MAINTENANCE AND OPERATION
INSTRUCTION MANUAL

Model DB3000

FM Modulation Analyzer

R·D·S
RADIO DATA SYSTEM

DB DEVA®
BROADCAST

Contents

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Introduction

ABOUT DEVA BROADCAST LTD.

Deva Broadcast Ltd. was established in 1997 as a broadcasting and telecommunications equipment importer for Bulgaria and Eastern Europe regions. Subsequently, Deva Broadcast Ltd. has developed and produced a wide range of low and mid power transmitters, RDS/RBDS Encoders and Decoders, Modulation Monitors, Remote Controls, Site monitoring and other systems for many companies. Our high degree engineers accomplish their bright ideas through successful engineering, marketing and management in Deva Broadcast's Headquarter in Bulgaria.

During the last ten years the company products have become our partners' best sellers. After detailed marketing analysis, our team has decided to launch its own brand products based on the latest technologies in the broadcasting business. The company's main goal is to design, develop and offer a complete line of high quality and competitive products for FM and Digital Radio, Radio Networks, Telecommunication Operators and regulation authorities. We base our market authority position on our good after sales support and relation with the clients.

Since 2003 Deva Broadcast Ltd has been ISO 9001:2000 certificated by SGS quality certification bureau.

The contractors of Deva Broadcast Ltd. are satisfied with the permanent business comfort and to their own confession they owe it to a great extent as well as their prosperity to the loyal partnership of our company.

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PRODUCT DESCRIPTION

The DB3000 FM Modulation Analyzer is a digital FM demodulator and modulation analyzer. The RF (IF) and MPX signal is digitalized as soon as it enters the device, and all signal processing is then made through calculations. Digitizing in this way, at the input gives the equipment measurement reproducibility over time. Digital filters' accuracy, used in this equipment, enables the FM multiplex signal's components to be accurately and repeatedly reproduced from one device to another, i.e. same signal applied to two devices will give the same result.

The processing power in this equipment enables all measurements to be refreshed simultaneously and synchronously, thereby allowing for detailed readings of all the Multiplex FM signal components.

DB3000 incorporates easy to read, high-resolution bargraph displays that allow reading the main signal parameters at a glance.

The built-in DB3000 Oscilloscope representing the observed signal change over time enables you to visualize the most important signals participating in the process of demodulating and stereo decoding.

Similarly to the Oscilloscope mode, Spectrum analyzer is a mode for spectral analysis of the input signal and part of DB3000 features. Spectral components of the selected signal are determined on the base of Fast Fourier Transform.

MPX Power measurement, supporting measurement data history is yet another DB3000's great feature.

In addition to the list of DB3000 features, RDS information that is contained in the processed MPX signal is easily visualized and represented as RDS/RBDS Data and RDS/RBDS Statistics.

Adjustable Alarms enable Alarm Signal for the most important signals and signal components and parameters to be generated and fed to the Rear Panel Alarm Terminal for remote alarm notification.

DB3000 is designed to support RS232, USB and LAN communication interfaces, allowing flexibility in remote connection and control of the unit.

Incorporating all the necessary features at a very affordable price, DB3000 is the best FM Mod-Monitor and measurement tool ever made.

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PRODUCT FEATURES

- Fully DSP based core
- Bright, accurate bargraph LED metering of the Modulation and Pilot Levels
- Total and independent Positive and Negative deviation bargraph
- Left, Right, L+R, L-R bargraph LED audio level meters
- Accurate "floating dot" program peak marker
- Easy to ready LED display for selected frequency
- Very Intuitive Navigational Menu
- Built-in Oscilloscope allowing IF, MPX, Pilot, Subcarriers, Left, Right, Left+Right and Left–Right display
- MPX Power measurement with data history
- RF Spectrum analyzer allowing to check the RF Carrier parameters
- MPX Spectrum analyzer for Pilot, SCA, L/R, L+R and L–R measurements
- Direct MPX Input for external composite signal measurement
- Selectable De-emphasis – Off, 50μs and 75μs
- Quick Station access via 15 Presets
- Built-in Stereo Decoder and Selectable Forced Mono mode
- Protected access to the device settings
- Date & Time Settings with various formats
- Level Adjustable Balanced Analog Audio Outputs on XLR Connectors
- Professional AES/EBU Digital audio output on XLR connector
- LAN port for full TCP/IP remote control and monitoring
- Headphone output with front panel level control
- Up to 90dBμV direct RF Antenna Input
- Adjustable MIN/MAX alarms for Carrier Loss, Multipath, Deviation, Pilot signal, Subcarriers, Analog Audio Loss
- USB, and RS232 communication interfaces
- Alarm tally outputs for remote fault indicators
- Easy and intuitive Windows Application
- Firmware update for future-proof operation
- Parameters Factory Restore option
- Operating voltage range 110-120V or 220-250V AC
- 19" Professional Case for high RF immunity

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Before you start

SAFETY PRECAUTIONS

After removing any housing parts and electronic assemblies it is possible to get access to live parts. It is essential to ensure that the subsequent safety rules are strictly observed:

- Servicing of electronic equipment must be performed by qualified personnel only.
- Before removing covers the equipment has to be switched off and the mains cable unplugged.
- When the equipment is open the power supply capacitors have to be discharged by the help of a suitable resistor.
- During servicing unprotected and operating equipment:
    - never touch bare wires or circuitry;
    - use insulated tools only;
    - never touch metal semiconductor cases because they may carry high voltages;
- For removing and installing electronic components, please follow the recommendations concerning the handling of MOS components.

ATTENTION: DB3000 uses internal Lithium battery. Do not try to re-charge this battery!!! In case you have to change the battery, please contact us for detailed instructions and more information about battery type.

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OPERATING ENVIRONMENT RECOMMENDATIONS

For the normal and reliable operation of the DB3000 device and reaching better measurements we recommend to follow the next list of instructions:

- Please, install the unit only in places with good air conditioning. The unit has been designed for operation within an ambient temperature range extending from 10 to 50°C. But because adjacent, less efficient equipment may radiate substantial second-hand heat, be sure that the equipment rack is adequately ventilated to keep its internal temperature below the specified maximum ambient temperature.
- We do not recommend installation in rooms with high humidity, dusty places or other aggressive conditions.
- Although it is expected that a DB3000 will be installed close to exciters (or transmitters of even higher-power!), please practice reasonable care and common sense in locating the unit away from abnormally high RF fields.
- Please, use only already checked power supply cables and sources. The shielded cables usage is strongly recommended.
- We strongly recommend connecting the device only to reliable power supply sources. In case of unstable power supply, please use UPS (Uninterruptible Power Supply).
- Please, use the device only with placed top cover to avoid any electromagnetic anomalies which may cause problems of the normal functionality of the unit.
- Please, connect DB3000 only to good quality Internet connection. This is very important for the normal remote operation of the unit.
- Please, check if your network settings pass through all the data traffic required for the normal operation of the DB3000 unit.

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INSTALLATION SPECIFICATIONS AND PRECAUTIONS REGARDING THE RF ENVIRONMENT. ANTENNA CONSIDERATION.

Attentively observing of the RF Environment, in which DB3000 is disposed and is functioning, is necessary for ensuring of the normal and reliable working of the system. Best conditions in accordance with the standards listed below must be provided for functioning of the system.

Depending on the application, the DB3000 monitoring receiver can be installed very close to high power FM transmitters. Usually its antenna port is directly connected to any FM transmitter monitor output or to directional coupler on the output of any combiner system. The typical RF output level of such sources is too high for the normal operation of the DB3000 receiver. We strongly recommend using external RF attenuators with attenuation value between 20 – 90dB for reaching optimal RF output level in the 55-60 dBµV range.

Using external antenna is required when the DB3000 receiver is used for off air monitoring too far from any transmitters or transmitter site. Very important step in such case is selecting the proper outdoor FM antenna, antenna location and direction. The three most popular antenna types are: omni directional, unidirectional dipole and directional multi-element array antenna.

The omni directional Antenna is not a good choice for using with DB3000, because of the low antenna gain, the very bad signal to noise ratio (compared to any directional antenna) and its high multipath interferences reception.

The other type antennas: unidirectional dipole and directional multi-element array antenna have some directivity and antenna gain. These factors make these antennas much proper for your needs. We recommend using of factory made antenna or antenna system, manufactured especially for the FM Radio Band 88 – 108 MHz.

After selecting the antenna type that will meet your needs, the next step is the installation of the antenna. You must follow several important principles:
- Install the antenna far enough from any walls, roofs, buildings or any transmitting equipment;
- The minimum spacing between the antenna and the closest object must be more than 3 meters.

One DB3000 monitoring receiver is usually used for the monitoring of one transmitter site, transmitting more than one program. In such cases the best antenna that can be used is a directional antenna directed exactly to this site.

If you would like to monitor more than one transmitter site, we recommend using antenna system with separate antennas for each of the monitored directions.

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CONNECTING AC POWER AND VOLTAGE SELECTION

Before connecting the AC Power, make certain that the internal Power Switch and the fuse rating are in accordance with the mains supply at your location.

ATTENTION: DB3000 Power Supply Factory Settings are:

- 220 VAC
- 1 Amp Fuse

CAUTION: Permanent damage will result if improper AC supply voltage is applied to the DB3000 device. Your warranty does not cover damages caused by applying improper supply voltage, or use of an improper fuse.

Changing AC Input Voltage Selection requires only a screwdriver and is not difficult, but you should make sure the power supply is set up correctly before connecting power.

AC Input Voltage Selection

- Disconnect the AC power cable from the AC outlet.
- Disconnect all cables from the DB3000's rear panel.
- Remove the two screws from each side of the DB8000, and the three screws from the top edge of the rear panel. Slide the top cover towards the rear and lift it.
- Locate the Voltage Selector Switch. It is clearly marked slide switch next to the IEC-320 Power Cable Connector. Move it to the '115' position for operation from 100-120 VAC, or to the '230' position for operation from 200-240 VAC.
- Locate the fuseholder on the rear panel and replace the switch (**if needed**). Always use fuses with the following rating:
     - 1-Amp for 220 VAC mains;
     - 2-Amp for 110 VAC mains;
- Replace the top cover and retighten its screws.

Once, it is certain that the DB3000 power section is properly set the Power Switch on the front panel can be used to turn on/off the Mains.
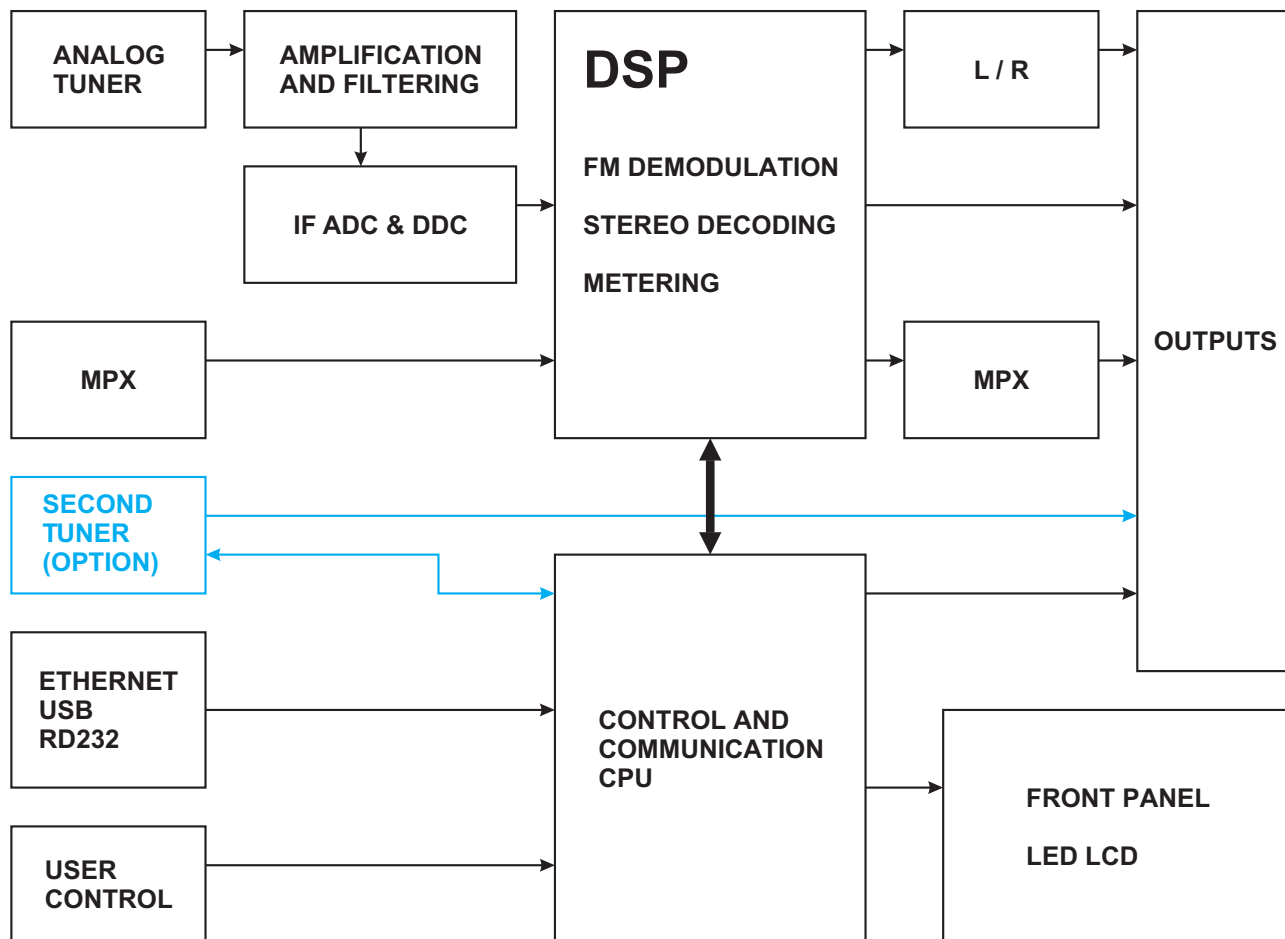
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TECHNICAL SPECIFICATIONS

RF Input	
Frequency Range	88 to 108 MHz, Frequency Agile, 100 kHz Increments
Antenna Input	30 dBμV sensitivity, 50 Ω , BNC Connector
Internal attenuator	0, 10, 20 and 30 dB
Dynamic range	0 dBμV to 100 dBμV
MPX Input	
Frequency Range	10 Hz to 200 kHz, 1 BNC Connector
Impedance	10 kΩ
Sensitivity	3.5 Vp-p @ 75kHz
FM Demod	
Frequency Response	±0.1 dB, 10 Hz to 96 kHz
SCA filter	38 kHz and 57 kHz selectable
MPX power	±12 dBr, 20 sec. integration
Stereo Decoder	
Frequency Response (L and R)	±0.1 dB, 10 Hz to 15 kHz
SNR (Stereo)	80 dB, 50 μs de-emphasis
Distortion	0.02%, 10 Hz to 15 kHz, 50 μs de-emphasis
Separation	
L to R, R to L	50 dB, 50 Hz to 10 kHz, 50 μs de-emphasis
Crosstalk	
L+R to L-R	55 dB min
L-R to L+R	55 dB min
FFT Spectrum Analysis (RF, Composite, Audio)	
Display Modes	Realtime, Average, Min Hold, Max Hold
Dynamic range	90 dB
FFT length	2048
Sampling rate	572 kHz - IF, 192 kHz - Composite, 48 kHz - Audio
Scope Analysis (RF, Composite, Audio)	
Display Modes	Realtime, Average, Min Hold, Max Hold
Trigger mode	Rise, Fall, Off
Dynamic range	90 dB
Sampling rate	572 kHz - IF, 192 kHz - Composite, 48 kHz - Audio
Metering Accuracy	
RF Level	±1 dB, 10 to 90 dBμV
MPX Power	±0.2 dBr, -12 to 12 dBr, 0.1 dBr resolution
Total, Pos, Neg	±2 kHz, 10 to 100 kHz, 1 kHz resolution
Pilot	±0.5 kHz, 1 to 12 kHz, 0.2 kHz resolution
SCA	±0.5 kHz, 1 to 6.5 kHz, 0.2 kHz resolution
L, R, L+R, L-R	±1 dB, +10.0 to -70.0 dB, 0.1 dB resolution

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Outputs	
Composite	3.5 Vp-p @ 75kHz, 75 Ω, unbalanced BNC Connector
Audio (L, R)	+6 dBm, 600 Ω balanced XLR Connector
AES3 (L, R)	5.0 Vp-p, 110 Ω , balanced XLR Connector
Alarms	dedicated terminals on rear panel, optoisolated
Headphone	1/4" Phone Jack
Computer Interface	
RS-232	9-pin Male D-Sub Connector
USB	B-type Connector
Ethernet 10/100 Base –T	RJ-45 Connector
Power Requirements	
Power Supply	40 Watts, 115/230V, 50/60 Hz
Connector	IEC320
Size and Weight	
Dimensions (W;H;D)	(482mm;89mm;300mm) , (19";3.5";11.8"), 19" Rack Unit;
Shipping Weight	6 kg

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BLOCK DIAGRAM

A simplified Block Diagram of the DB3000 Modulation Analyzer is shown below:

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Panel Indicators, Switches and Connectors

FRONT PANEL

The DB3000 front panel can be provisionally divided into two main areas – Left Area and Right Area. A brief description of controls and switches, indicators and displays located in both areas is given below. For detailed information please refer to chapter "Operation" on page 19.
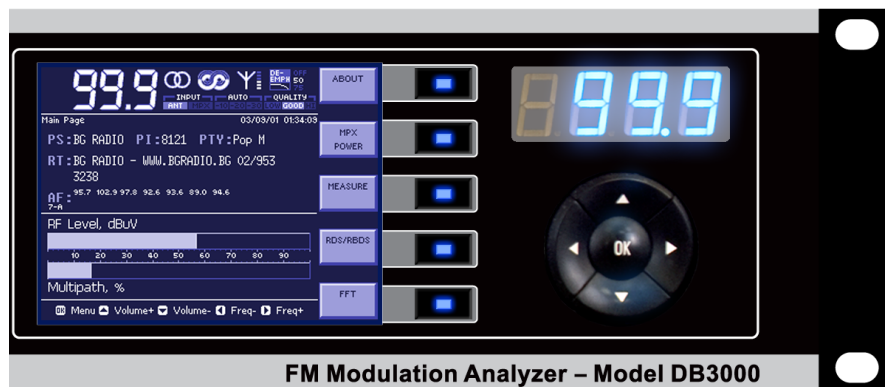
Left Area
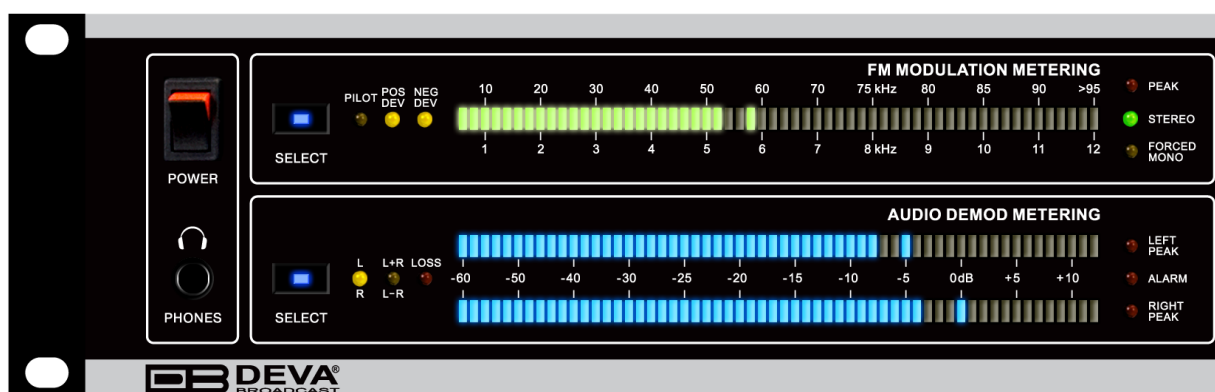
At the extreme left are located the Power Switch and Phones connector. Next to them are the sub areas of *FM MODULATION METERING* and *AUDIO DEMOD METERING* with the appropriate *SELECT* buttons and LED indicators. Both areas contain 58 segments LED bargraphs. Depending on the selection, the upper one is used to indicate the Total Deviation, individually the Positive or Negative deviations and the Pilot signal as well. The lower bargraphs are used to show demodulated audio according to the mode selected by the *SELECT* button on the left.

Both sub areas are supplemented by LED indicators working in conjunction with the bargraphs some of them, or as selected by the menus the rest of them.

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Right Area
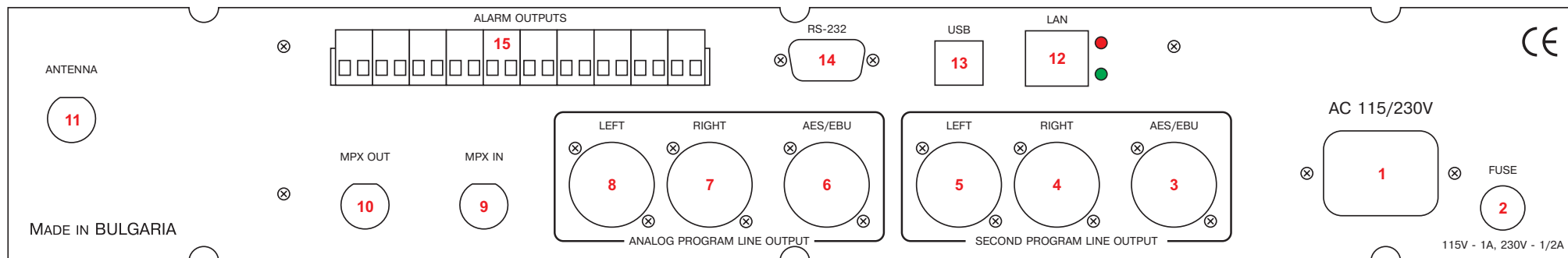

FM Modulation Analyzer – Model DB3000

LCD Display - signals received by DB3000 can be viewed and analyzed by the built-in LCD display. This is the display to visualize all the measurements of the received signal and show the various DB3000 settings.

Soft Buttons – used to navigate through the menus, quickly access the parameters, modes and functions and to change their values. Their functions vary in accordance with the selected menu. On the right side of the LCD display are located Soft Button captions. The same change their meaning following the function currently selected by the Soft Buttons. Pressing of a Soft Button, causes a visual effect of pressing the appropriate button on the LCD Screen. Soft Buttons will be referred as SB1 (top one), SB2 ... SB5 (lowest one) further in this manual.

Navigational Buttons – *UP* and *DOWN*, *LEFT* and *RIGHT* and *OK* buttons are used for frequency selection and similarly to the Soft Buttons to navigate through the menus selecting various functions and parameters.

LED indicator - located above the Navigation Buttons displays the currently selected frequency.

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REAR PANEL

1 - AC 115V/230V – Mains connector, IEC-320 type;

2 - Fuseholder;

3 - Second Audio AES/EBU Output;

4 - Second Audio Right Output;

5 - Second Audio Left Output;

6 - Analog AES/EBU Output;

7 - Analog audio Right Output;

8 - Analog audio Left Output;

9 - MPX Input;

10 - MPX Output;

11 - RF Input (Antenna);

12 - RJ45 TBASE100 Lan;

13 - USB;

14 - RS232 UART;

15 - Alarm Outputs;

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REAR PANEL ALARM TERMINAL
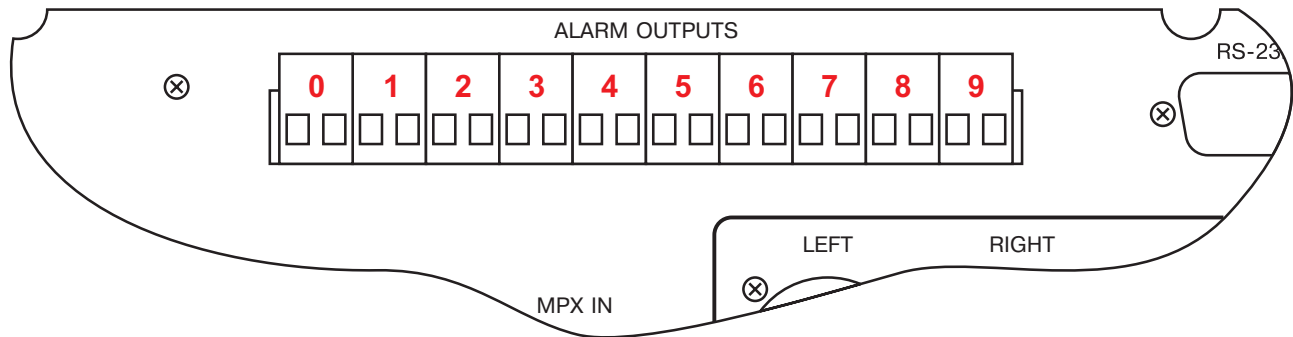
0 - Alarm Carrier
1 - Multipath
2 - Deviation
3 - Pilot
4 - SCA
5 - Analog Audio
6 - Not Used
7 - Not Used
8 - Not Used
9 - Not Used

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Operation

A WORD ABOUT MEASUREMENT LIMITATIONS

Signal Strength

Signal strength is a major factor when a signal is measured and evaluated. FM as compared to the AM is a much less susceptible to the inherent noise in radio reception.

On the other side speaking about FM broadcasting, it is the monaural reception which can tolerate and profit from a much narrower IF bandwidth. Stereo reception adds all the noise present in the 23 – 53 KHz sub-band. Moreover it is the amplitude component (AM) of this sub band that is converted down to audible noise to be added to the program signal. That is why the noise performance of FM-stereo can be as much as 20 dB worse than that of monaural broadcast.

As a general rule better reception and measurement can be obtained by using highly directional outdoors antenna. Such antenna besides improving the signal strength, will contribute in eliminating the multipath distortion.

A bargraph indicator used in DB3000 allows measuring the strength of the signal being received, where the rule "the more the better" is in force. To reach this indicator, activate *MEASURE CARRIER* menu.

Multipath Distortion

In FM reception, regardless of overall signal strength, a very important consideration is that obstacles, (which an FM signal may encounter in the line-of-sight path) tend to reflect and disperse the signal in many directions. In many locations, especially in urban areas where many tall buildings interfere with the direct transmitted signal or in suburban areas surrounded by hills or mountains, an FM receiver may pick up a station's primary signal but, also, several secondary reflections coming from various directions. These reflections arrive at the receiver out-of-phase, slightly delayed in time with the primary signal and tend to blur or distort the principal signal. The degree of distortion depends on the number and relative strength of the reflections.

The result, known as multipath distortion in FM reception can range from a low-level fuzziness to a severely distorted sound quality, particularly at the high frequencies or treble. Multipath distortion is especially troublesome in FM stereo reception.

DB3000 incorporates a multipath distortion detector and multipath bargraph indicator to show the multipath level of received signal. The so mentioned multipath bargraph can be reached under the menu MAIN PAGE – MEASURE CARRIER (see "Measure Carrier" on page 34) or just *MAIN PAGE*.

Multipath bargraph combined together with RF Level bargraph can be an useful tool in aiming the receiving antenna for best reception, reaching the lowest multipath level and highest RF Level. Moreover, Multipath Alarm is provided in DB3000 to ensure clean reception and proper measurements. The reach Multipath Alarm setting, please see SETTINGS – ALARM THRESHOLDS – MULTIPATH. (see "Alarms Thresholds" on page 61)

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Co-channel Interference

In many populated areas, there just isn't much room in the radio spectrum and stations will be jam-packed in. Another thing which would result in mutual interference between the broadcasting stations is poor frequency planning.

The inherent broad bandwidth of the DB3000 receiver is vulnerable from stations working on the nearby frequencies, where signal strength will be the most important factor – the stronger the interfering station, the stronger the interference effect.

One method to identify adjacent channel interference is to observe independent positive and negative deviation readings. If the positive deviation is considerably higher then the negative one, interference from a strong station above the monitored frequency would be indicated and vice–versa. In this example the negative deviation can probably be trusted as an indication of total carrier modulation, though this should be confirmed in free of interference RF environment.

In any event program deviation should be fairly symmetrical about the carrier frequency. Using the built-in Attenuator can be of some help, but using of an outdoors directional antenna could dramatically improve the situation with unwanted adjacent working stations. Other solutions include a band-pass filter at the primary frequency or a trap at the interfering frequency.

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FIRST TIME POWER ON

In this chapter we will try to give you a brief guidance on starting and initial setup up of DB3000. By this you will get initial idea and understanding of procedures and measurements in daily use of DB3000.

For the beginning the items needed are a pair of headphones and a connection to an outside antenna. Considerations for antenna selection are described in details previously in this manual (see "Installation Specifications and Precautions regarding the RF Environment. Antenna Consideration." on page 10). Anyway, if you have no outside antenna at your disposal and the transmitter is close by, a piece of insulated wire, approximately 1 m long will suffice. Carefully insert the stripped wire's end into the center of the Rear Panel *ANTENNA* connector, without forcing it, mindful not to distort the connector.

Assuming that you are acquainted with the procedures of Power Settings as described in chapter "Connecting AC Power and Voltage Selection" and the unit is properly set to the Mains at your location, you can plug in the power cord free end into the wall socket. Now turn the *POWER* switch ON.

NOTE: The DB3000 powers-up to the last selected frequency. This frequency, along with some parameters and settings will be held by the DB3000's non-volatile memory and used on switching on of DB3000.

Plug the headphones into the front panel jack *PHONES*. Press the OK button (from the group of Navigational Buttons) to select the *MAIN PAGE* and using the *LEFT* or *RIGHT* Navigational Buttons start tuning in. Find a strong local station that even with a short wire antenna could be clearly heard in the phones. If needed try repositioning the antenna in order to improve reception.

Regardless of the previous selections, both deviations (Positive and Negative) will be selected upon DB3000 powering on and both the *POS DEV* and *NEG DEV* LED indicators on *FM MODULATING METERING* will be lighted. Although the SELECT button enables independent monitoring of positive and negative deviation, the DB3000 is in default mode when **both** the POS DEV and NEG DEV indicators are lighted. Unless there is a reason for doing otherwise the *FM MODULATION METERING* display should be kept in the default mode for the most exact measurement of the station's carrier deviation.

The above are just the first, basic steps in DB3000 operation. Detailed explanation of tuning, setting up and measurement procedures are given in the lower chapters.

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FRONT PANEL – READOUT SECTION (LEFT SIDE)

POWER Switch

This is the switch used to turn the DB300 ON or OFF. Prior to switching on the unit, please make sure, that the Internal Power Switch and the fuse rating are set in accordance with the power supply at your location (see "Connecting AC Power and Voltage Selection" on page 11).

Phones

PHONES – phones jack to monitor the received signal. Headphones volume can be menu adjusted by going to SETTINGS – AUDIO OUTPUTS – L/R PHONES LEVELS (see "Audio Output Levels" on page 51).

Bargraphs and LED Indicators, Select Buttons

FM MODULATING METERING – 58 segments LED bargraph indicator to visualize the highest Total Deviation (default), or the Positive or Negative Deviation depending on the *SELECT* button selection. It is peak-responding and it updates-and-holds the highest peak. When both the POS DEV and NEG DEV indicators are lighted, the highest deviation in either polarity is shown and this is the default display mode. The *SELECT* button is also used to switch the bargraph to display the injection level of 19 KHz stereo pilot signal, which is usually set to 7-8 KHz injection. Stereo *PILOT* signal is read on the lower metering scale. It is calibrated in appropriately smaller scale units then the carrier deviation.

SELECT button – used to change the LED bargraph's mode and associated LED indicators. Possible selections are *POS DEV, NEG DEV, POS DEV + NEG DEV, PILOT*.

LED Indicators *PILOT, POS DEV, NEG DEV* – these indicators are associated with the *FM MODULATING METERING* bargraph and indicating currently selected mode.

PEAK – alarm indication for MPX Deviation (*POS DEV + NEG DEV*) beyond a level specified by *SETTINGS – ALARMS THRESHOLDS – DEVIATION* menu (see "Alarms Thresholds" on page 61). This is indication only and **NO** signal to the Rear Panel Alarm Terminal is generated.

STEREO – indication of stereophonic signal being received.

FORCED MONO – when engaged the stereo decoder is disabled and the station is received monaurally with the left and right program channels equally combined.

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AUDIO DEMOD METERING – two 58 segments LED bargraphs showing L/R, L+R/L-R demodulated audio. By default the *AUDIO DEMOD METERING* displays left and right channels of the stereo pair with the *L/R* indicator lighted. The *SELECT* button can be used to switch the *AUDIO DEMOD METERING* display between L/R and L+R/L-R. Upon selecting any of the L/R or L+R/L-R modes the relevant indicator will light, but the headphones will continue monitoring the L/R stereo program.

Although there are instances where the L+R and L-R bargraphs may be close in value, the L-R meter should generally lag the L+R meter by at least a few dB, i.e. the L+R sum will always have more energy than the L-R difference and this applies to nearly all recorded music. For signals where voice announcements are predominant, without background music or for other mono sources the L-R indication may drop almost off-scale.

The *SELECT* button associated with the above described bargraphs cycles amongst the available options, each of them identified with associated LED indicator.

LED Indicators *LR, L+R/L-R* – these indicators are associated with *AUDIO DEMOD METERING* scales, indicating currently selected mode.

LOSS – indicating that the audio of the Left and/or Right stereo channel is lost. DB3000 can detect program audio loss and alarm is initiated whenever any of the Left or Right channels of the stereo pair drops below -15dB for more than 30 seconds. Alarm signal will be generated and fed to the Rear Panel Alarm Terminal upon such occurrence. This function is not affected by the SELECT button.

LEFT PEAK – indicating that the level of the Left audio channel is beyond a preset level as defined by *SETTINGS - ALARM THRESHOLDS* - ANALOG AUDIO LOSS (see "Alarms Thresholds" on page 61). Alarm signal is generated and fed to the Rear Panel Alarm Terminal enabling remote alarm notification.

RIGHT PEAK – indicating that the level of the Right audio channel is beyond a preset level as defined by *SETTINGS - ALARM THRESHOLDS* - ANALOG AUDIO LOSS (see "Alarms Thresholds" on page 61). Alarm signal is generated and fed to the Rear Panel Alarm Terminal enabling remote alarm notification.

ALARM – this LED lights if any of the alarms, as defined in the menu *SETTINGS – ALARMS THRESHOLDS* is activated (see "Alarms Thresholds" on page 61). Alarm signal is generated and fed to the Rear Panel Alarm Terminal enabling remote alarm notification.
Alarm could be sent for the following signals and signal parameters:
- CARRIER LOSS
- MULTIPATH
- DEVIATION
- PILOT
- SCA
- ANALOG AUDIO LOSS
- HD AUDIO LOSS

FRONT PANEL - LCD DISPLAY, NAVIGATIONAL & SOFT BUTTONS (RIGHT SIDE)

LCD Display

The DB3000's LCD display has four function areas: Header, Soft Button's captions, Navigational Bar and Main Screen Working Area.

LCD Display with its function areas

Header

The Header is located at the upper end of the screen and contains the following items:

Communication Indicator ⊞ showing the currently active remote connection (located in the upper left corner).

Frequency Indicator showing the currently selected frequency. Frequency's resolution is 0.1 MHz;

Input - ⊞ - Currently selected active Input:
 - ANT – signal being processed is the one from the Antenna Input.
 - MPX – input from external MPX source;

Attenuator – showing the state and currently selected position of the ANT Input Attenuator as indicated by the corresponding icon:
⊞ - AUTO - DB3000 selects automatically the Attenuator's position. As shown there is no attenuation selected;
⊞ - ATT - Attenuator's position is set by the operator. In this example -20dB attenuation is selected. Possible selections are OFF, Auto, -10, -20, -30 dB.

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Quality Indicator - indicating quality of the received signal. This indicator is based on integrated assessment of the Signal's Level, ATT position and Multipath. Possible states are LOW, GOOD and HI;

Stereo Indicator - indicator for stereophonic information contained in the received signal.

RDS Indicator - indicator for RDS information contained in the received signal.

Signal Level - indicator to show the signal level at the ANT input.

De-emphasis indicator - indicating currently selected De-emphasis. Possible selections are:
- OFF – no de-emphasis is selected;
- 50 – de-emphasis with 50 µs time constant is selected;
- 70 – de-emphasis with 70 µs time constant is selected.

Having three different selections, the question arises which one to select? As well known, one of the problems with the high quality VHF FM transmissions is that the increased audio bandwidth means that background noise can often be perceived. It is particularly noticeable towards the treble end of the audio spectrum, where it can be heard as a background hiss. To overcome this it is possible to increase the level of the treble frequencies at the transmitter. At the receiver they are correspondingly attenuated to restore the balance. This also has the effect of reducing the treble background hiss which is generated in the receiver. The process of increasing the treble signals is called pre-emphasis, and reducing the treble signals in the receiver is called de-emphasis. The rate of pre-emphasis and de-emphasis is expressed as a time constant. It is the time constant of the capacitor-resistor network used to give the required level of change. In the UK, Europe and Australia the time constant is 50 µs whereas in North America it is 75 µs.

So it can be selected depending on the region you are located or to completely disable this feature.

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Soft Buttons

LCD Display

Soft buttons are located on the right side of the LCD Display. They make it possible direct transition from some of the pages to another page, selecting or changing a function or parameter. Menu Page, Function or Parameter that correspond to a particular Soft Button will appear as 1 or 2 lines caption on the LCD display. In all cases the caption of a particular Soft Button corresponds to the page, parameter or function it is linked with and follows the changes. Pressing of a particular Soft Button causes visual effect of pressing the appropriate Soft Button on the LCD Display.

It should be noted that most of the pages have the same or similar functionality distinctive segments (areas).

Example:

 - This button will APPLY changes being made;

 - MAIN PAGE will be selected;

 - Alternating the HOLD button status;

Each parameter's name will appear on the upper line of the corresponding Soft Button caption, followed by the parameter's value on the lower line:

 , .

These will follow the parameter's change.

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Navigational Bar

A bar located at the bottom of the LCD Display shows the Navigational Buttons meaning for each of the pages.

Navigational Bar

Example:

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Main Screen Working Area

The Main part of the LCD Display is a place where information is changed dynamically, depending on the selected working mode. The Menu Screen (shown below) will appear when you turn on DB3000 or after a short press of the OK Navigational Button. The DB3000's Menu Page contains software buttons for selecting various modes and functionalities of this device.
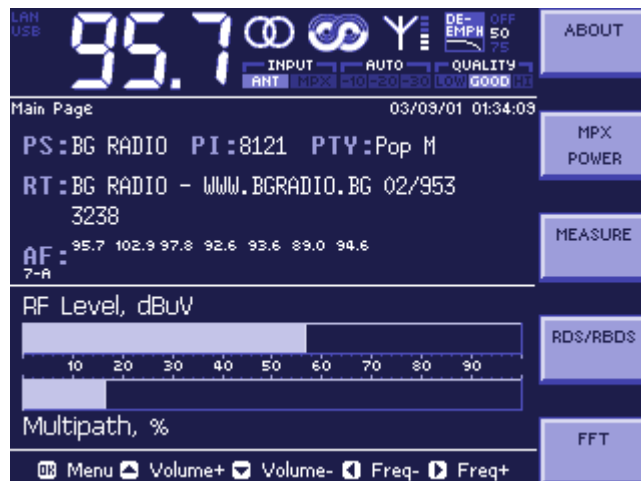

Software Buttons

You can scroll through the menus using any of the *UP* or *DOWN*, *LEFT* or *RIGHT* Navigational Buttons and select desired menu by pressing the *OK* button.

The following Operating Modes and sub pages can be selected using the above said Navigational Buttons:
- Measure Stereo
- Measure Carrier
- Settings
- MPX Power
- Main Page
- RDS Decoder
- Scope (Oscilloscope)
- RF Spectrum
- MPX Spectrum

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Main Page

Main Page

Pressing any of the Soft Buttons *ABOUT*, *MPX POWER*, *MEASURE*, *RDS/RBDS* or *FFT* will perform transition to the appropriate page. Shown are also the most important attributes of the RDS signal, Signal Level at the ANT Input and Mulitpath.

About page

This is an informative page, representing the unit's Serial Number, MAC address and some of the DB3000's circuitry.

About page

Press the OK button to return to Main Page.

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Measure Carrier Page

MEASURE CARRIER is a group of three sub-pages:

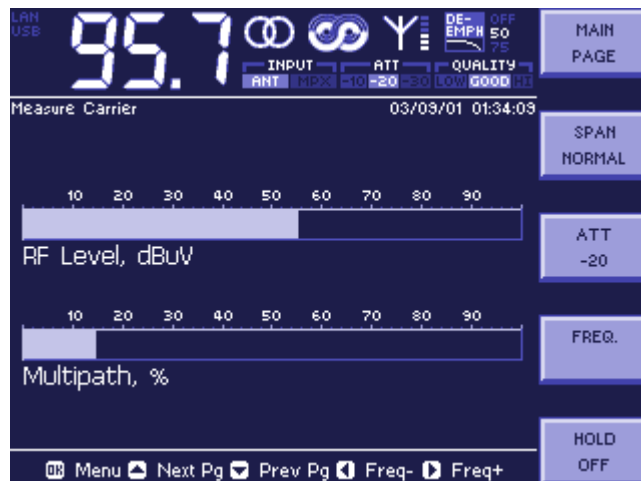MEASURE CARRIER – RF signal main parameters;
MEASURE AUDIO – measurement of demodulated Audio Signal basic parameters;
MEASURE MODULATION – MPX signal measurement;

While in the main menu, using the Navigational Buttons select "**MEASURE CARRIER**" button and press the *OK* button. This will open *MEASURE CARRIER* sub page.

Navigational Buttons *UP* and *DOWN* can be used to select any of the three sub-pages. Pressing the *OK* button in any of the sub-pages will bring back the Main Menu.

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Measure Carrier sub page

Measure Carrier Sub page

Detailed explanation of the Soft Buttons and their functions in *MEASURE CARRIER* sub-page is given below:

SB1 - MAIN PAGE – turning back to the Main Page;

SB2 - SPAN NORMAL / ZOOM – used to change the scope of the RF Level bargraph.

SB3 - ATT – used to set desired attenuation level of the ANT Input. Repeatedly pressing, this Soft Button will cycle the attenuator through AUTO, OFF, -10, -20 and -30 dB. Selected attenuation level will be indicated by the corresponding icon located on LCD Display Header.

SB4 - FREQ / PROGRAM – through this Soft Button functioning of the Navigational Buttons LEFT and RIGHT can be changed as follows:

- If the state of SB4 is FREQ, then the LEFT and RIGHT buttons are used to change the received signal frequency up or down. The available steps of frequency change are 100 KHz for single press of the LEFT or RIGHT buttons and 500 KHz if any of these buttons is kept pressed.

- If the state of SB4 is PROGRAM, then the LEFT and RIGHT buttons are used to cycle through presets (if any).
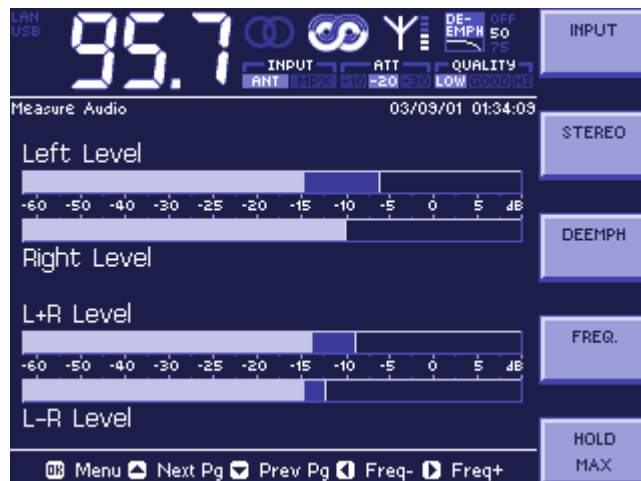
SB5 - HOLD – selects between the 4 available positions of the Peak Hold function:
  - OFF - Peak Hold is OFF;
  - MIN - Peak Hold of the minimum signal level;
  - MAX - Peak Hold of the maximum signal level;
  - BOTH - Peak Hold function is active for both the minimum and maximum levels.

NOTE: The Peak Hold is reset automatically every 3 seconds, regardless if minimum, maximum or both of them are active.

MULTIPATH is the other bargraph visualized on this sub-page. It is for informative purposes only and there are no Soft Buttons to affect its performance.

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Measure Audio sub page

Measure Audio Sub page

Measure Audio is the sub-page where the audio levels of the received signal are visualized.

Detailed explanation of the Soft Buttons and their functions in MEASURE AUDIO sub-page is given below:
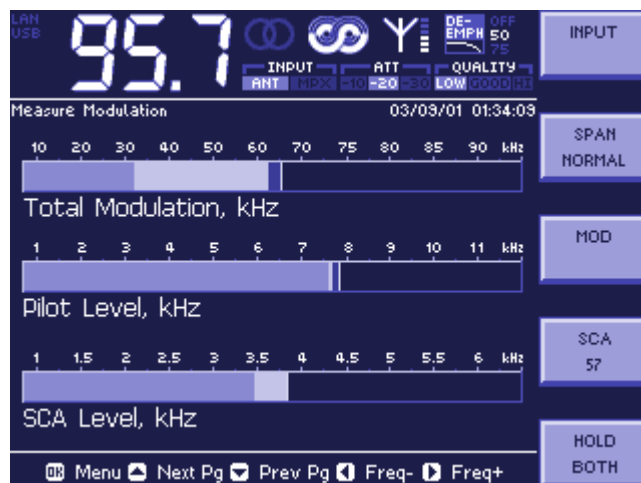
SB1 - INPUT – this Soft Button determines the active Input. Available sources are ANT and MPX. Active selection is indicated by the corresponding icon on the LCD Screen Header.

SB2 - STEREO – when pressed the stereo decoder is disabled and the station is received monaurally with left and right program channels equally combined. This button's caption will change to FORCED MONO and the LED indicator FORCED MONO on the front panel will be lighted.

SB3 - DEEMPH – this Soft Button selects the De-emphasis Time Constant between the three available states: OFF, 50µs and 75µs. Active selection is indicated on the LCD Screen Header.

SB4 and **SB5** - FREQ and HOLD Soft Buttons have identical meaning as that in the MEASURE CARRIER sub-page .

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Measure Modulation sub page

Measure Modulation sub page

Detailed explanation of the Soft Buttons and their functions in MEASURE MODULATION sub-page is given below:

SB1 - INPUT – this Soft Button determines the active Input. Available sources are ANT and MPX. Active selection is indicated by the corresponding icon on the LCD Screen Header.

SB2 - SPAN – used to change the scope of the Total Modulation bargraph. Repeatedly pressing this Soft Button will change the bargraph scope between 10-95 kHz (NORMAL) and 60-85 kHz (ZOOM). Selected status is shown by the corresponding caption.

SB3 - MOD – used to change the Modulation parameter as shown in Modulation bargraph. The three possible states are: Total Modulation, Positive Modulation and Negative Modulation. In wideband FM, used in wireless broadcasting, the instantaneous frequency varies above and below the frequency of the carrier with no modulation. When the instantaneous input wave has positive polarity, the carrier frequency shifts in one direction; when the instantaneous input wave has negative polarity, the carrier frequency shifts in the opposite direction. At every instant in time, the extent of carrier-frequency shift (the deviation) is directly proportional to the extent to which the signal amplitude is positive or negative.
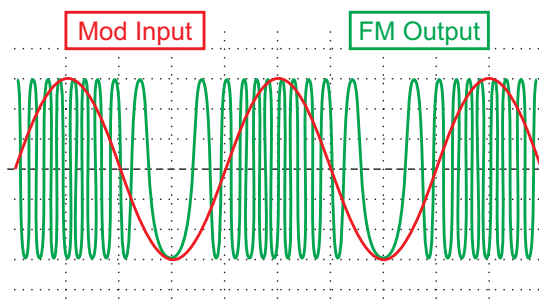
Positive and Negative Deviation.

SB4 - SCA – selects between the two possible states of the SCA level measurement filter - 38 and 57 kHz.

SB5 - HOLD Soft Button has identical meaning as that on MEASURE CARRIER sub-page (see "Measure Carrier sub page" on page 31).

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Measure Stereo Page

Measure Stereo Sub Page

The graphical representation of the phase relations between Left and Right audio channels is illustrated above. This graphic is used to assess mono compatibility of the audio material as well as visualizing the stereo image or balance of the material. Experienced users of this type of display can easily detect the differences between mono signals, "pan-pot" stereo and true stereo signals.

Detailed explanation of the Soft Buttons and their functions in MEASURE STEREO sub-page is given below:

SB1 - BACK - turning back to the Main Menu;

SB2 - DRAW - used to change the drawing method of phase display. Possible positions are CLOUD, STAR and PATH;

DRAW CLOUD

DRAW STAR

SB3 - PERSIST - selects between the 4 available positions of the PERSIST function:

- NONE - PERSIST is OFF;
- LIGHT - Persistent data is drawn with Light color;
- MEDIUM - Persistent data is drawn with Medium color;

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- HEAVY - Persistent data is drawn with Heavy color;

Drawn as PATH with LIGHT Persistent turned on

SB4 - FREQ / PROGRAM – through this Soft Button functioning of the Navigational Buttons LEFT and RIGHT can be changed as follows:

- If the state of SB4 is FREQ, then the LEFT and RIGHT buttons are used to change the received signal frequency up or down. The available steps of frequency change are 100 KHz for single press of the LEFT or RIGHT buttons and 500 KHz if any of these buttons is kept pressed.

- If the state of SB4 is PROGRAM, then the LEFT and RIGHT buttons are used to cycle through presets (if any).

SB5 - CLEAR - wipes out all persistent data;

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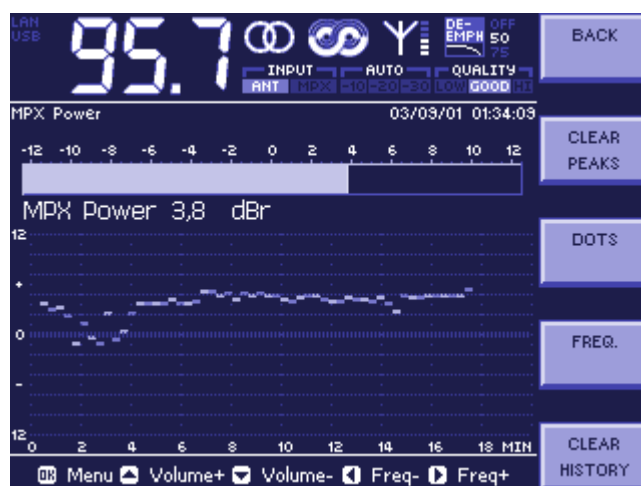
MPX Power Page

The rule of MPX Power provides to measure the modulation power, which is seen equal to modulating signal electric power, for one minute time period and to compare it to a sinusoidal modulating signal one which deviates ±19KHz. The result, expressed in dB, must be lower or equal to zero to comply the rule.

Modulation power is to be considered the relative power averaged over 60 s of the modulation signal according to the formula:

Modulation Power = 10 log {(2/60 s) + ∫ (Δf(t)/19 kHz)2 dt} [dBr]

0 dBr is the average power of a signal equivalent to the power of a sinusoidal tone which causes a peak deviation of ±19 kHz.

MPX power value of the received signal is calculated continuously and the period to integrate a new value is 20 seconds. This value is visualized both as bargraph and as discrete numerical value. Last 60 measured values are stored and used as parameter's history.
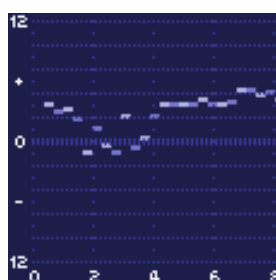

MPX Power

Functions and operation of the Soft Buttons associated to this page are explained below:
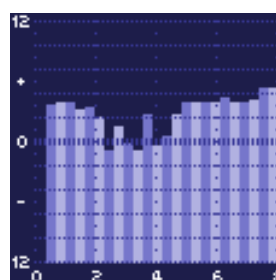
SB1 - BACK – moving back to the previous page;

SB2 - CLEAR PEAKS – wipes out all collected data for retained maximum and minimum peak values.

SB3 - DOTS / BARS – selects history's view as DOTS or BARS.

DOTS   BARS

SB4 - FREQ – (see "Measure Carrier sub page" on page 31);

SB5 - CLEAR HISTORY – resets the history's contents and data accumulation starts again;

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RDS/RBDS Decoder Page

RDS information that is contained in the processed MPX signal is represented in two pages: RDS Data and RDS Statistics.

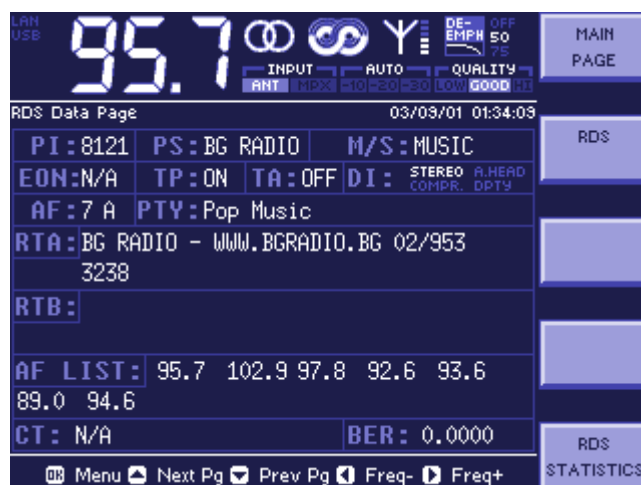When RDS mode is selected the Soft Buttons meaning is as follows:
SB1 - MAIN PAGE – turning back to the Main Page;
SB2 - RDS changing between RDS and RBDS mode;
SB5 - RDS STATISTICS / RDS DATA - transition between the two RDS pages. The same can be accomplished also through the Navigational Buttons UP or DOWN.

RDS/RBDS Decode sub page

RDS Data sub page

RDS Data sub page represents in a convenient table view the main RDS parameters:

PI (Program Information) – 4 digits Program Identification code. This field contents depend on the selected RDS or RBDS mode. In RBDS mode for the user's convenience is shown the so-called CALL SIGN.

PS (Program Service Name) – this is the label of the Program Service consisting of not more than 8 alpha-numeric characters representing the name of the station. An example for a name is "Radio 21".

M/S (Music/Speech) – provides information on whether MUSIC or SPEECH is being broadcast;

EON (Enhanced Other Networks information) – indicates whether in the RDS/RBDS stream is present EON information. EON allows the RDS/RBDS equipped receivers to monitor other networks or stations for traffic programs, and automatically temporarily tune into that station. Possible states are N/A, OFF, ON;

TP and **TA** – indicate the current status of TP and TA RDS/RBDS flags. The receiver can often be set to pay special attention to this flag and e.g. stop the tape/pause the CD or retune to receive

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a Traffic bulletin. The TP flag is used to allow the user to find only those stations that regularly broadcast traffic bulletins whereas the TA flag is used to stop the tape or raise the volume during a traffic bulletin.

Possible states are N/A, OFF, ON;

DI – this is a field consisting of four RDS/RBDS flags with the active one being lit. It stands for Decoder Identification and dynamic PTY indicator. These bits indicate which possible operating modes are appropriate for use with the broadcast audio and to indicate if PTY codes are switched dynamically.

AF – indicates the number of Alternative Frequencies and the broadcast method used – A or B. This allows a RDS/RBDS equipped receiver to re-tune to a different frequency providing the same station when the first signal becomes too weak (e.g. when moving out of range). This is often utilized in car stereo systems.

PTY – this is an identification number to be transmitted with each program item and which is intended to specify the current Program Type within 31 possibilities. This code could be used for search tuning. This code will, moreover, enable suitable receivers and recorders to be pre-set to respond only to program items of the desired type. The last number, i.e. 31 is reserved for an alarm identification which is intended to switch on the audio signal when a receiver is operated in a waiting reception mode. This field content depends on the selected mode – RDS or RBDS;
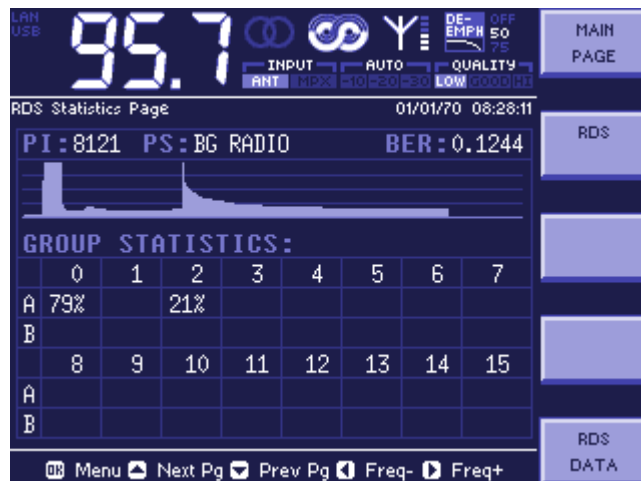
RTA, RTB – the so-called RADIO TEXT. This function allows a radio station to transmit a 64-character free-form textual information that can be either static e.g. station slogans or in sync with the programming such as the title and artist of the currently-playing song.

AF LIST – list of broadcast Alternative Frequencies;

CT – The Clock Time feature is designed to enable a receiver to set and maintain accurate time and date, both for display and for control purposes. CT is used as time stamp by various RDS applications and thus it must be accurate. If no CT is broadcast, then N/A will be shown in the CT field.

BER (**B**it to **E**rror **R**atio) - is the ratio between all the valid and non valid RDS data. It changes in the range between of 0 to 1. In case the RDS is coming with 100% valid data stream, the BER indicator will measure 0. If some errors are detected, the BER reading may rise.

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RDS/RBDS Statistics sub page
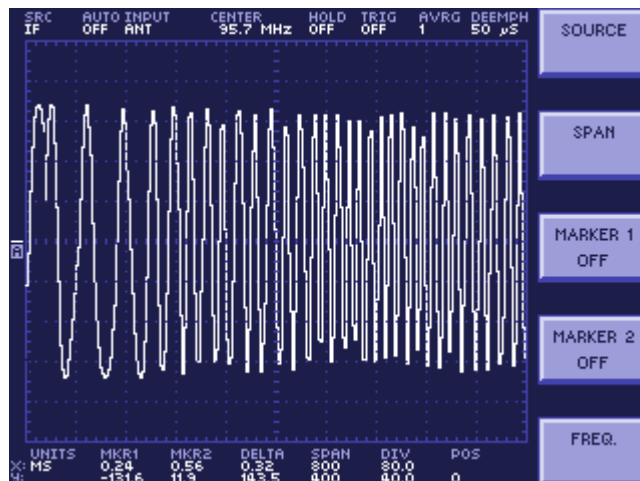

RDS Statistics page

This page represents statistics of the RDS broadcast. Percentage distribution between RDS groups is represented in tabular form showing the percentage broadcast time of each group or percentage of a group as compared to the other groups. Percentage values are rounded to an integer.

A graphical indicator situated at the upper end of the screen, represents how the BER parameter is changed over time:


The entire length of the indicator is a time span with duration XX minutes. Its reading is reset automatically at each entry in the RDS Statistics page.

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Oscilloscope (SCOPE) Page

DB3000 as scope

SCOPE mode is used to visualize the most important signals participating in the process of demodulating and stereo decoding. This mode represents the observed signal change over time. In order to maximize the plot area, the top and bottom parts (header and footer) of this page differ from the conventional view. Around the plot area are disposed various parameters affecting oscilloscope's operation. Some of these parameters are informative, some of them are indicators, and others can be directly changed by the user. To change a parameter (SOURCE, SPAN, MARKER 1, MARKER 2) press the corresponding Soft Button (SB1 – SB4). Selected parameter's name will be surrounded by a rectangle and editing mode will be initiated. Upon pressing MKR1 or MKR2, the relevant marker will appear if it was hidden.
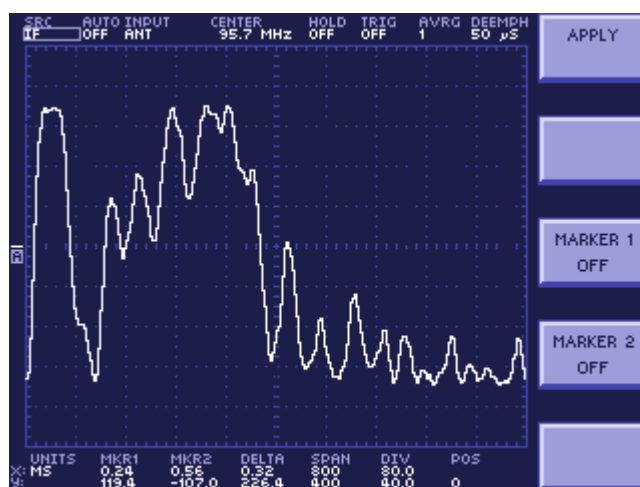
Scope's view after pressing the "**SOURCE**" button.

Now by the Navigational Buttons Up or Down, value of the selected (focused) parameter can be changed within the limits of potential values. To select the previous or next parameter use the LEFT or RIGHT Navigational Buttons respectively. Selected parameter's change is applied

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immediately, while pressing the "**APPLY**" button will exit the editing mode.

Repeatedly pressing any of the Soft Buttons "**MARKER 1**", or "**MARKER 2**" will hide or make visible the relevant marker in the plot area.

SCOPE parameters meaning is as follows:

SRC - (Signal Source) – indicates the signal visualized in the plot area. Possible selections are: IF, MPX, PILOT, SCA, LEFT, RIGHT, L+R or L-R. It should be noted that each signal has its own pre-set of parameters (trigger, span, etc.). Any of the available signals may be selected by the Navigational Buttons UP or DOWN..

ATT - indicates the ANT Input Attenuator's state. When in AUTO mode the parameter's name will be AUTO instead of ATT. Attenuation level can be selected by the Navigational Buttons Up or Down.

INPUT - indicates which one of the ANT or MPX EXT input is active.

ANT or MPX EXT can be selected by the Navigational Buttons UP or DOWN.

ATTENTION: If SRC = IF, then the signal observed in the plot area is the one coming from the ANT input, regardless of the INPUT selection.

CENTER - shows the frequency (in MHz) that the ANT input is tuned in. The Navigational Buttons UP or DOWN can be used to select another frequency.

HOLD - indicates any of the three available positions:

 - OFF - HOLD function is switched off;

 - MIN - minimums of the signal levels will be retained;

 - MAX - maximums of the signal levels will be retained;

Any of the available positions can be selected by the Navigational Buttons UP or DOWN.

TRIG - indicates the trigger's type, while at the same time the status indicator 🔳 could be seen on the left side of the plot area. Positions available are:

 - OFF - No triggering is used;

 - A (Auto) - meaning there is no coincidence for the triggering condition and the signal's buffer (in fact there is on triggering).

 - T (Triggered) - the signal is triggered. A dash above the symbol indicates the triggering level.

Any of the three available positions may be selected by the Navigational Buttons UP or DOWN.

RISE - triggering on the rising edge of the signal;

FALL - triggering on the falling edge of the signal;

AVRG - indicates buffer numbers taken into account in calculation the average signal. Using this function makes sense in monitoring periodically triggered signals. The trigger's status indicator must be "T". Buffer's value can be selected by the Navigational Buttons UP or DOWN.

DEEMPH - indicates the De-emphasis Time Constant between the three available states: FLAT (OFF), 50 μs and 75 μs. Any of the available positions can be selected by the Navigational Buttons Up or Down.

UNITS - measuring units for the X and Y axis. DELTA is not an editable field.

MKR1, **MKR2** - fields to show the X and Y axis markers values. These values are constantly updated even if the markers are hidden and not visible in the plot area.

The Horizontal Axis X markers are vertical dashed lines that can be repositioned across the axis. On the other side, the Vertical Axis markers are small triangles, always located on the dashed

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lines representing X markers. They will move up and down along the vertical lines, synchronously with the curve representing the amplitude of the monitored signal.

To move a marker across the Horizontal Axis first select it and make it visible by pressing MKR1 and/or MKR2 Soft Buttons. Now by pressing the Navigational Buttons UP or DOWN selected marker can be repositioned across the Horizontal Axis.

DELTA - showing the absolute value of the difference between the MKR1 and MKR2 values. DELTA is not an editable field.

SPAN - showing the X and Y scales ranges. The X axis range depends on the selected signal (IF, MPX, PILOT, SCA, LEFT, RIGHT, L+R or L-R), as the sampling rate is different for each signal. Ranges for the each of the scales can be selected by the Navigational Buttons Up or Down.

DIV - indicates each division's value on the graticule for the X and Y axis scales. This field can neither be selected nor edited.

POS - indicates the signal displacement along the vertical scale Y. It can be moved up or down using the Navigational Buttons UP or DOWN respectively.

TRIG LEVEL - this is an implicit parameter without caption in the plot area. When selected, the area left from the vertical axis Y will be surrounded by a rectangular in which the trigger indicator falls. This level can be adjusted by the Navigational Buttons UP or DOWN.
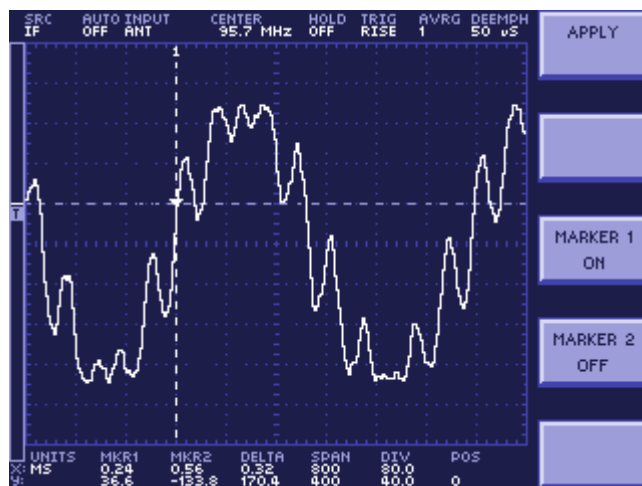

Trigger's level change and one of the markers shown

When changed the trigger's current level is shown for some time as dashed horizontal line in the plot area.

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**MPX Spectrum and RF Spectrum Pages (Spectrum Analyzer)**

Similarly to the above described SCOPE mode, both MPX SPECTRUM and RF SPECTRUM are modes for spectral analysis of the input signal. Spectral components of the selected signal are determined on the base of Fast Fourier Transform.
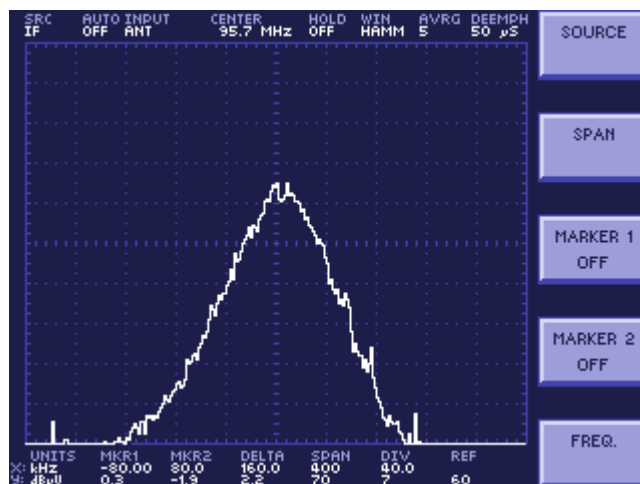
IF signal spectrum

Display appearance and navigation, parameter's change and meanings are similar to those described in the SCOPE section with the only difference, that the TRIG and TRIG LEVEL parameters are removed and a new parameter WIN is added instead.

WIN (Window function) – sets the Window Function to calculate the FFT. The possible parameter values are: HAMM, HANN, BLACK and RECT – Hamming, Hanning, Blackman and Rectangular Window Function respectively. More information regarding Window Function utilization can be found on http://zone.ni.com/devzone/cda/tut/p/id/4844 .
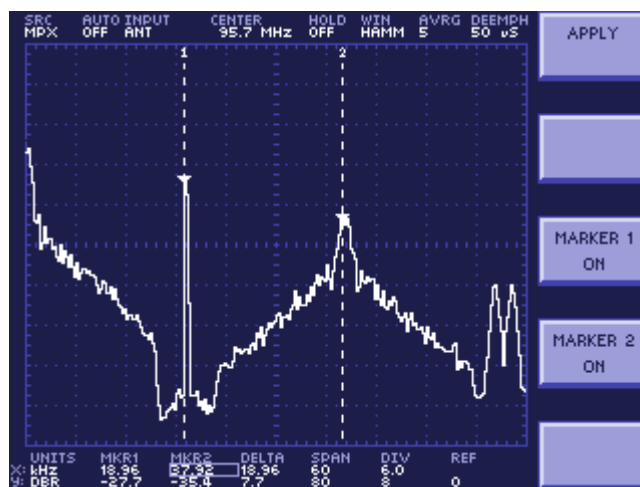
FFT of MPX

In this example the span of the Horizontal Axis X is 60 kHz. All the components of the MPX signal can be clearly seen: Marker 1 is over the Pilot signal, Marker 2 in the area of the L-R audio. RDS signal is also visible at the extreme right of the plot area.

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Adjustment and Device Settings – Settings Page

DB3000 settings can be reached through the "**SETTINGS**" button. The sub menu SETTINGS appearance and navigation are similar to those of the Main Menu and all of its sub pages will be examined below.

Sub-menu Settings

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Access Code

SECURITY is the sub-page where **Access Code** must be entered in order to make some of the pages accessible. The default *Access Code* is **1234** but it could be changed if needed. Protected pages are marked by a small padlock at the lower left corner and all their buttons are inactive.
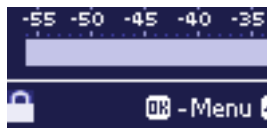
Protected page

Security measures will enter into effect only 10 minutes after their activation and only if there is no button activity during this time. To access the SECURITY Settings after the 10 minutes period you must re-insert the *Access Code*.

Access Code page

To insert the Access Code, please use the Navigational Buttons LEFT or RIGHT to select each digit's position, and UP or DOWN to select specific value.

Selected digit will be visualized for a short time (3-4 seconds) and replaced by a dash (-) for security reasons.

The "**ACCEPT**" button is to verify the inserted four digits code. Upon validity confirmation, transition to the SECURITY SETTINGS page will be performed and all DB3000's features become available. No action will be taken if the inserted code validity is rejected.

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Unlock Code

This page allows insertion of the so-called "**UNLOCK CODE**". Each DB3000 unit has its unique Unlock Code that is to be used in the event the Access Code is lost. To obtain your Unlock Code, please contact Deva Broadcast Ltd. and report the Serial Number of your DB3000 as taken from the *ABOUT* menu.

Unlock Code page

The procedure of *Unlock Code* insertion is identical to that of the *Access Code* insertion. If the validity of the inserted *Unlock Code* is confirmed, then the *Access Code* value will be restored to its default (**1234**) and all security functions will be disabled (checkbox *Disable Security* on *Settings Security* is unchecked).

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Preset Freq's Page

PRESET is a pre-saved set of parameters for instant recall later on.

"Preset" explained

Presets store the following data:
- FM frequency;
- Attenuator's state;
- De-emphasis state;
- Forced Mono state;
- De-emphasis state;
- PI RDS field's value as taken from the RDS data;
- RF signal's level at the time of Presets' creation.

Presets and their attributes stored in DB3000 are visualized on the screen in tabular view as shown below:

- No – Preset's consecutive number
- En/Dis – indicating if a preset is enabled or banned. If a preset is banned its parameters can not be utilized by DB3000, i.e. it becomes inactive. This attribute can be used to activate/deactivate any preset.
- Freq – FM frequency;
- PI/CALL – RDS PI;
- RF Level – RF level at the ANT Input.

Preset's attributes FREQ, PI/CALL and RF Level will be updated upon Preset's edit;

No Presets created

Creating a new Preset

Open the *PRESET FREQ'S* menu and by the Navigational Buttons *LEFT* or *RIGHT* select desired frequency. Now press the lowest Soft Button (SB5) labeled *NEW*. A new Preset was created with parameters corresponding to those at the time of creation: *FREQUENCY, ATT, DE-EMPHASIS, FORCED MONO, RDS PI* and *RF Level*. The newly created Preset is visualized on the Table of Presets and can be edited later on.

NOTE: New Preset will not be created if there is an existing one with the same frequency.

3 presets with the second one being selected

Editing of Presets

Open the *PRESET FREQ'S* menu and by the Navigational Buttons *UP* or *DOWN* select the Preset to be edited (surrounded by a dashed rectangle). Now press SB1 - *EDIT*.

Preset No 2 in editing mode

When a Preset is in editing mode, the Soft Buttons SB1 – SB5 will change their functions as follows:

SB1 - BACK – exits editing mode without saving the changes;
SB2 - STREO/MONO – changing FORCED MONO flag;
SB3 - DEEMPH – changing De-emphasis time constant;
SB4 - ATT – changing Attenuator's settings;
SB5 - APPLY – changes will be applied and DB3000 will exit Preset Editing Mode;

In Preset Edit mode the Navigational Buttons *LEFT* and *RIGHT* are used to change the Preset's Frequency. Also SB2, SB3, SB4 functions will change and the corresponding captions will indicate values of the parameters being edited;

NOTE: PI/CALL and RF Level fields are dynamically updated.

Presets Removal

Open the *PRESET FREQ'S* menu and by the Navigational Buttons *UP* or *DOWN* select the Preset to be removed (surrounded by a dashed rectangle). Now press the SB4 - *REMOVE*. Selected Preset will be permanently deleted from the list of Presets.

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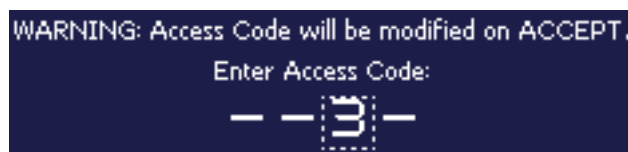
Security sub page

This page enables you to set restrictions on access to certain DB3000 features and changing the Access Code as well. Access to this page is protected by default.
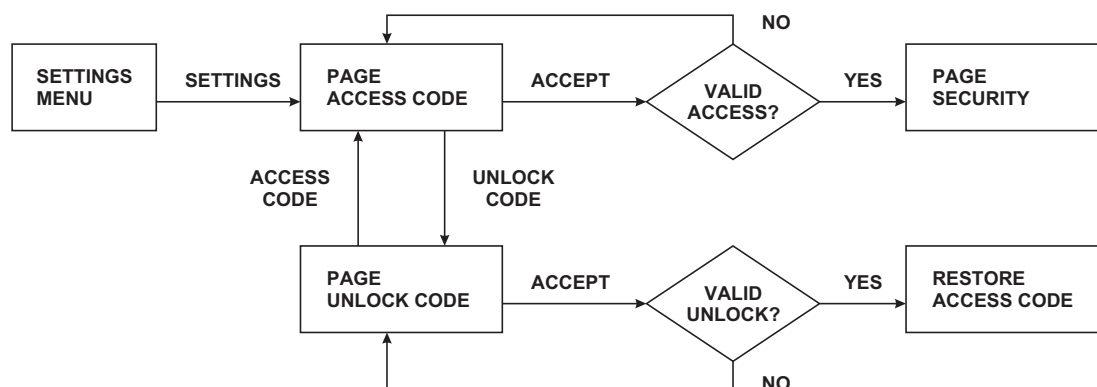

Security page

Selecting any of the sub-menus is performed by the Navigational Buttons UP and DOWN, while the LEFT or RIGHT buttons are used to change the state of the selected sub-menu: active ☑ or not active ☐ . The same is applicable for the *Access Code* as well. Selecting a check-box applies the restrictions for the corresponding sub-menu. In the above example restrictions will be applied to pages *Communication ports*, *Firmware Update* and *Set Factory Defaults*, while the *Access Code* will remain unchanged.
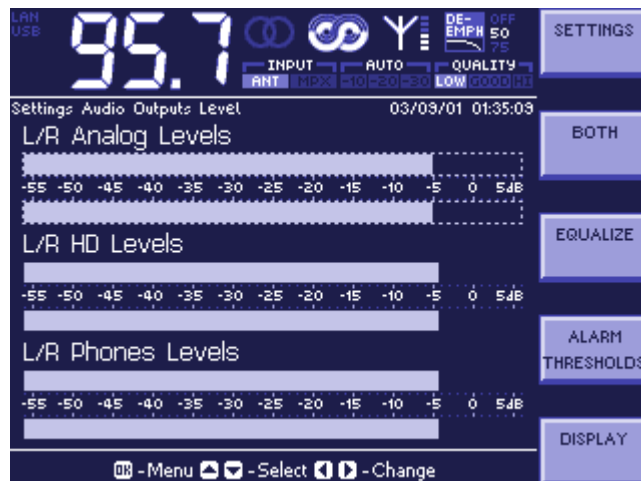
ACCEPT button applies the changes. If the *Access Code* is going to be changed, a warning message as the one shown below will appear:

A Block Diagram illustrating relationship and transition between the Access Code, Unlock Code and Security pages is shown below:

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Audio Output Levels sub page

Audio Levels settings

This page enables you to adjust the DB3000 audio outputs levels. Values set here are used as initial values upon switching on DB3000. The ANALOG AUDIO, HD AUDIO and PHONES output levels can be adjusted for both of the channels (Left and Right) and individually for each of them. Currently selected levels are indicated by the corresponding bargraphs and measured in dB.

The Soft Buttons meaning is as follows:

BOTH/APART - determines whether both (BOTH) or separate (APART) level adjustment of selected audio channel will be performed;
EQUALIZE - equating the Left and Right channel levels;
SETTINGS, ALARM THRESHOLDS, DISPLAY - opening the corresponding Menu page;

Level adjustment of the desired channel can be performed in the following way:
- Using the Navigational Buttons UP or DOWN select the channel to be adjusted (surrounded by a dashed rectangle);
- Using the SB2 BOTH/APART select the adjustment mode – both of the channels or individually each of them;
- Now with the LEFT or RIGHT buttons select desired output level;

Changes take effect immediately.

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Display sub page
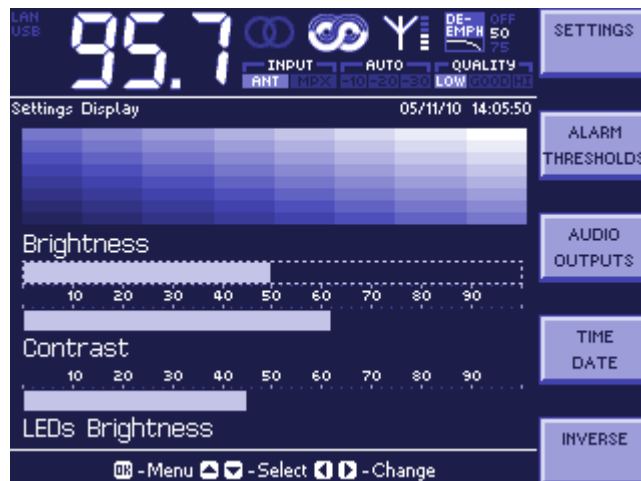
Display Settings page

This page enables you to adjust Brightness and Contrast of the LCD display and brightness of the front panel LED indicators as well. Bargraphs are used to represent currently selected parameter's values.

Brightness adjustment can be performed in the following way:
- Using the Navigational Buttons UP and DOWN select the parameter to be adjusted (surrounded by a dashed rectangle);
- Using the LEFT or RIGHT buttons set desired level of selected parameter;

Changes take effect immediately and are stored in the non-volatile memory.

The "**INVERSE**" button is used to change the LCD background between normal and light.

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COMM Ports sub page

This page enables you to set the parameters of the communication interfaces. There are three sub-views – for network (LAN) , RS232 (UART) and USB port settings. The Navigational Buttons UP and DOWN are used to select the desired sub-menu. RIGHT and OK are used to edit/enter the selected Menu. LEFT will go back to previous choice.

Top Menu of Communication Settings

Network/LAN configuration:

Network settings are divided into several sub-pages:

Use the Navigational Buttons to select the desired sub-menu. Press OK or RIGHT to enter sub-menu or edit the selected parameter.

Interface - Enables/Disables the Network Controller;

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IP Configuration:
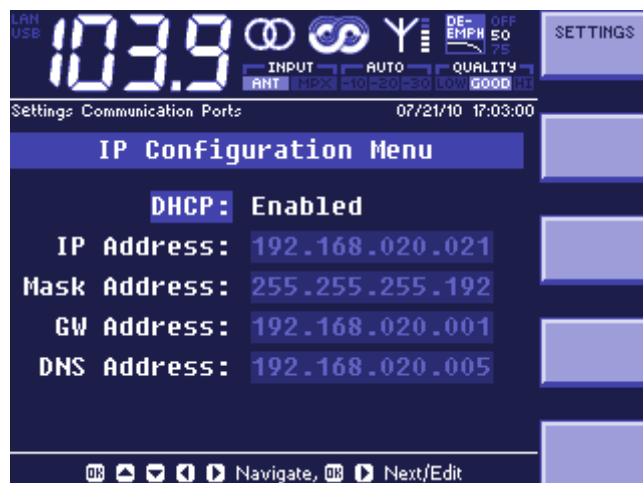
Setting up of network addresses:

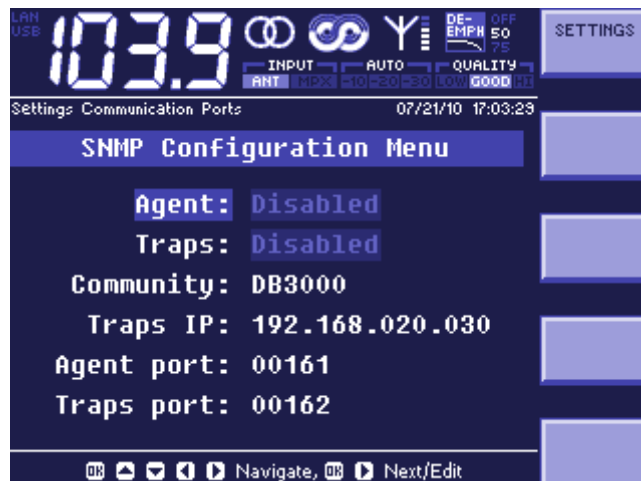There are two ways to setup the network addresses: manually (static IP) and automatically via DHCP client.

Setting DHCP field to Enable will activate the built-in DHCP Client. As a result all network addresses will be read-only. Activating DHCP Client is a procedure that takes about 1-2 seconds and upon its completion all the assigned values will be shown in the relevant fields. Continuing display of zero values means that for some reason the DHCP procedure can not be completed. In this case, it is recommended to check the following items:
- Network cable;
- Whether the LAN Interface is enabled;
- Ping availability to the DHCP Server's IP;
- Sufficient address space for distribution by the DHCP server;

To setup IP, MASK, GATEWAY and DNS addresses manually, first set DHCP to Disabled, then using the Navigational Buttons change addresses to appropriate values.

NOTE: The digit to be edited will not change if the new value would lead to invalid address.

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SNMP Configuration:

Simple **N**etwork **M**anagement **P**rotocol (SNMP) is a UDP-based network protocol. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention. SNMP is a component of the Internet Protocol Suite as defined by the Internet Engineering Task Force (IETF). It consists of a set of standards for network management, including an application layer protocol, a database schema, and a set of data objects.

SNMP exposes management data in the form of variables on the managed systems, which describe the system configuration. These variables can then be queried (and sometimes set) by managing applications.

In typical SNMP use, one or more administrative computers called managers have the task of monitoring or managing a group of hosts or devices on a computer network. Each managed system executes, at all times, a software component called an agent which reports information via SNMP to the manager.

Essentially, SNMP agents expose management data on the managed systems as variables. The protocol also permits active management tasks, such as modifying and applying a new configuration through remote modification of these variables. The variables accessible via SNMP are organized in hierarchies. These hierarchies, and other metadata (such as type and description of the variable), are described by Management Information Bases (MIBs).

The MIB file for DB3000 is downloadable through Deva Broadcast Web site.

The DB3000 SNMP agent is compatible wiht SNMPv1 and SNMPv2c versions.

Remote Configuration:
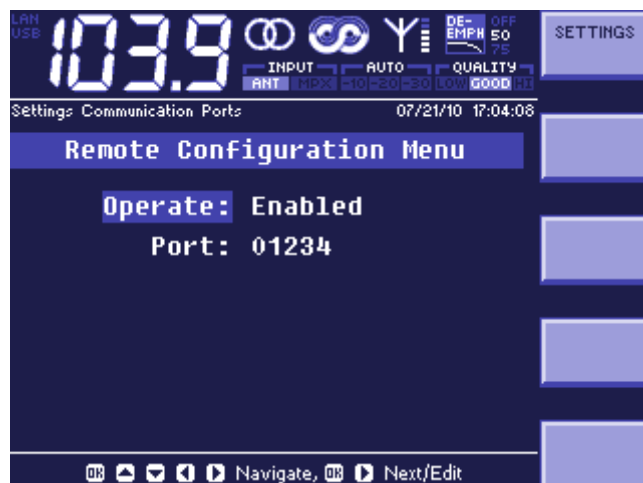
Operate - Enables/Disables the remote connectivity;
Port - defines the local port for remote connection.

USB Configuration:

Interface - Enables/Disables the USB Controller;

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UART Configuration:

Interface - Enables/Disables the connectivity to UART Controller;

Speed - defines the transfer speed. Possible values are 9600, 19200, 38400, 57600 and 115200;

Data Format - defines the number of Data bits, Parity control and Stop bits **D-P-S** where **D** is the number of data bits (6,7 or 8), **P** stands for Parity control (none, odd, even) and **S** for stop bits number (1 or 2).

Flow control - the three possible selections are none, xonf/xoff and rts/cts.

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Date & Time sub page

This page enables you to set the date and clock of the built-in RTC (real time clock) and the relevant format in which they are displayed on the LCD display.

Time & Date page

Date and Time changing is effected in the following way:

- Use the LEFT or RIGHT buttons and select the field to be changed. Selected field colour will be lighter than the rest of fields;

- Use the UP or DOWN buttons to select desired value. Each press increases or decreases the field value by 1, which is visible on the LCD display.

Example: If the current date is 31-Dec-2009 and the Date field is increased by 1, the resulting date will be 01-Jan-2010.

The above procedure is identical for all the fields and changes take effect immediately.

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The Date and Time format can be changed by the Soft Buttons in the following way:

- **TIME FORMAT** – each press of this Soft Button (SB2) will change the Time field format. Possible formats are HH:MM:SS, HH:MM, HH:MM AM/PM and a blank field;

- **DATE FORMAT** – each press of this Soft Button (SB3) will change the Date field format. Possible formats are DD:MM:YY, DD-MM-YYYY, DD-mmm-YY a blank filed;

- **HIDE DATE, HIDE TIME** – pressing any of these Soft Buttons (SB4 & SB5) will hide the relevant field. Warning message will be displayed at the bottom of the LCD display if any of the fields is hidden. To make them reappear, press the HIDE DATE or HIDE TIME Soft Buttons once again.

Warning for hidden time field

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Alarms Thresholds sub page

Some of the signals available in DB3000 are involved in generation of alarm flags associated with the Alarm Terminal pins on the Rear Panel. The so said signals and signal parameters are:
- CARRIER LOSS;
- MULTIPATH;
- DEVIATION;
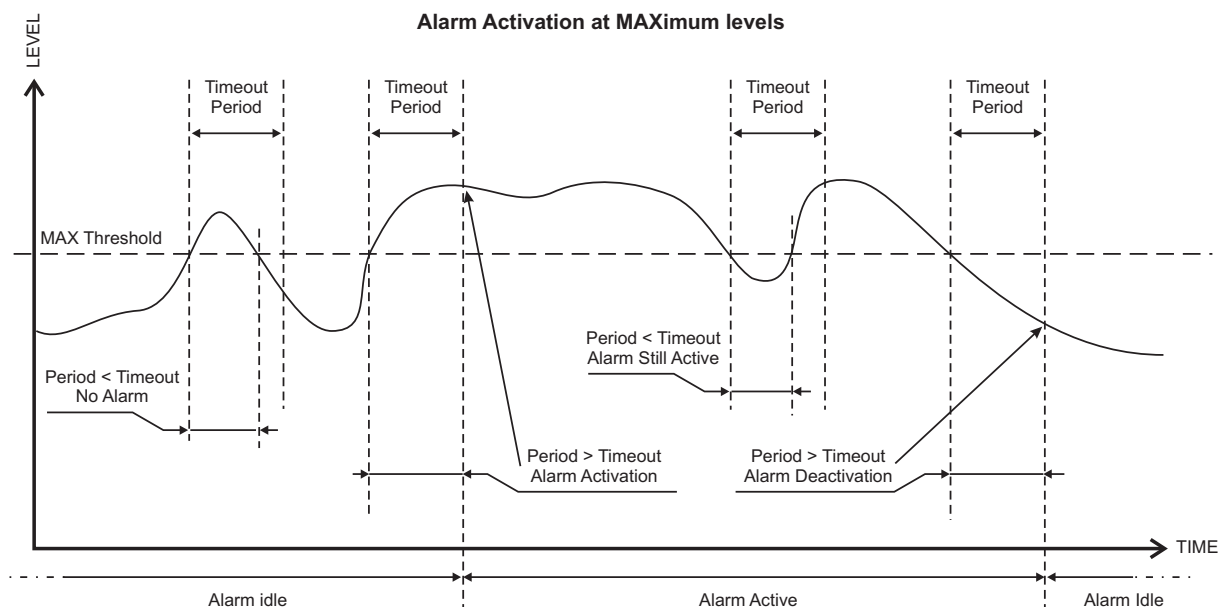- PILOT;
- SCA;
- ANALOG AUDIO LOSS;
- HD AUDIO LOSS;

Low /MIN/ and high /MAX/ values can be set for each of the signals. If the current value of a signal is lower then MIN or greater than MAX for a specified time (Timeout), the corresponding alarm flag is activated (the icon ACTIVE becomes white). If there is alarm activation for both MIN and MAX levels, then the two alarm signals are combined and fed to one and the same pin of the Alarm Terminal on the Rear Panel.

It is needed the signal's value (associated with the alarm) to remain within normal limits for a specified time (Timeout), so that the active alarm to be canceled. Activation and canceling times (Timeouts) are equal and can be adjusted according to the needs.

You can also set the active mode and state of the alarm pins – *Level* or *Pulse* and *Open* or *Close* respectively.

On the pictures below is shown alarm activation with regard to timeout periods and threshold level.

Alarm Activation at MINimum levels

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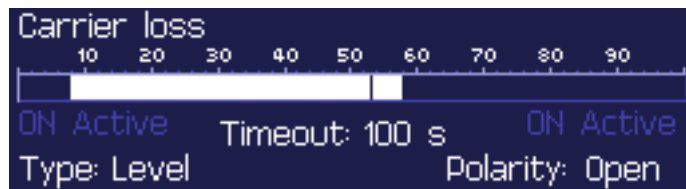**Alarm Activation at MAXimum levels**
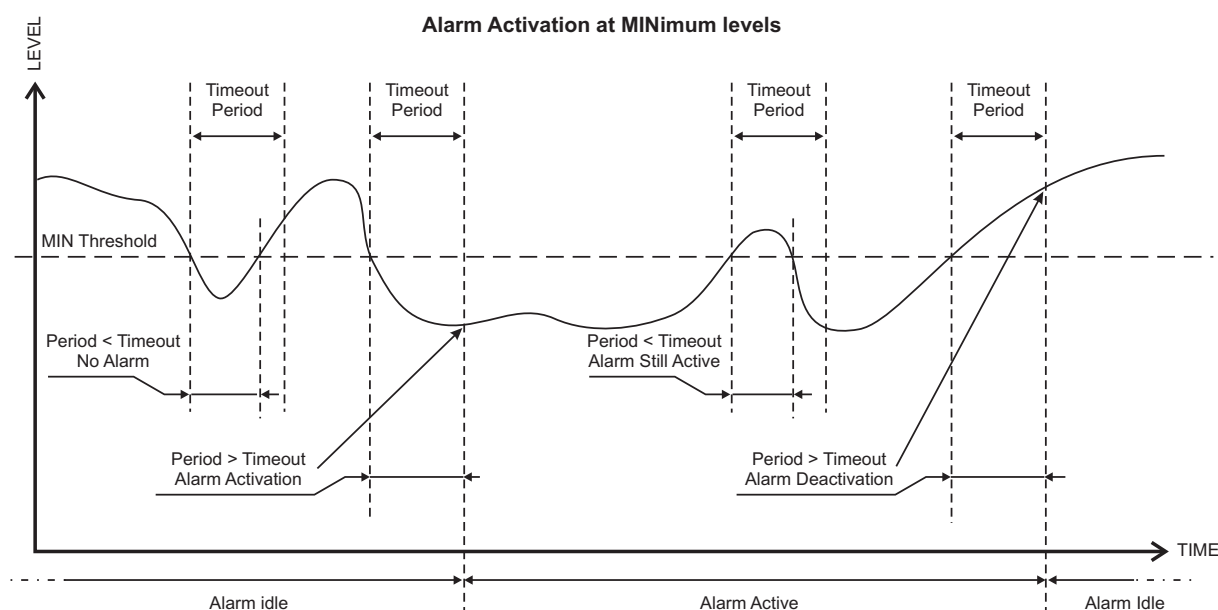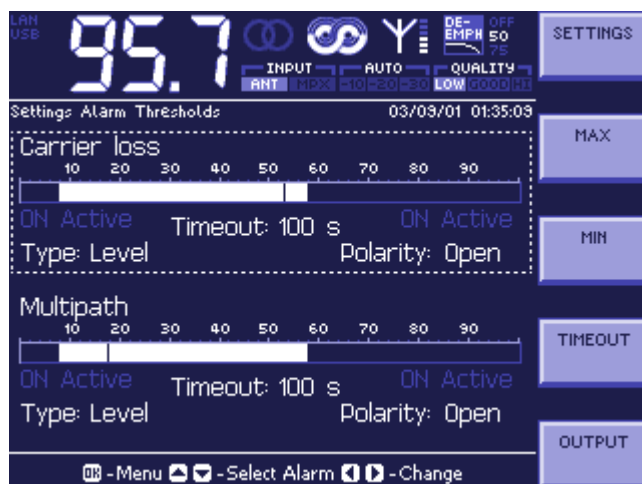
Alarms Thresholds page – Carrier being selected

This page (ALARM THRESHOLDS) can be either in Alarm Selection state or Editing of a selected alarm state. Used as a reference is the Soft Button 1 where SETTINGS stands for Alarm Selection and APPLY means that the selected alarm is in Edit mode.

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On the picture below are given the elements of the alarm field:

General view of the Alarm Setting Field

In the above example the alarm elements are:

- **Name** of the signal associated with the alarm (Carrier loss in this example);
- **Bargraph** scale of the specified limits. You can set the limits of the area in white, representing the range where **NO** alarm is raised. For user's convenience, the current parameter's value is displayed as a vertical line (the black line in the white area, as given in the above example). Value at the left edge of the white scale area determines the alarm flag MIN limit. Value at the right edge of the white area determines the alarm flag MAX limit respectively.
- **ON** - indicating whether the alarm flag MIN or the alarm flag MAX associated with a particular signal and involved in producing alarm signal to the Terminal pins on the Rear Panel are turned on. If <u>white</u>, the corresponding flag is turned on.
- **Active** - indicates whether the corresponding alarm flag is active (measured signal's value is beyond the specified limit (s) for the specified timeout).
- **Timeout** – sets the time in seconds for which the current signal's value must remain outside the limits to activate the corresponding alarm flag - MIN or MAX.
- **Type** - determines whether the alarm output (a pin on the Rear Panel Terminal) is Pulse or Level type. If the selected alarm type is Pulse, then the alarm occurrence causes production of a pulse in the active polarity (see next parameter) with duration 2 seconds. If the selected alarm type is Level then the alarm occurrence will change the level from <u>inactive</u> to <u>active</u> polarity.
- **Polarity** - determines the active state (level) of the alarm output. If *Open* the active status in case of alarm occurrence is "open" (lack of conductivity, high resistance) and vice versa - if *Closed* the active status of the alarm output is closed.
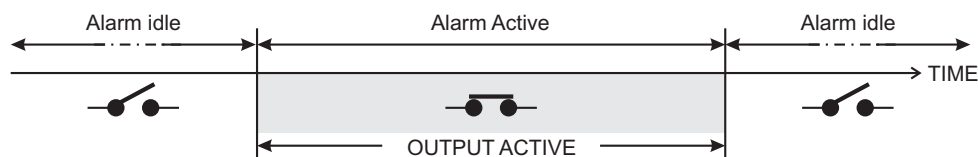
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Lower pictures illustrate the state of the rear panel alrm pin with regard to output polarity and type.
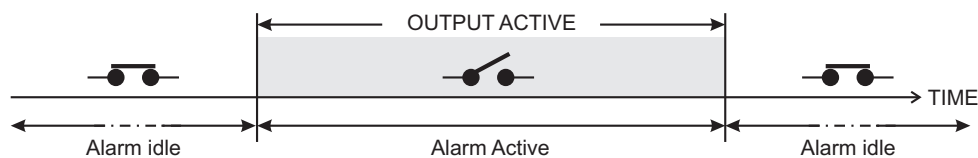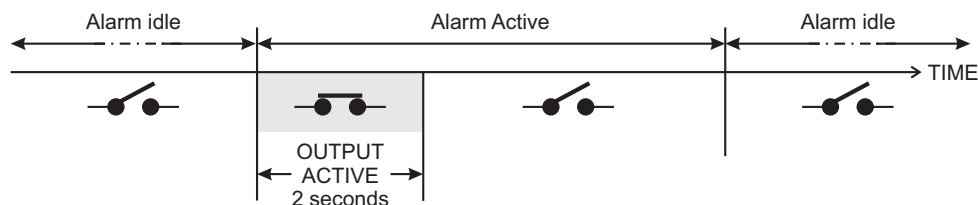
Open Polarity, Level Type
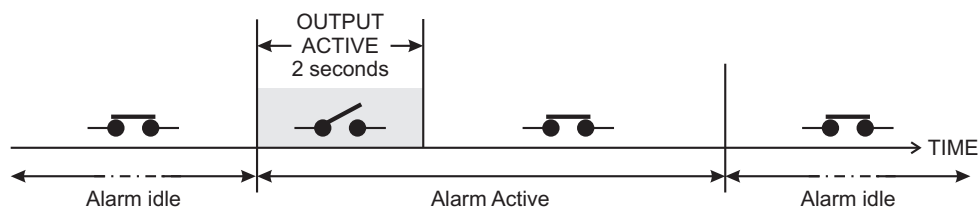
Open Polarity, Pulse Type (Pulse Length = 2 sec)

Close Polarity, Level Type

Close Polarity, Pulse Type (Pulse Length = 2 sec)

Once an alarm is selected, its parameters can be changed while you are in editing mode. This can be accomplished by either pressing any of the Soft Buttons 2 through 5, or Navigational Buttons LEFT or RIGHT. In both cases some of the alarm parameters will be focused and the caption of Soft Button 1will change to APPLY. The difference between the two methods is that SB2 – SB5 will focus directly the element to be edited, while the LEFT or RIGHT buttons will move the focus, cycling through the alarm elements.

The UP or DOWN Navigational Buttons are used to set desired alarm value of a signal, while pressing the SB1 (*APPLY*) will exit the editing mode.

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Factory Defaults sub page

This page allows setting some of the DB3000 parameters to their factory defaults.

Factory Defaults Settings page

For this purpose use the Navigational Buttons to select the set of parameters to be restored to the factory values – *Audio Outputs, Communication Ports* or *Alarm Levels*. To move through the list of sets use the LEFT or RIGHT buttons and to tick selected checkbox use the UP button. The last button is used to cycle between checked and unchecked state of selected set of parameters. This procedure is accomplished by pressing the APPLY Soft Button (SB2).

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Update Firmware sub page

DB3000's firmware update is examined in the following chapter.

DB3000 Firmware Update

The DB3000's firmware can be updated if desired. By updating the firmware, new function(s) can be added, improvement of performance parameters can be obtained and bugs detected during service time can be corrected.

Update process can be started from the SETTINGS -> UPDATE FIRMWARE page and takes place in several stages:

- Transferring the new firmware image file into DB3000's memory;
- Validation of newly transferred firmware;
- Saving the new firmware in the non-volatile memory;
- DB3000 restart;

Firmware Image Transferring Methods

The first stage of firmware renewal is to select how to load the new firmware image.

Selecting firmware transferring method

Two methods are available for downloading the new firmware into DB3000's memory: XMODEM and TFTP. XMODEM can be selected by SB2 and TFTP by SB3. Both methods require a computer with the relevant communication interface and a preloaded software application.

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XMODEM Method

This method uses the RS232 port to transfer the new firmware image into DB3000's memory.

The following items are necessary to be prepared prior to firmware update:
- Download via the Internet the latest firmware image file from the web site of Deva Broadcast Ltd. (www.devabroadcast.com) – download area.
WARNING: The file's name must be db3000.bin.bzip. If the file's name differs from db3000.bin.bzip it will not be accepted by DB3000, so please rename it accordingly.
- A PC connected to DB3000 via RS232 com port. It is recommended using a real Com Port at the PC side, instead of USB to RS232 converter.
- A Terminal Software Application preloaded on the PC and having access to the new firmware file.

The Terminal Program must support XMODEM Protocol for data exchange. Examples of such programs are Tera Term or the MS Windows™ built-in HyperTerminal.

Select "XMODEM file transmission" in the Terminal Program and select the file to be transmitted to DB3000 (**db3000.bin.bzip**). Upon pressing SB4 - START DOWNLOAD, DB3000 will start receiving the new file from the Terminal Program. Transferring time depends on the size of the file and at the time of transfer the front panel indicators will be "frozen". Please note, there is approximately 30-40 seconds timeout when the link between the PC and DB3000 is interrupted.

Information regarding link speed and quantity of transferred data is usually provided by the Terminal Program.

You can proceed with the next steps of firmware update if the transferring process is successfully completed. However, if an error occurs, please analyze the reasons for it and repeat the transferring process.

XMODEM method selected

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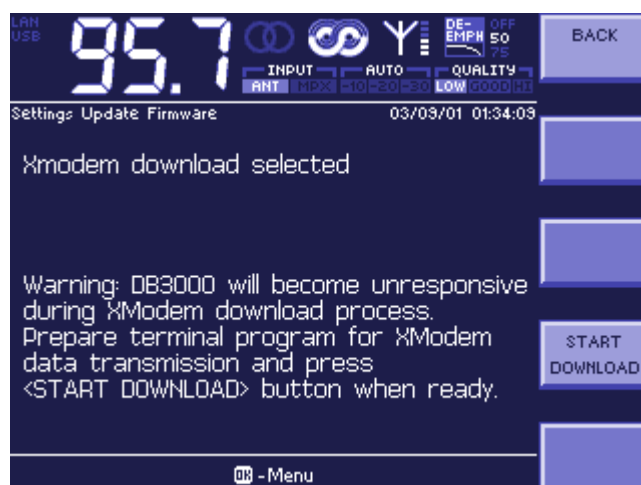
TFTP Method

Under this option DB3000's Ethernet communication interface is used to transfer the firmware file.

The following items are necessary to be prepared, prior to firmware update:

- Download via the Internet the latest firmware image file from the web site of Deva Broadcast Ltd. (www.devabroadcast.com) - download area.

WARNING: The file's name must be db3000.bin.bzip. If the file's name differs from db3000. bin.bzip it will not be accepted by DB3000, so please rename it accordingly.

- A PC connected to DB3000 via the Ethernet port.
- A TFTP server preloaded on the PC and having access to the new firmware file.

NOTE: DB3000 and the PC must be in one and the same subnet and the server must be configured to listen for incoming connections on port 69.

DB3000 configuration for TFTP connection establishment

As shown above, to transfer the firmware image file into DB3000's memory, please insert the IP address of the TFTP server and press SB4 - START DOWNLOAD. The firmware file will be downloaded from the TFTP server and saved into DB3000's memory.

Downloading the firmware file into DB3000's memory

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The following pictures show messages appearing in the presence of errors:
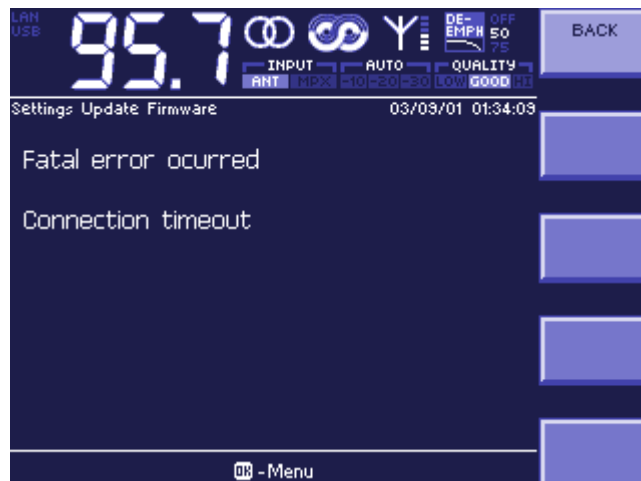

Timeout error message during file transfer
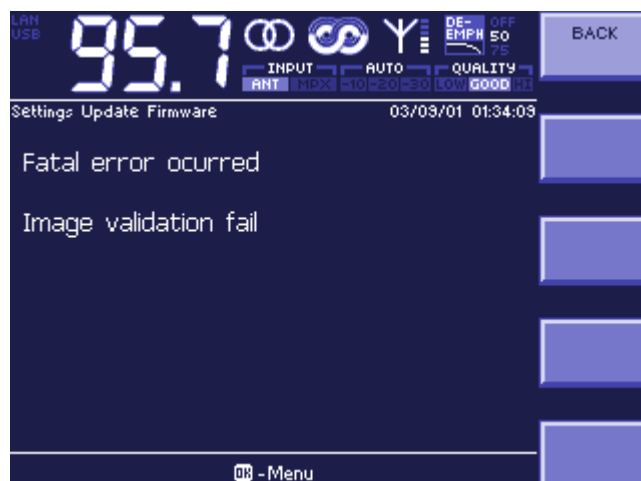
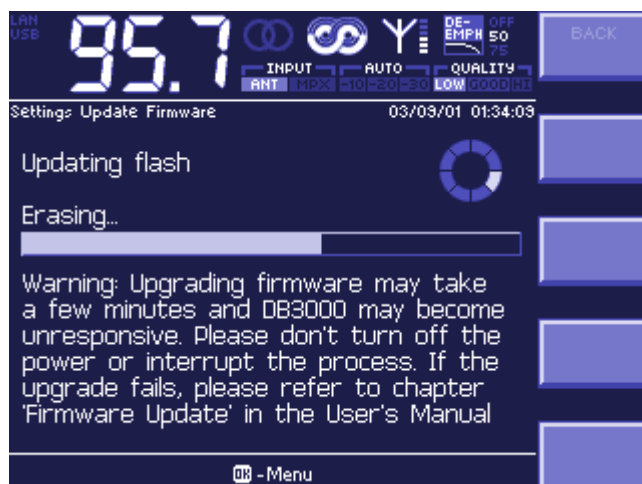Error message in case of interrupted XMODEM file transfer or corrupted file

Once the new firmware file is successfully transferred into DB3000's memory (regardless which one of the methods is used - XMODEM or TFTP), you may proceed saving it to the non-volatile memory.

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Non-volatile Memory Update

At this stage we have the new firmware successfully transferred and validated into DB3000's memory. Now, it must be saved into DB3000's non-volatile memory. To perform this press SB5 – START UPDATE.
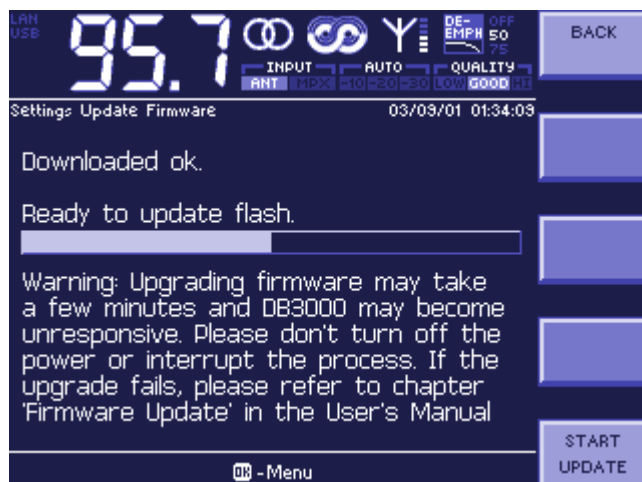
Successful reception and validation of the new firmware
(regardless which one of the transfer methods is used)

Non-volatile memory deletion

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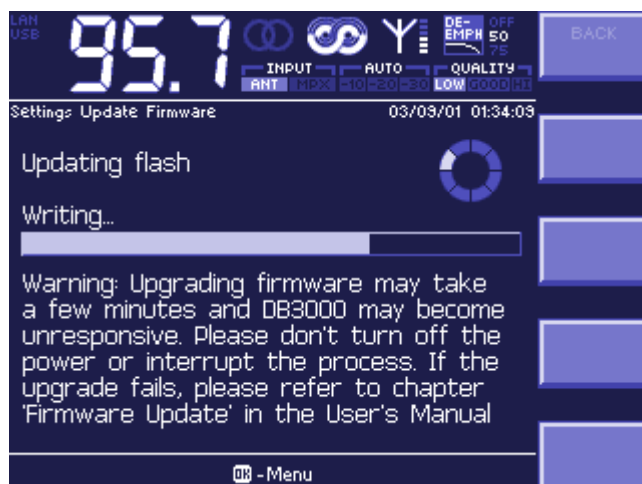
The process of saving the new firmware into DB3000's non-volatile memory

Critical operations related to deletion and saving in the non-volatile memory are carried out during DB3000's firmware update. It is extremely important not to interrupt the update process until it ends by itself and DB3000 is self restarted. Now, after rebooting, DB3000 will work utilizing the new firmware. Versions of the firmware modules are displayed on the ABOUT page, as shown below:

About page

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Emergency Recovery Mode
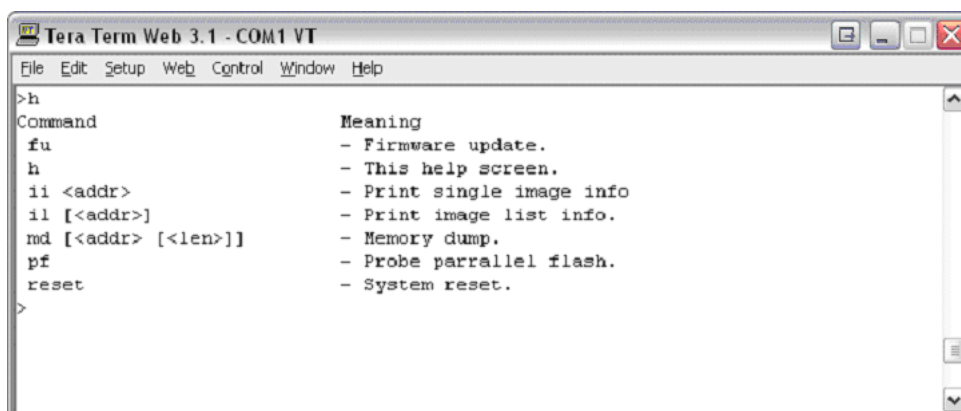
There is an emergency plan that can be used, if for some reason the update process is interrupted, ended with error or not completed for a very long time (more than 5 minutes).

During the startup DB3000 is analyzing the firmware and if it finds that the firmware stored in the non-volatile memory is damaged, the unit will enter into Recovery Mode. Indication of this mode is continuously blinking of the front panel buttons blue LEDs with a period of about 1 sec. Minimum functionality is provided in this mode, sufficient for firmware recovery. The only communication with DB3000 in recovery mode is via RS232, using the following settings: 8 data bits, 1 stop bit, parity none.
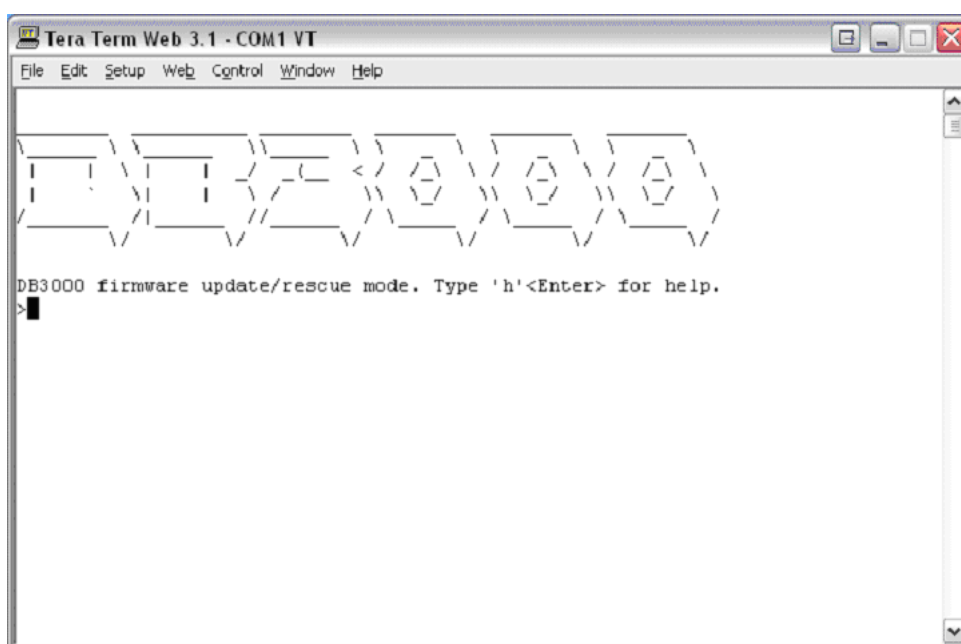
DB3000 prompt in Recovery Mode

The ">" character at the beginning of a line is the command prompt in DB3000 recovery mode and means that "entering" of a command by the user is expected. Each command is executed after you press the <ENTER> button. This type of interacting with a computer is the so-called CLI – Command Line Interface. Command's execution ends with the command prompt ">" on a new line.
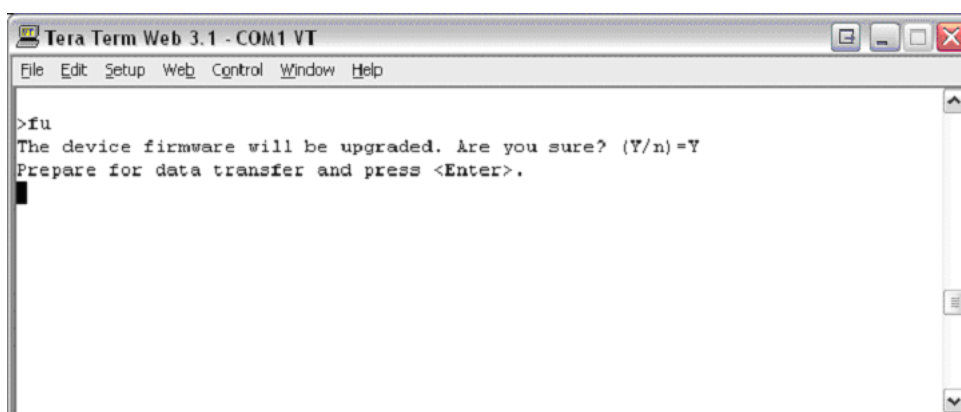
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List of commands supported by DB3000

To update the firmware, please use the <fu> command followed by <ENTER>. As shown on the picture below, DB3000 requires confirmation, that can be done by pressing "Y", followed by <ENTER>.
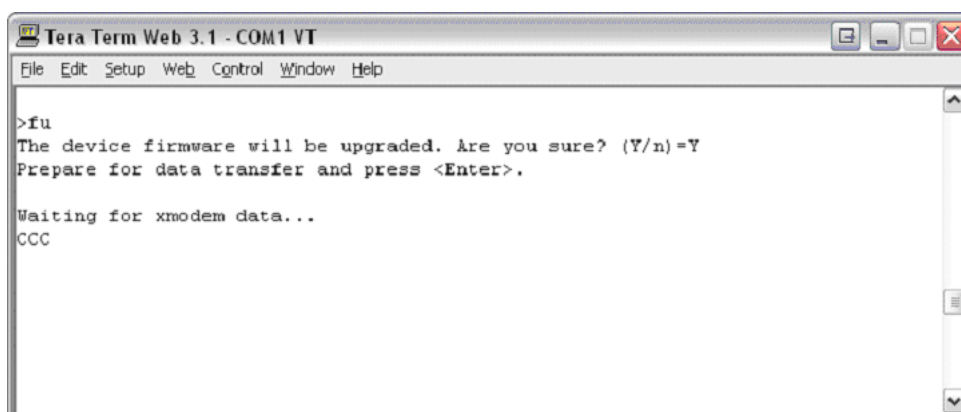

Frimaware update confirmation after 'fu' command

Now, using the Terminal Program, the firmware image file that have to be saved into DB3000's non-volatile memory can be send to the unit.
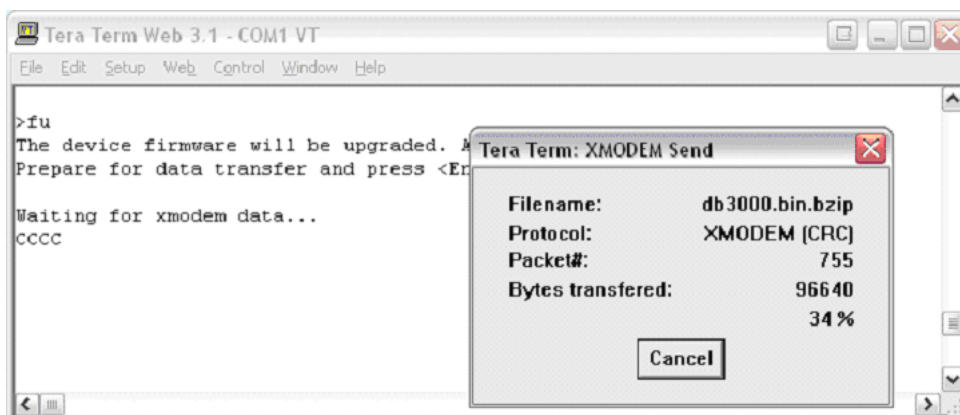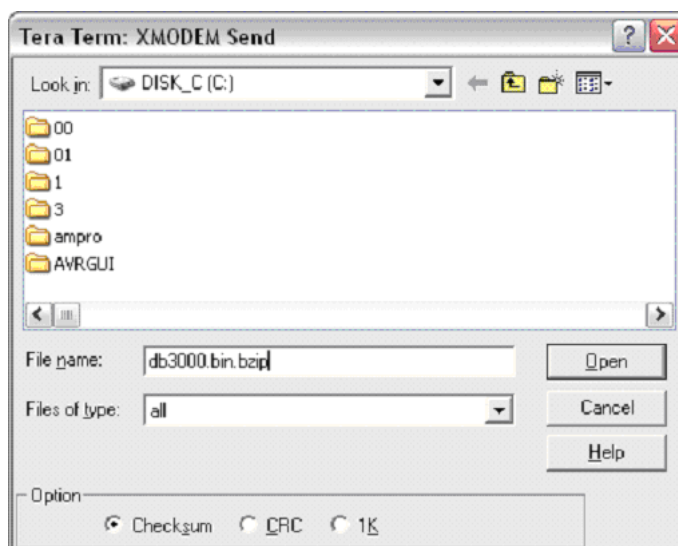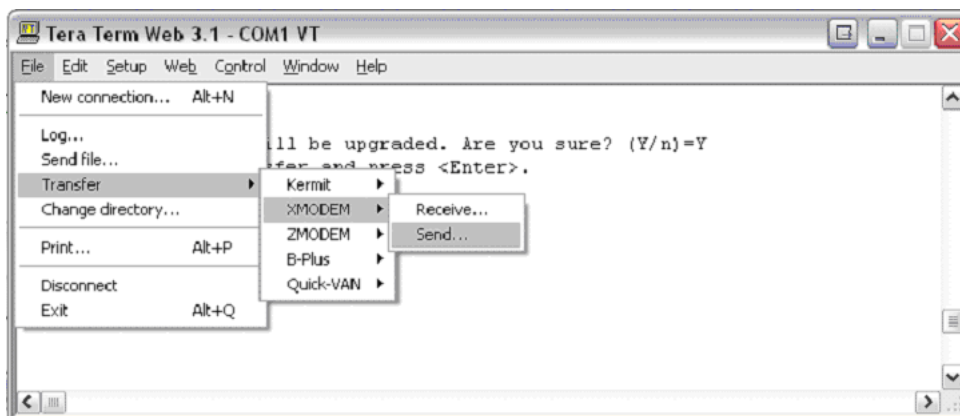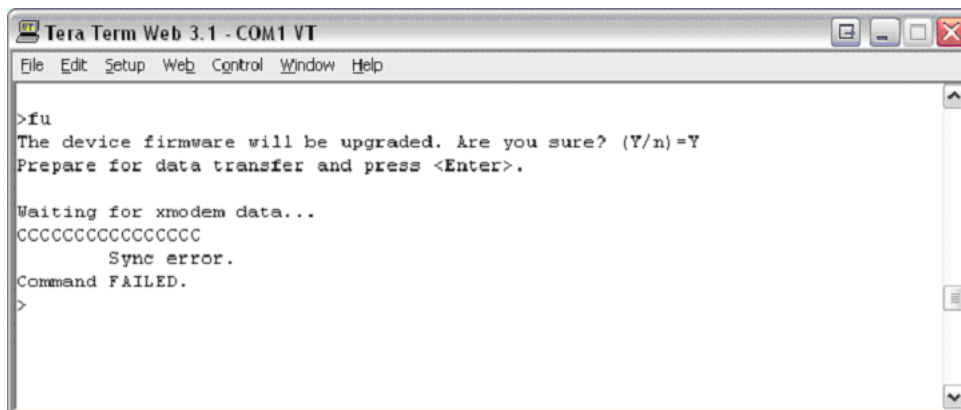

DB3000 waiting for data via XMODEM protocol

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How to select the file to be sent to DB3000 and transfer it to the unit using Tera Term is shown on the following pictures:

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Delayed data transmission message is shown on the picture below:

Data delayed transmission

Once properly received and validated, the new firmware is saved in the non-volatile memory of DB3000.

NOTE: DB3000 must NOT be powered off until completion of 'fu' command execution.

The „>" will appear when the firmware update is completed. DB3000 must be restarted in order the new firmware to take effect. To restart DB3000 use the "reset" command followed by <ENTER> or just power off and on the unit.

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Warranty Terms and Conditions

I. TERMS OF SALE: Deva Broadcast products are sold with an understanding of "full satisfaction"; that is, full credit or refund will be issued for products sold as new if returned to the point of purchase within 30 days following their receipt, provided that they are returned complete and in an "as received" condition.

II. CONDITIONS OF WARRANTY: The following terms apply unless amended in writing by Deva Broadcast Ltd.

A. The Warranty Registration Card supplied with this product must be completed and returned to Deva Broadcast within 10 days of delivery.

B. This Warranty applies only to products sold "as new." It is extended only to the original end-user and may not be transferred or assigned without prior written approval by Deva Broadcast.

C. This Warranty does not apply to damage caused by improper mains settings and/or power supply.

D. This Warranty does not apply to damage caused by misuse, abuse, accident or neglect. This Warranty is voided by unauthorized attempts at repair or modification, or if the serial identification label has been removed or altered.

III. TERMS OF WARRANTY: Deva Broadcast Ltd. products are warranted to be free from defects in materials and workmanship.

A. Any discrepancies noted within ONE YEAR of the date of delivery will be repaired free of charge, or the equipment will be replaced with a new or remanufactured product at Deva Broadcast's option.

B. Parts and labor for factory repair required after the one-year Warranty period will be billed at prevailing prices and rates.

IV. RETURNING GOODS FOR FACTORY REPAIR:

A. Equipment will not be accepted for Warranty or other repair without a Return Authorization (RA) number issued by Deva Broadcast prior to its return. An RA number may be obtained by calling the factory. The number should be prominently marked on the outside of the shipping carton.

B. Equipment must be shipped prepaid to Deva Broadcast. Shipping charges will be reimbursed for valid Warranty claims. Damage sustained as a result of improper packing for return to the factory is not covered under terms of the Warranty and may occasion additional charges.

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PRODUCT REGISTRATION CARD

• All fields are required, or warranty registration is invalid and void

Your Company Name_____

Contact_____

Adress Line 1_____

Address Line 2_____

City_____

State/Province_____ ZIP/Postal Code_____

Country_____

E-mail_____ Phone_____ Fax_____

Which Deva Broadcast product did you purchase?_____

_____

_____

Product Serial #_____

Purchase date_____/_____/_____   Installation date_____/_____/_____

_____
Your signature*

*Signing this warranty registration form you are stating that all the information provided to Deva Broadcast are truth and correct. Deva Broadcast declines any responsibility for the provided information that could result in an immediate loss of warranty for the above specified product(s).

Privacy statement: Deva Broadcast Ltd. will not share the personal information you provide on this card with any other parties.