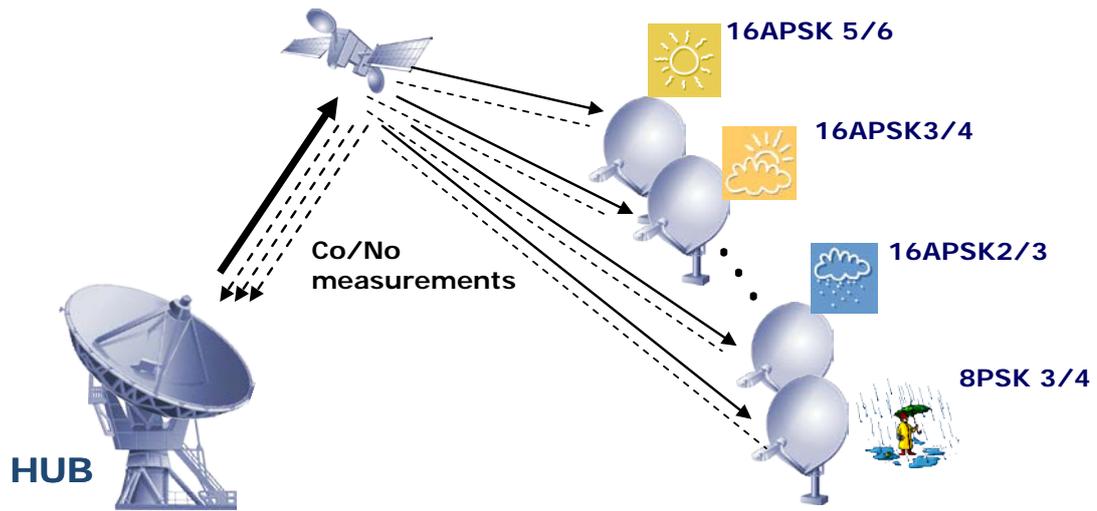


Figure 42- ACM

Newtec's implementation of ACM for applications is called FlexACM. It relies on a unique very accurate linear and non-linear distortion measurement technology in the demodulator (called NoDE) and advanced traffic shaping technologies in the hub.

7.2 Pilots in DVB-S2

7.2.1 What are Pilots

Pilots are unmodulated symbols grouped in blocks that can be added on the physical layer framing level.

7.2.2 Why are pilots used in DVB-S2

- Reduce the phase noise influence;
Phase noise is created by the frequency components around the main carrier frequency.
This noise contains components at many frequencies with randomly changing phase.
- Pilots are used to increase the reliability and the continuous receiver synchronization.

7.2.3 When are Pilots Used in DVB-S2

It is advised to use pilots in the following cases.

- In ACM mode (always on).
- When a noticeable amount of phase noise is present;
- At low data rates;
- When distortion is present on the signal for example due to non linearity.
- When using one of the following ModCods. (this is due to the ModCod structure)
 - 8-PSK 3/5 and 2/3
 - 16-APSK 3 /4
 - 32 APSK 3/5

7.3 Processing Mode

Newtec Azimuth devices can operate in several processing modes to carry transport streams and/or IP data.

These processing modes indicate how the incoming data or signal is interfaced to the modulator or demodulator and how it is transmitted over the modulated carrier.

The most important method to interface the signal to the modulation equipment is:

- **ASI(TS)**: The incoming/outgoing signal is an MPEG transport stream and is entering the modulator or leaving the demodulator via an ASI interface;

7.3.1 Processing Mode - ASI(TS) \leftrightarrow Air(TS)

A typical application for the “ASI(TS) \leftrightarrow Air(TS)” processing mode is a DTH application whereby a TV bouquet is distributed to many subscriber set-top-boxes.

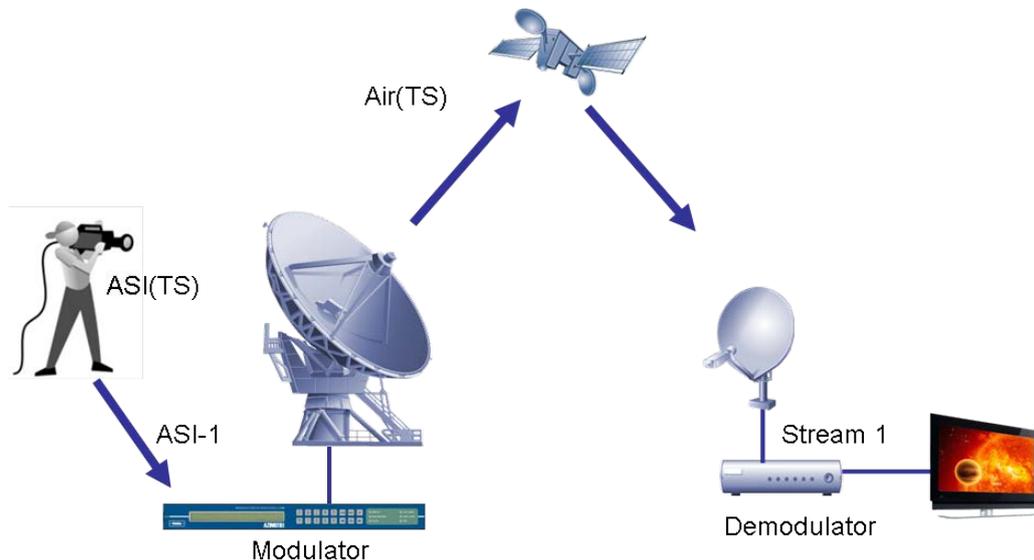


Figure 43 - Typical Application - DTH

- The ASI interface carries transport stream packets; the satellite interface also carries transport stream packets;
- Supports DVB-S and DVB-S2 single-stream modulation;
- In DVB-S mode, the transport stream packets are directly modulated towards the satellite link. In DVB-S2 mode, the transport stream packets are packed into DVB-S2 baseband frames before being modulated.

This single-stream processing mode allows transport stream packets to be forwarded between one of the ASI interfaces and the satellite interface. The other ASI interface can only be used for redundancy (future release), or for duplicating the outgoing transport stream.

In this processing mode, the system supports various manipulations to the transport stream, such as:

- Rate limitation;
- Rate adaptation with or without null-packet stuffing;
- Conversion of 204 bytes MPEG frames to 188 bytes MPEG frames.

8 FEATURES

8.1 Rate Adaptation

In principle a one to one relationship exists between the ASI Interface bit rate and the symbol rate of the modulator. With rate adaptation this is no longer true. It is possible to set one variable independent of the other.

When activated, the on-board rate adapter will insert MPEG null packets as required to obtain a fixed transmit symbol clock, even if the net input transport rate is variable. It is necessary to explicitly allow for null packet dropping. The rate adapter will also adjust MPEG PCR time stamps as required by the MPEG specifications. The rate adapter buffer is operated at minimum delay, but can store more than 1000 packets for bursty input.

When the rate adapter is disabled, the modulator transmit clock will be slaved to the transport stream clock rate.

The monitoring output is fully regenerated and by default branched to the rate adapter input.

Navigate to:

AZ110 >> Modulator >> Control >> Interfaces >> Main

The parameter **MPEG framing** allows configuring the rate adapter.

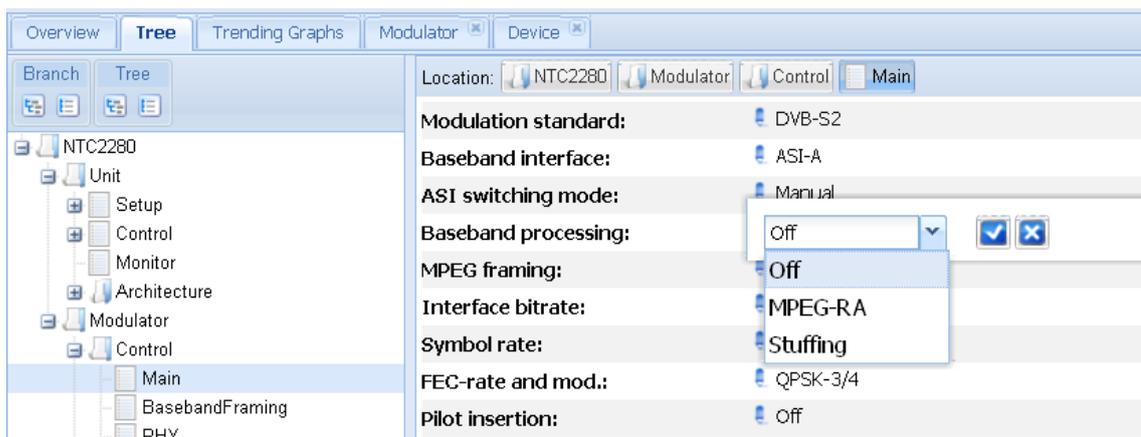


Figure 44- Rate Adaptation

8.2 BISS

The Basic Interoperable Scrambling System (BISS) is used on digital contribution circuits (satellite, DSNG, etc.) which uses MPEG compression, the DVB-S and DVB-S2 modulation schemes and the DVB Common Scrambling Algorithm with fixed keys.

BISS-E uses encrypted Session Keys and allows centrally-managed Conditional Access.

8.2.1 Overview

The **Basic Interoperable Scrambling System** (BISS) is based on the DVB-CSA specification [1], and the use of fixed clear keys called **Session Words** (SWs). BISS specification Mode 1, in Newtec Equipment, is used for DSNG.

BISS specification Mode E (BISS with Encrypted keys – referred to as BISS-E) introduces an additional mechanism to accept the insertion of **Encrypted Session Words** (ESWs) while, at the same time, conserving interoperability. This mechanism is backward compatible with BISS specification Mode 1.



The following definitions are used:

- **Scrambler** relates to the overall mechanisms required to meet the DVB-CSA specification;
- **Session Word (SW)** relates to the word assigned during a transmission by the Management Centre;
- **Unit** relates to the Newtec Equipment;
- **Management Centre** refers to an organization controlling or managing the conditional access system;
- **Decryption function** refers to a logical function used to decrypt the Encrypted Session Words, with the help of a key;
- **Interoperable function** refers to a decryption function that is embedded in all units containing BISS functionality.

8.2.2 Security Approach

To control access to the transmission, the DSNG model requires the direct entry of a Session Word at the transmitter and receiver. The sender and receiver(s) of the transmission share the session word, such that only the intended parties will receive the transmission. This is outlined as follows:

1. The Session Word is entered at the DSNG unit in the field, or at the transmitting earth station;
2. The Session Word is entered at the receiving IRDs;
3. If the Session Words are the same, then the IRDs are able to decrypt the broadcast;
4. If the Session Words are different, then the broadcast is not received.

The security requirements for fixed contribution systems are somewhat different to the DSNG model. The secure exchange of session words is fundamental to such systems and is achievable by encrypting them.

8.2.3 Modes of Operation

The Newtec Scrambler supports the following three modes of operation:

- **Mode 0:** No scrambling;
- **Mode 1:** All components are scrambled with a fixed **Control Word (CW)**, derived from a clear **Session Word (SW)**;
- **Mode E:** All components are scrambled by a fixed CW, derived from an **Encrypted Session Word (ESW)**.

The scrambling mechanism, as defined in the DVB-CSA specification, is applied at the Transport level only.

A **Conditional Access Table (CAT)** is present in the multiplex for BISS Mode 1 and BISS-E, although the table shall be empty as no **Entitlement Management Message (EMM)** stream will be present.

For BISS Mode 0 the Scrambler disables the scrambling operation. In this mode, there will be no *CA_descriptor* in the **Programme Map Table (PMT)** and no **Entitlement Control Message (ECM)** stream. The *Transport_Scrambling_Control* bits of the Transport Packets will be set to "00".



A scrambler supports a number of modes of operation according to a specific hierarchy. The Newtec Scrambler provides support for Mode E and therefore also supports Modes 0 and 1.

8.2.3.1 BISS Mode 1

This mode has been specifically designed for DSNG applications, fly-away operations, emergency situations, etc. It can also be used as a fall-back solution while using the complete BISS-E system. In Mode 1, a fixed 12-character session word is inserted in the scrambler. The 64-bit control word is derived from the session word according to the DVB-CSA specification.

Manual entry of the session word shall be in hexadecimal notation, with the digits entered most-significant-nibble first, i.e. from left to right as viewed in hexadecimal notation.

For example, 0xA13DBC42908F would be entered in the following sequence: A,1,3,D,B,C,4,2,9,0,8,F.

The *Transport_Scrambling_Control* bits of the Transport Packets shall be set to "10".

8.2.3.2 BISS Mode E

Clear Session Word

The Newtec Scrambler is compliant with BISS Mode 1. It supports the insertion of a 12-character clear session word through the front panel and through a remote control interface (RMCP or SNMP).

The clear session word, entered via the user interface or remote control port, is readable through any unit interface.

Encrypted Session Word

The unit supports the insertion of encryption session words through the front panel and through the remote control interface.

The encryption session word is a 16-character number that is transformed by the unit into a 12-character clear SW. The clear session word is then used by the unit to decrypt the broadcast according to paragraph 8.2.3.1 (BISS Mode 1).

Once the encrypted session word has been entered via the front panel or via the remote control interface, it is impossible to read it back through any unit interface.

The manual entry of the encrypted session word is in hexadecimal form; the 16 digits are entered with the most-significant nibble first (i.e. the left-most nibble).

For example, if the encrypted session word is 0xF76EE249BE01A286, it shall be entered in the following sequence:

F,7,6,E,E,2,4,9,B,E,0,1,A,2,8 and 6.

8.3 AES Content Protection

AES content protection is a solution to protect content during the satellite transmission. The protection is implemented at DVB-S2 baseband frame level. The modulator will encrypt the content before transmission. To receive the content, the demodulator must be able to decrypt the received signal. The encryption and decryption process is based on content keys. The decryptor is only authorised to receive the content when the correct content key is loaded on the demodulator.

Furthermore, AES content protection is a fully transparent security solution that guarantees the transport stream at the output of the decryptor to be bit-per-bit identical to the one at the input of the encryptor. This guarantees to use the content in a single frequency network after satellite transmission.

AES protect transport streams or IP data, independently of the encapsulation used.

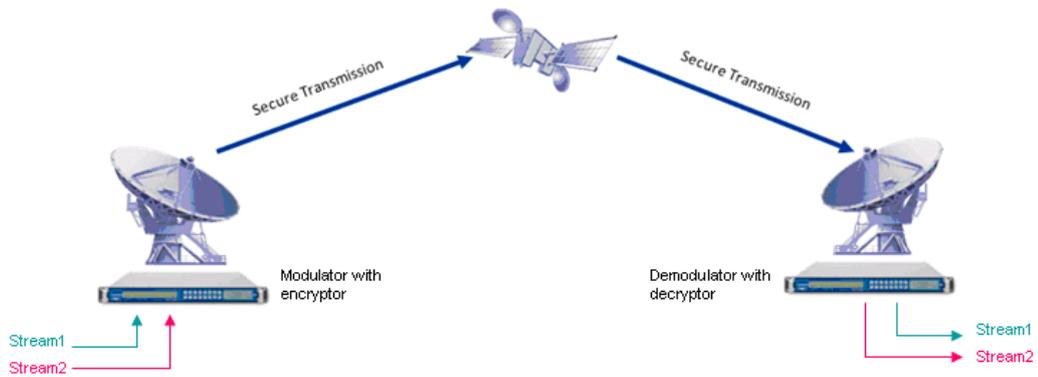


Figure 45 - Secure Transmission over Satellite



The security mechanism implemented is however NOT suited for applications requiring very strong security, such as banking data exchanges, military secrets, highly sensitive information, video feeds that needs to be kept confidential for a long time.

8.3.1 Content Protection

Content is protected by encrypting the baseband frames of a DVB-S2 transmission.

Encryption is applied on the data field of the baseband frame, using the AES algorithm to encrypt it. Different baseband frames are encrypted independently.

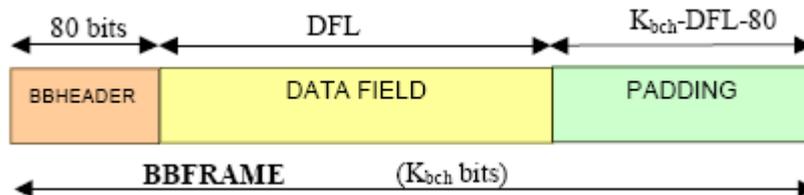


Figure 46 - Baseband Frame Structure (Source: EN-302307)

The encryption-decryption process makes sure that at the output of the decryptor, the baseband frame is identical to the one at the input of the encryptor.

The signalling used for the encryption is proprietary. Unencrypted streams can be received by any DVB-S2-compliant receiver. Encrypted signals can only be received by devices that have the Newtec AES decryption mechanism implemented.

8.3.2 Key Management

8.3.2.1 Overview

The key management defines the ways encryption/decryption keys are sent to and used by the encryptor and decryptor engines.

The key management system is designed to be straightforward, enabling effective manual or automated operations.

Keys are sent to the devices through the monitoring and control channel.

The encryption keys must be entered on the modulator by a human operator or an automated management system. The content key can be entered in non-encrypted or in encrypted format.

The non-encrypted format is used in any deployment where the channel (human operator or computer network) used to send the content key to the device is secure enough.

The encrypted format is used when the communication channel used to distribute the keys to the device is not secure. In that case, the system uses a secret group key stored in the device to guarantee that the encrypted content key can only be used on that device (or devices with the same group key).

Each device can support two keys for each stream: the odd key or the even key. One key is the active key, while the other one is the next key to use. This allows to distribute keys to all devices, then to switch to the new key on all devices at the same time.

8.3.2.2 Key Management System Structure

The following picture details the structure of the AES key management system that is implemented on all devices.

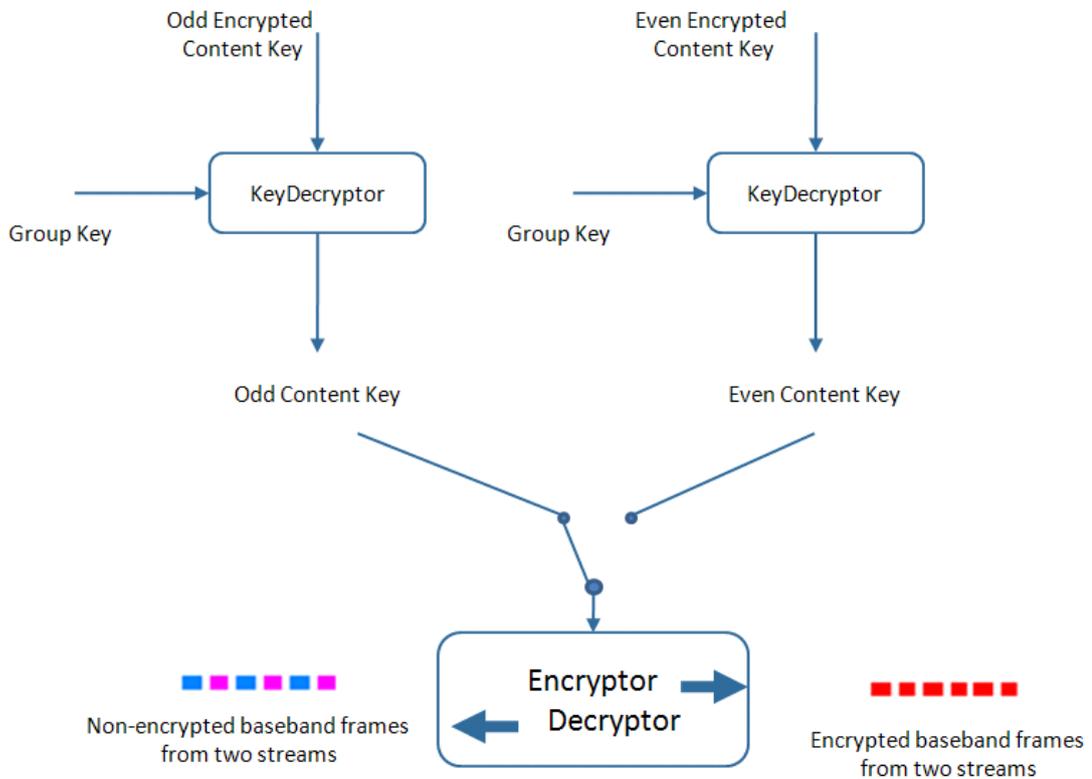


Figure 47 - AES Key Management System

- **Group key:** This key is entered by the user through any interface and stored in the device. Group keys are used to decrypt the encrypted content keys. Group keys cannot be read back on any interface.

AZ110 >> Unit >> Control >> AES

The screenshot shows a configuration window for the AES module. At the top, there is a 'Location:' label followed by four buttons: 'NTC2280', 'Unit', 'Control', and 'AES'. Below this, there are three rows of configuration options:

Group Key:	<input type="password" value="*****"/>
Key Length:	<input type="text" value="64"/>
Erase All Keys:	<input type="text" value="No"/>

Figure 48 - Group Key Field

- **Encrypted content key:** There are two encrypted content keys per stream - the odd encrypted content key and the even encrypted content key. These keys are entered by the user through any interface and used to compute the corresponding content key which is stored in the device. Encrypted content keys cannot be read back on any interface.
- **Content key:** There are two content keys per stream - the odd content key and the even content key. The content keys are entered by the user through any interface or these keys are computed from the corresponding encrypted content key. Content keys cannot be read back on any interface.
- **Key decryptor:** The key decryptor is an AES decryption engine used to compute the content key based on the encrypted content key and using the group key as the AES key. The previous statement is only valid for 128-bit keys. In case of 64-bit keys, a DES decryption engine is used instead of AES.
- **Odd/Even key:** The operator on the modulator selects which key to use. The demodulators automatically detect which key is used (odd or even) and selects the key of the same type (odd or even) to performing the decryption.

8.3.2.3 Key Sizes

The key management layer for AES is defined to work with two key sizes: 128 bits for maximum security and 64 bits for meeting exportation restrictions in some countries - the 64 bit keys have a randomness of 56 bits to fully meet exportation restrictions. The last byte of the key is not used.

It is possible that the security mode on your modulator is restricted in the factory to use 64-bit keys only. In that case, you cannot switch to 128-bit key mode.

AZ110 >> Unit >> Control >> AES

The screenshot shows the AES configuration interface. It includes a 'Group Key:' field with a masked password '*****'. Below it is the 'Key Length:' dropdown menu, which is currently set to '64' and has a dropdown arrow. A dropdown menu is open, showing '64' and '128' as options. To the right of the dropdown are two buttons: a checkmark button and a close button (X).

Figure 49 - Key Length Selection



Switching from one key size to another erases all keys in use.

8.3.2.4 Use of Group Key

The group key can be used in two ways:

- A unique group key is defined for each device. In that case, a different encrypted content key needs to be sent to each device. This key is unique and the operator is guaranteed that if the key is intercepted, it cannot be used on another device (unless the group key is known).
- A group key is defined for a group of devices. Devices from region A share the same group key, while devices from region B share another group key. In this case, the same encrypted content key (let's say protected with the group key of region A) can be broadcasted to all devices. Only devices of region A will be able to receive the content. The same procedure can be used to separate receivers from two different sub-networks and it can also be used to separate receivers dedicated to different purposes.

For 64-bits keys, some restriction applies. As the DES encryption is used to protect the encrypted content key, it is not possible to use a weak DES key as a group key. Weak DES keys are listed in Appendix E at the back of this manual.

8.3.2.5 Seamless Key Change

The AES key management system is designed to allow the change of an encryption key during a transmission without interrupting the stream, if the demodulator stores the same content keys than the modulator.

Demodulators can detect which key (odd or even key) is currently in use. When the modulator switches from one key to another, the demodulator automatically detects the change and switches to the other key in a frame-synchronous way. This way, the demodulator always uses the proper key to decrypt the baseband frames. No interruption or glitch appears at the output of the demodulator.

By changing the unused key on the modulator and demodulators, it is possible to switch again the key in the network.

8.3.2.6 Protection

DVB-S2 allows the transmission of several streams over satellite at the same time. The different streams are all encapsulated in baseband frames and each stream is linked to a different input stream identifier or ISI. The ISI-values are used to separate all streams again at the reception site.

The AES encryption mechanism works as follows:

All different DVB-S2 streams are encrypted with the same content key. One pair of odd and even content keys or one pair of odd and even encrypted content keys can be entered in the modulator.

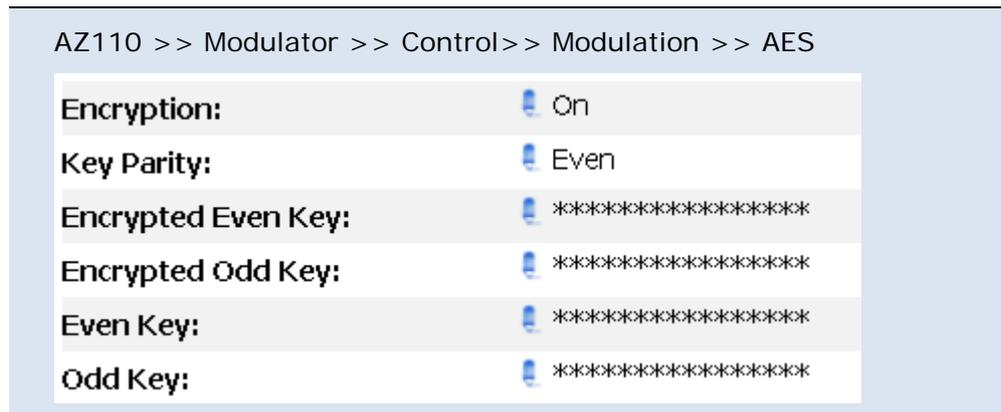


Figure 50 - Global Control Keys

8.3.3 Operation of AES

8.3.3.1 Setting a Key for the Transmission

Starting point: The encryptor sends clear data to the decryptor. Both have their encryption mode set to “Off” or no encryption.

Steps:

1. The odd content key is entered in the decryptor.
2. The decryptor encryption mode is set to “On”.
3. The odd content key is entered in the encryptor.
4. The encryptor encryption mode is set to “On”.

8.3.3.2 Changing Keys Seamlessly

Starting point: The encryptor sends encrypted data to the decryptor. The odd key is active. Both have their encryption mode set to “On”.

Steps:

1. The even content key is entered in the decryptor.
2. The even content key is entered in the encryptor.
3. The encryptor is toggled to use the even key.



An alternative is to turn the encryptor off, change the keys on encryptor and decryptor and turn the encryptor back on. The drawback is that the content is in clear for the time needed to change all the keys.

8.3.3.3 Adding a Receiver to the Network

Starting point: The encryptor sends encrypted data to several decryptors all using the same content key.

Steps:

1. Simply send the correct content key to that new receiver.
2. Turn on the decryptor of the new receiver.

8.3.3.4 Removing a Receiver from the Network

Starting point: The encryptor sends encrypted data to the decryptors. The odd key is active. All have their encryption mode set to "On".

Steps:

1. Define a new even content key.
2. The new content key is entered in all decryptors, except the one receiver to be removed from the network.
3. The new content key is entered in the encryptor.
4. The encryptor is switched to the even key.

8.3.3.5 Sending Protected Content Keys

Starting point: An encryptor and a set of decryptors are running in a secured facility (or in secured facilities).

Steps:

1. Define a group key.
2. Insert the group key in all units by a trusted person/system in expert mode.
3. Deploy the devices.
4. Set the key for a transmission, sending encrypted content keys rather than content keys.

8.3.3.6 Creating Groups of Receivers

Groups of receivers, mutually exclusive, are created by inserting different group keys in those receivers and in the related sender. This way, keys sent to a group of receivers cannot be used by another group of receivers.

8.3.3.7 Changing Group Keys

Group keys need to be changed by a trusted person or entity. The devices are set in expert mode and the group key is changed. The security of this operation relies on the security level of the entity modifying the group key.



For remote group key update, use a secure connection up to the device or at least up to the machine controlling the device.

8.3.3.8 Multi-stream Transmissions to Different Groups of Receivers

If receivers are only part of one group and all receivers of the same group receive the same content, the group key is well adapted to this case.

It can also happen that the group of receivers shall differ for each stream. But as one receiver can receive several streams, groups must be defined per stream. In this case two options are possible:

- Send the (encrypted) keys of each stream only to the relevant receivers. The sending should be unicasted as other receivers with the same group key could decrypt the stream key too.
- Define one group key per receiver and to send the encrypted content keys to those receivers only. This solution has the advantage that a message intercepted cannot be used on another receiver (unless group keys are known publicly).

8.3.3.9 Deleting Keys

AZ110 >> Unit >> Control >> AES

A command “Erase All Keys” is implemented to erase all AES-related keys on that device. This command erases (i.e. writes a 0xFFFF...FF value):

- The group key.
- The content keys that are in use.



The content keys stored in device configurations are NOT erased. A factory reset will erase all keys stored in the device.

8.3.4 Generating Encrypted Content Keys



Newtec distributes a simple web-based java script to compute encrypted keys for a specific device.

Use the Newtec Service Desk tool to receive a copy:

- > Browse to <http://customersupport.newtec.eu>.
- > Fill in your Username and Password
- > Create a ticket

As response of your request you will receive the script from our support team.

In case you don't have a Username and Password yet for the Newtec Service Desk tool: request a login to customersupport@newtec.eu.



In the section below, all keys or data are represented in hexadecimal. For the algorithms, they are represented with the most significant byte (bit) first.

8.3.4.1 128-bit Keys

The computation of the encrypted content key from a given content key is depicted in the following figure.

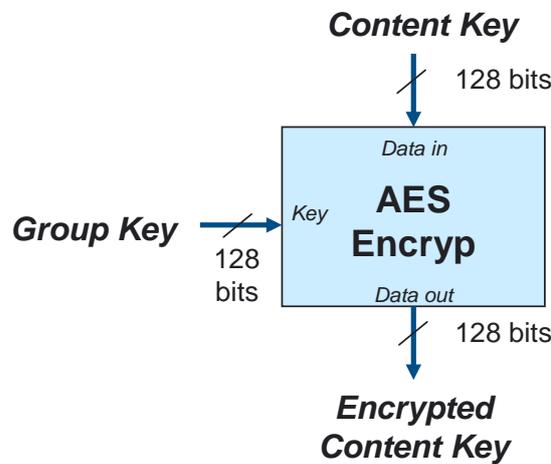


Figure 51 - Process to Encrypt a Content Key with a Specific Group Key in 128 bit Mode

The following lines provide a few examples of key computations for reference:

Example 1:

Content Key: e81816b87e5cf9c4e81816b87e5cf9c4

Group Key: d9d47fae81fad3154384d79cf1278306
 Encrypted Content Key: be9c253b8e707ee851ba5ce6dd388753

Example 2:

Content Key: 1234567890abcdef1234567890abcdef
 Group Key: d9d47fae81fad3154384d79cf1278306
 Encrypted Content Key: d52e1da09a29691f85f9d5da74e07bed

Example 3:

Content Key: 1234567890abcdef1234567890abcdef
 Group Key: 06450f0aaa9b9655ee9c4073097c7b08
 Encrypted Content Key: 9df1586017ee2b0417eebf86ac6d4627

8.3.4.2 64-bit Keys

A similar process is used for the computation of encrypted content keys in the 64-bit mode. The computation of the encrypted content key from a given content key is depicted in the following figure.

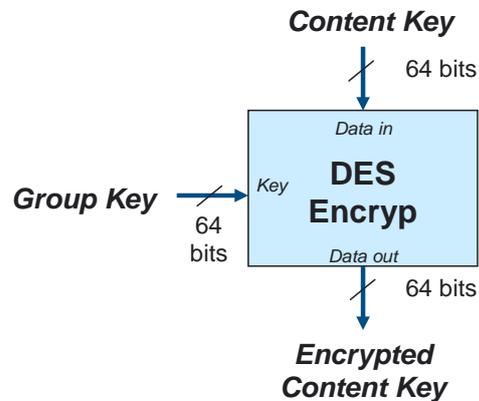


Figure 52 - Process to Encrypt a Content Key with a Specific Group Key in 64-bit Mode

The DES algorithm used is the one described in the FIPS-46-3 standard from the NIST.

The following lines provide a few examples of key computations for reference:

Example 1:

Content Key: 278da56a0f06aa1f
 Group Key: fb5f9c585dd359aa

Encrypted Content Key: bf561dd5e15890b7

Example 2:

Content Key: 1234567890abcdef

Group Key: fb5f9c585dd359aa

Encrypted Content Key: d46f63e2cc998eec

Example 3:

Content Key: 1234567890abcdef

Group Key: 7fae81fad3154384

Encrypted Content Key: be407096c6104b1e

8.4 ASI Test Generator

The AZ110 modulator has a built-in ASI test generator and detector. The test generator generates a signal on the ASI A interface. This is very useful to test the proper functioning of the setup.

It can also be used to test the quality of the transmission channel over satellite. If the test generator is active the test LED on the front panel lights up.

The test monitor consists of a counter and an estimated error counter.

AZ110 >> Modulator >> Test	
Coax output signal:	<input type="checkbox"/> Off
<u>BEC input selection:</u>	<input type="checkbox"/> Off
BER counter control:	<input type="checkbox"/> ??? (undefined)
BER alarm threshold:	<input type="checkbox"/> 1 E-6
BER meas. period:	<input type="checkbox"/> 1 s
Clock polarity:	<input type="checkbox"/> Normal
Use LVDS CE:	<input type="checkbox"/> Off
Null-packet dropping:	<input type="checkbox"/> On
RA PCR restamping:	<input type="checkbox"/> On
Test generator type:	<input type="checkbox"/> PRBS
Transmit data:	<input type="checkbox"/> External
Modulator delay mode:	<input type="checkbox"/> Minimum
Buffer setpoint :	<input type="checkbox"/> 50 %
Buffer setpoint:	<input type="checkbox"/> 5.63 frames
BB NCO mode:	<input type="checkbox"/> Auto
Testgen output rate:	<input type="checkbox"/> 2 Mbps
Testgen timing mode:	<input type="checkbox"/> Free running
Packet counters rst:	<input type="checkbox"/> ??? (undefined)

Figure 53 – BEC input selection

8.5 Equalink

BER performance degradation due to transmission channel impairments is becoming increasingly important in DVB-S2 systems operating with higher order modulation formats (16APSK, 32APSK), in particular at the higher symbol rates.

The Equalink concept effectively optimises satellite link performance by counteracting these effects. Newtec DVB-S2 modulators equipped with the Equalink™ feature contain both linear and non-linear predistortion functions which can be individually enabled/ disabled.

Equalink operating principle:

- Optimum predistortion is computed off-line based on specified distortion characteristics;
- Resulting predistortion table(s) are uploaded to the modulator and activated.

Link performance can be expressed in terms of Bit or Packet Error Rate (BER or PER) versus Energy-per-symbol to Noise density ratio (E_s/N_0).

For a communication channel over a satellite link, the overall link performance can be severely degraded by channel impairments. Examples of such impairments are interference (Adjacent Channel Interference (ACI) and Co-Channel Interference (CCI), Inter-Modulation (IM), Adjacent Satellite Interference (ASI)...), phase noise, signal distortions, etc.



Please refer to the Equalink™ User Manual for a full description of this feature.

APPENDIX A – SETUP WIZARD

- Click **Misc. > Wizards**

The following screens are displayed:

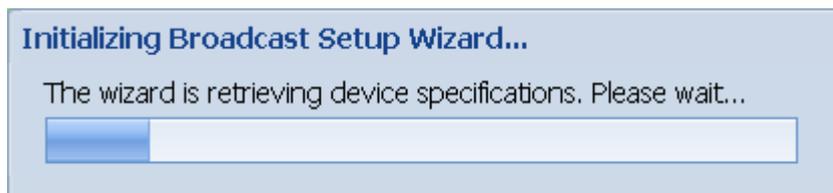


Figure 54 - Initializing Broadcast Setup Wizard

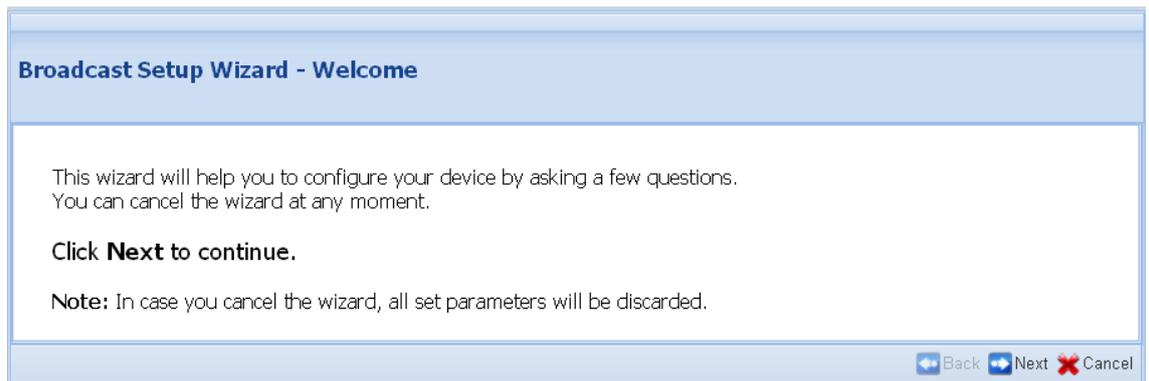


Figure 55 - Welcome

➤ Click **Next**

Broadcast Setup Wizard - Interface Parameters

Please fill in the following form:

Modulation Standard:	<input type="text" value="DVB-S2"/>	▼
Baseband Interface:	<input type="text" value="ASI-A"/>	▼
Enable ASI port auto-switching:	<input type="checkbox"/>	
MPEG Framing:	<input type="text" value="188 bytes"/>	▼
Baseband Processing:	<input type="text" value="No processing"/>	▼

Figure 56 - Interface Parameters

➤ Click **Next**

Broadcast Setup Wizard - Modulation Settings

Configure the modulation settings. Note that you can specify either the symbol rate or the data rate. The constant rate will be the last configured one.

Output Frequency:	<input type="text" value="1250.000000"/>	MHz
Symbol Rate:	<input type="text" value="1.408184"/>	MBaud
Data Rate:	<input type="text" value="0.690353"/>	Mbps
Roll Off factor:	<input type="text" value="20%"/>	▼
<i>Occupied Bandwidth:</i>	1.689821 MHz	
Output Level:	<input type="text" value="-35.0"/>	dBm
FEC Frame type:	<input type="text" value="Normal"/>	▼
ModCod:	<input type="text" value="QPSK-1/4"/>	▼
Enable Pilots Insertion:	<input type="checkbox"/>	

Figure 57 - Modulation Settings

➤ Click **Next**

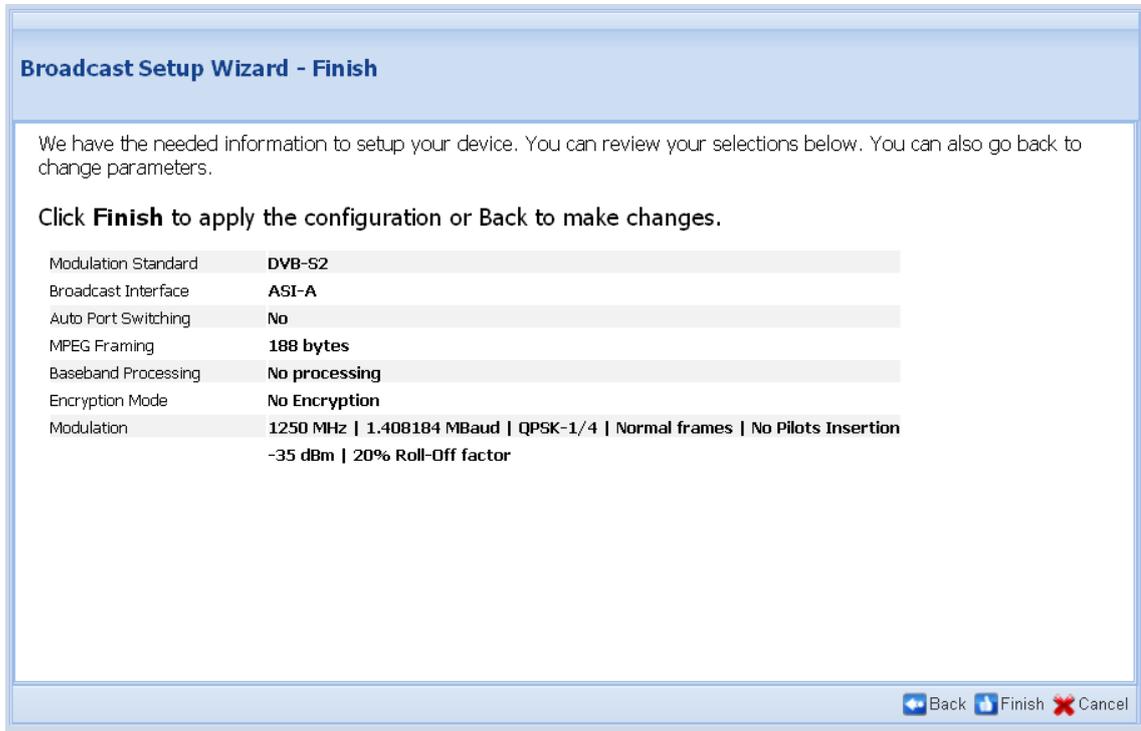


Figure 58 - Finish

APPENDIX B – USER DEFINED MENU

The user menu can be configured according to the customers needs. In this way, the user can create a quick access to those control, monitor and testing parameters that he needs to change or monitor regularly. In addition, the user can also change the order in which the menu items are presented to meet his specific demands. This is very useful in, for example, DSNG applications. Pre-configure the general parameters and store them in the default boot-configuration. Then make all relevant parameters that need a quick change during link setup available as a group in the user menu. By doing this, an inexperienced user can operate the modulator without having to go through all the different menus. A typical example would be to group the parameters **output frequency**, **output level** and **transmit** while leaving all other parameters untouched.

Define the user menu

- Choose **AZ110 > Unit > Setup > User menu** and click **OK**.

AZ110/Unit/Setup

User menu: <press OK, ESC when done>

- Choose **AZ110 > Unit > Setup > User menu** and click **OK**. This brings up the first item from the **AZ110 > Control** menu:

AZ110/Control not present

Base band interface <OK> to add

- Click **OK** to add this menu to the list of menu items that is visible in the user menu or press the 'right arrow' key to move to the next menu item in the control, monitor and test menu. The available list contains all the menu items when the user profile expert.
- Click **OK** to change the display to:

AZ110/Control present

Base band interface <OK> to remove

The above indicates that this menu item is present in the user menu. To remove it, click **OK** again.



After a "reset to factory defaults" the user menu contents are removed.

APPENDIX C – TECHNICAL SPECIFICATIONS

Input interface

ASI/SPI interface (default):

- 2 selectable ASI input on BNC (F) - 50 ohms (coax);
- 2 selectable ASI output (loop through) on BNC (F) - 50 ohms (coax);
- SPI on 25 pin sub-D connector;
- Optical ASI on ST (optional);
- 188 or 204 byte mode;
- Encryption (optional):
 - BISS (single program): mode 0,1, E : up to 54 Mbit/s;
 - BISSM (multiple program): mode 0,1,E : up to 100 Mbit/s.
- Rate adapter.

Modulation

Supported modulation schemes and FEC

- DVB-S/DSNG:
Outer/Inner FEC: Reed Solomon /Viterbi;
ModCods:
 - QPSK: 1/2, 2/3, 3/4, 5/6, 7/8;
 - 8PSK: 2/3, 5/6, 8/9;
 - 16QAM: 3/4, 7/8.
- DVB-S2:
Outer/Inner FEC: BCH/ LDPC;
ModCods:
 - QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10;
 - 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10;
 - 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10;
 - 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10.

Baud rate Range

- DVB-S2:
 - QPSK/8PSK/16QAM 0,05 – 45 Mbaud;
 - 32APSK 0,05 – 33 Mbaud.
- DVB-S/DSNG:
 - QPSK/8PSK/16QAM 0.05-45 Mbaud.

Frame Length

- DVB-S/DSNG 188 bytes;
- DVB-S2 Short Frames 16200 bits;
- DVB-S2 Normal Frames 64800.

Roll-off factor

- 20 % - 25 % - 35 %.

Output interfaces

L-band output (default):

- Connector SMA (F), 50 ohms;
- Return loss > 14 dB;
- Level -35/+5 dBm (+/- 2dB);
- Frequency 950 - 1750 MHz (50 Hz steps);
- Spurious: better than -65 dBc/4 kHz @ +5 dBm level and > 256 kbaud.

Extended L-band output (optional)

- Connector SMA (F), 50 ohms;
- Return loss > 14 dB;
- Level -35/+5 dBm (+/- 2dB);
- Frequency 950 - 2150 MHz (50 Hz steps);
- Spurious: better than -65 dBc/4 kHz @ -10 dBm level and > 256 kbaud.

IF-band (optional):

- Connector:
 - BNC (F) - 75 ohms
- Return loss:
 - 50 ohms : > 14 dB;
 - 75 ohms : > 20 dB.
- Level -30/+5 dBm (± 3 dB);
- Frequency 50 - 180 MHz (50 Hz steps);
- Spurious: better than -65 dBc/4 kHz @ -10 dBm level and > 256 kbaud.

L-band+IF (optional)

- L-band: -30/0dBm (+/-3dB) output level;
- IF: fixed 70 or 140 MHz frequency:
 - -34/+1 dBm (+/- 3 dB) output level.

- Spurious: better than -65 dBc/4 kHz @ -10 dBm level and > 256 kbaud.

RF band (optional)

- Connector SMA (F), 50 ohms;
- Return loss > 12 dB;
- Frequencies:
 - 5.85-7.05 GHz;
 - 12.75-13.25 GHz;
 - 13.75-14.5 GHz.
- Level -35/-7 dBm (+/- 3dB);
- Frequencies:
 - 17.30-18.10 GHz;
 - 17.60-18.40 GHz;
- Level -25/+3 dBm (+/- 3dB).

L-band monitoring output (default)

- Connector SMA (F), 50 ohms;
- Return loss > 7 dB;
- Level -45 dBm;

Frequency default: identical to L-band output
with options: AA-02 / AA-06: 1080 MHz.

BUC power and reference frequency (optional)

- Max. current 3A;
- Voltage 12V, 24V, 48V;
- Frequency 10MHz;
- Stability $\pm 5 \times 10^{-8}$ over 0°C to 65°C.

10 MHz reference input / output (optional)

- Connector BNC (F) – 50 ohms;
- Input level -3dbm up to 7dBm;
- Output level +7dBm;
- Internal Reference frequency.

High Stability (optional)

- Stability: $\pm 5 \times 10$ over 0°C to 70°C;
- Ageing: ± 15 ppb/day ± 300 ppb/year.

Very High Stability (optional)

- Stability: $\pm 2 \times 10$ over 0°C to 65°C;
- Ageing: ± 0.5 ppb/day ± 500 ppb/10 year.

Generic

Monitor and control interfaces

- Web based GUI;
- Diagnostics report, alarm log • RMCP over TCP-IP/UDP and RS232/RS485;
- SNMP v2c.

Alarm interface

- Electrical dual contact closure alarm contacts;
- Connector 9-pin sub-D (F);
- Logical interface and general device alarm.

Physical

- 1RU, width: 19", depth 51 cm, 6 k;
- Power supply:
 - 90-130 & 180-260 Vac, 105 VA, 47-63 Hz;
 - Temperature - Operational: 0°C to 40°C - Storage: -40 to +70°C;
- Humidity: 5% to 85% non-condensing;
- CE label.

APPENDIX D – DETAILS GR-01 AND GR-02

Specifications of option GR-01 - High Stability 10MHz reference In/Out	
Stability:	+/-5x10exp-8 over 0°C to 70°C
Warm-up time:	5 min (+/-100 ppb)
Ageing:	+/-15 ppb/day
	+/-300ppb/year
Phase noise (dBc/Hz):	10Hz:-100
	50kHz:-140

Specifications of option GR-02 – Very high stability 10 MHz reference In/Out	
Stability:	+/-2x10exp-9 over 0°C to 65°C
Warm-up time:	5 min (+/-50 ppb)
Ageing:	+/-0.5 ppb/day
	+/-75ppb/year
	+/-500ppb/10year
Phase noise (dBc/Hz):	10Hz: -120
	50kHz:-140
	1kHz:-145
	10kHz:-145
	100kHz:-145

APPENDIX E – LIST OF WEAK 64-BIT GROUP KEYS

Some group keys of 64-bit length are refused when you try to use them. Those are:

0000000000000000	e00000e0f00000f0
00001e1e00000e0e	e0001efef000efe
0000e0e00000f0f0	e000e000f000f000
0000fefe0000fefe	e000fe1ef000fe0e
001e001e000e000e	e01e00fef00e00fe
001e1e00000e0e00	e01e1ee0f00e0ef0
001ee0fe000ef0fe	e01ee01ef00ef00e
001efee0000efef0	e01efe00f00efe00
00e000e000f000f0	e0e00000f0f00000
00e01efe00f00efe	e0e01e1ef0f00e0e
00e0e00000f0f000	e0e0e0e0f0f0f0f0
00e0fe1e00f0fe0e	e0e0fefef0f0fefe
00fe00fe00fe00fe	e0fe001ef0fe000e
00fe1ee000fe0ef0	e0fe1e00f0fe0e00
00fee01e00fef00e	e0fee0fef0fef0fe
00fefe0000fefe00	e0fefee0f0fefef0
1e00001e0e00000e	fe0000fefe0000fe
1e001e000e000e00	fe001ee0fe000ef0
1e00e0fe0e00f0fe	fe00e01efe00f00e
1e00fee00e00fef0	fe00fe00fe00fe00
1e1e00000e0e0000	fe1e00e0fe0e00f0
1e1e1e1e0e0e0e0e	fe1e1efefe0e0efe
1e1ee0e00e0ef0f0	fe1ee000fe0ef000
1e1efefe0e0efefe	fe1efe1efe0efe0e
1ee000fe0ef000fe	fee0001efef0000e
1ee01ee00ef00ef0	fee01e00fef00e00
1ee0e01e0ef0f00e	fee0e0fefef0f0fe
1ee0fe000ef0fe00	fee0fee0fef0fef0
1efe00e00efe00f0	fefe0000fefe0000
1efe1efe0efe0efe	fefe1e1efefe0e0e
1efee0000efef000	fefee0e0fefef0f0
1efefe1e0efefe0e	fefefefefefefefe
fffffffffffffffffff	

APPENDIX F – ABBREVIATIONS

Acronym	Definition
AC	Alternating Current
ACI	Adjacent Channel Interference
AES	Advanced Encryption Standard
ACM	Adaptive Coding Modulation
AGC	Automatic Gain Control
APSK	Amplitude and Phase Shift Keying
ASI	Asynchronous Serial Interface
BCH	Boise Chaudhuri and Hocquengham
BEC	Bit Error Counter
BER	Bit Error Rate/Ratio
BISS	Basic Interoperable Scrambling System
BNC	Bayonet (Neill Concelman) Connector (for coaxial cable)
BUC	Block Up Converter
CCM	Constant Coding and Modulation
CTS	Clear To Send
CW	Continuous Wave (Radio signal without modulation)
DC	Direct Current
DES	Data Encryption Standard
DSNG	Digital Satellite News Gathering
DTH	Direct to Home
DTR	Data Terminal Ready
DVB	Digital Video Broadcasting
DVB-S	Digital Video Broadcasting-Satellite
EMC	ElectroMagnetic Compatibility
ESW	Encrypted Session Words
FCC	Federal Communications Commission
FEC	Forward Error Correction (in data transmission systems)
FTP	File Transfer Protocol (computer networks & systems)

Acronym	Definition
GND	Ground (connection in equipment or circuits)
GUI	Graphical User Interface
HTML	HyperText Mark-up Language (used by World-Wide Web Docs)
ID	Identifier
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
IP	Internet Protocol
ISI	Input Stream Identifier
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LDPC	Low-density Parity-check code
LO	Local Oscillator
LSB	Least Significant Bit (in digital coding)
LVDS	Low Voltage Digital Signalling
M&C	Monitoring and Control
MGC	Manual Gain Control
MIB	Management Information Base
ModCod	Modulation and coding combination
MPE	Multi Protocol Encapsulation
MPEG	Motion Picture Experts Group
NMS	Network Management System
ODU	Outdoor Unit
PC	Personal Computer
PCR	Program Clock Reference
PER	Packet Error Rate
PHY	Physical Layer
PID	Packet Identification
PRBS	Pseudo Random Binary Sequence
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RMCP	Remote Monitor and Control Protocol

Acronym	Definition
ROHS	Restriction Of Hazardous Substances
RS	Reed Solomon
RTP	Real-time Transmission Protocol
SNMP	Simple Network Management Protocol
SPI	Synchronous Parallel Interface
SW	Software
TCP	Transmission Control Protocol
TS	Transport Stream
TV	Television
TX	Transmit
UDP	User Datagram Protocol
ULE	Unidirectional Lightweight Encapsulation
VA	volt-ampere
VCM	Variable Coding and Modulation
XPE	Extended Performance Encapsulation