

TERMINATOR

User's Manual

DIGITAL
AUTO FEEDBACK
ELIMINATOR



www.altoproaudio.com
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— English —

SAFETY RELATED SYMBOLS



This symbol, wherever used, alerts you to the presence of un-insulated and dangerous voltages within the product enclosure. These are voltages that may be sufficient to constitute the risk of electric shock or death.



This symbol, wherever used, alerts you to important operating and maintenance instructions. Please read.



Protective Ground Terminal



AC mains (Alternating Current)



Hazardous Live Terminal

ON: Denotes the product is turned on.

OFF: Denotes the product is turned off.

WARNING

Describes precautions that should be observed to prevent the possibility of death or injury to the user.

CAUTION

Describes precautions that should be observed to prevent damage to the product.

WARNING

• Power Supply

Ensure that the mains source voltage (AC outlet) matches the voltage rating of the product. Failure to do so could result in damage to the product and possibly the user.

Unplug the product before electrical storms occur and when unused for long periods of time to reduce the risk of electric shock or fire.

• External Connection

Always use proper ready-made insulated mains cabling (power cord). Failure to do so could result in shock/death or fire. If in doubt, seek advice from a registered electrician.

• Do Not Remove Any Covers

Within the product are areas where high voltages may present. To reduce the risk of electric shock do not remove any covers unless the AC mains power cord is removed.

Covers should be removed by qualified service personnel only.

No user serviceable parts inside.

• Fuse

To prevent fire and damage to the product, use only

the recommended fuse type as indicated in this manual. Do not short-circuit the fuse holder. Before replacing the fuse, make sure that the product is OFF and disconnected from the AC outlet.

• Protective Ground

Before turning the product ON, make sure that it is connected to Ground. This is to prevent the risk of electric shock.

Never cut internal or external Ground wires. Likewise, never remove Ground wiring from the Protective Ground Terminal.

• Operating Conditions

Always install in accordance with the manufacturer's instructions.

To avoid the risk of electric shock and damage, do not subject this product to any liquid/rain or moisture. Do not use this product when in close proximity to water.

Do not install this product near any direct heat source.

Do not block areas of ventilation. Failure to do so could result in fire.

Keep product away from naked flames.

IMPORTANT SAFETY INSTRUCTIONS

Read these instructions

Follow all instructions

Keep these instructions. Do not discard.

Heed all warnings.

Only use attachments/accessories specified by the manufacturer.

• Power Cord and Plug

Do not tamper with the power cord or plug. These are designed for your safety.

Do not remove Ground connections!

If the plug does not fit your AC outlet seek advice from a qualified electrician.

Protect the power cord and plug from any physical stress to avoid risk of electric shock.

Do not place heavy objects on the power cord. This could cause electric shock or fire.

• Cleaning

When required, either blow off dust from the product or use a dry cloth.

Do not use any solvents such as Benzol or Alcohol.

For safety, keep product clean and free from dust.

• Servicing

Refer all servicing to qualified service personnel only. Do not perform any servicing other than those instructions contained within the User's Manual.

PREFACE

Dear Customer:

Thanks for choosing ▲LTO TERMINATOR and thanks for choosing the one of the results of ▲LTO AUDIO TEAM job and researches.

For our ▲LTO AUDIO TEAM, music and sound are more than a job...are first of all passion and let us say...our obsession!

We have been designing professional audio products for a long time in cooperation with some of the major brands in the world in the audio field.

The ▲LTO line presents unparalleled analogue and digital products made by Musicians for Musicians in our R&D Centers in Italy, Netherlands, United Kingdom and Taiwan. The core of our digital audio products is a sophisticated DSP (Digital sound processor) and a large range of state of the art algorithms which have been developed by our Software Team for the last 7 years.

Because we are convinced you are the most important member of ▲LTO AUDIO TEAM and the one confirming the quality of our job, we'd like to share with you our work and our dreams, paying attention to your suggestions and your comments. Following this idea we create our products and we will create the new ones! From our side, we guarantee you and we will guarantee you also in future the best quality, and the best fruits of our continuous researches and the best prices.

Our ▲LTO TERMINATOR is the result of many hours of listening and tests involving common people, area experts, musicians and technicians.

The result of this effort is the realization of a multi-mode and configurable DSP Audio Processor, devoted to preserve the cleanness of on-stage events from being disturbed by Feedback between loudspeakers and microphones.

Nothing else to add, but that we would like to thank all the people that made the ▲LTO TERMINATOR a reality available to our customers, and thank our designers and all the ▲LTO staff, there to make possible the realization of products containing our idea of music and sound and there to support you, our customers, in the best way, conscious that you are our best richness.

Thank you very much.

▲LTO AUDIO TEAM

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1. INTRODUCTION

Purchasing ▲LTO TERMINATOR, you purchased a very powerful unit, easy to use and contained in a very efficient single-rack unit package.

▲LTO TERMINATOR is a multi-mode and configurable DSP Audio Processor, devoted to preserve the cleanness of on-stage events from being disturbed by Feedback between loudspeakers and microphones.

With ▲LTO TERMINATOR we offer to the performer a new freedom of movements and an increased monitor level, and let them concentrate on music, instead of having to do with Feedback concerns.

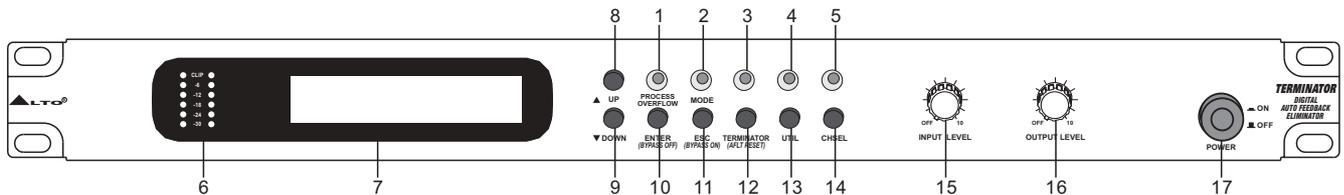
All the algorithms used in this device are completely original and innovative, and take care of the suggestions of professional users worldwide. The whole design has been developed, modified and optimized thanks to the experience of ▲LTO AUDIO TEAM researchers.

2. FEATURE LIST

- Robust and Compact Design
- 24/32 bits Digital Audio Processor
- MPU Control
- Variable Input/Output Gain
- Illuminated Power Switch
- Digital Saturation LED
- Easy to Operate Front Panel Controls
- SMT Design for Greater Reliability
- Optimized Signal Path to Provide Superior Sound
- Manufactured Under QS9000, VDA6.1 Quality System

3. FRONT AND BACK PANELS DESCRIPTION

3.1 Control panel (Front Panel)



1. Digital overflow
2. Terminator searching LED
3. Enable/disable Terminator LED
4. Utility LED
5. Enable/disable channel select LED
6. VU-Meter
7. LCD alphanumeric display 20x2
8. Up key
9. Down key
10. Enter key (When the system is bypassed, press **ENTER** to return to normal operation)
11. Esc key (Keeping pressed the **ESC** key for some seconds, the system will go into bypass mode)
12. Terminator key (AFLT RESET)
13. Utility key
14. Channel select key
15. Analog input volume
16. Analog output gain
17. Power ON/OFF switch

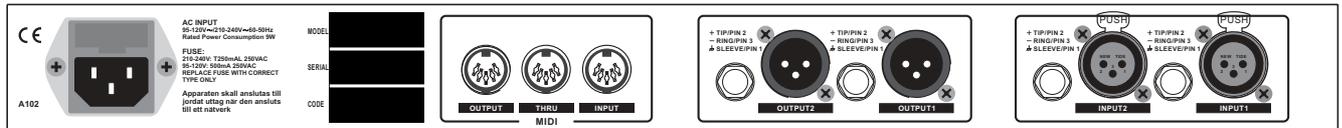
a. Analog levels

- **Analog Input Level Potentiometer (15):** The input level control sets the main input gain, before the signal reaches the input bus. It controls both the INPUT 1 and INPUT 2 levels simultaneously.
- **Analog Output Level Potentiometer (16):** The output level control set the level going to the amplifier or mixer from this apparatus.

b. LED and Illuminated Power Switch

- **Digital Saturation LED (1):** Displays the signal level coming into the input during normal operation, if the signal level is too high, this LED will turn red and you will begin to hear the signal distortion.
- **Power On/Off Switch (17):** Turns the apparatus on and off.

3.2 Analog connections (Back Panel)



a. Analog Inputs/Outputs

- **Inputs:** These are 1/4" TRS and XLR balanced connectors which connect to sources such as the effects sends of mixing console. They may be used with nominal input levels from consumer to professional audio.
- **Outputs:** These are 1/4" TRS and XLR balanced connectors which connect to devices such as the effects returns on a mixing console or power amplifier inputs.

b. MIDI Connectors

- **MIDI In:** DIN connector for the MIDI input to the TERMINATOR.
- **MIDI Thru:** DIN connector for the MIDI thru.
- **MIDI Out:** DIN connector for the MIDI output from the TERMINATOR.

c. Power Connector

- **Power Connector:** This is a plug for connecting the power supply to the TERMINATOR.

4. INSTALLATION & CONNECTION

4.1 Audio Connections and Power Up

a. Audio Connections

The connections between the TERMINATOR and the other audio devices have to be made using high quality cables so to prevent bad performances of the TERMINATOR itself. So it should be good to use low-capacitance shielded cables with a flexible internal conductor. Connect the cables to the TERMINATOR properly by observing the following precautions:

- Do not bundle audio cables with AC power cords.
- Avoid place audio cables and TERMINATOR, near sources of electromagnetic interference such as transformers, monitors, computers, etc..
- Always unplug cables by firmly grasping the body of the plug and pulling directly outward.
- Do not place cables where they can be stepped on.
- Avoid twisting the cable or having it make sharp, right angle turns.

b. Power Up Setting

After making your connections, turn on the system's power using this procedure:

Before turning on the TERMINATOR's power, check if:

- All connections have been made correctly.
- The volume controls of the amplifier or mixer are turned down.

Insert the Power plug into the POWER input on the rear panel of the TERMINATOR and plug the power cord into an AC outlet.

Turn on the power of the TERMINATOR, pushing the ON/OFF button on the front panel.

Turn on the power of the amplifier/mixer, and adjust the volume.

4.2 Analog

a. Levels Setting

Proper setting of the input and output levels is crucial in order to achieve the maximum signal-to-noise ratio. It is possible to say that it is usually best to set both input and output level controls at 3/4 or 75% of full. This will decrease the possibility of overload distortion and keep the amount of background noise to a minimum.

If the VU-Meters or the Digital Saturation LED on the TERMINATOR begin to clip (turn red), turn down the Input level or decrease the volume of the source (instrument, mixer send, etc.). If the output level is causing the mixer or amp to distort, turn the output level down.

4.3. Installation

a. Standard Use

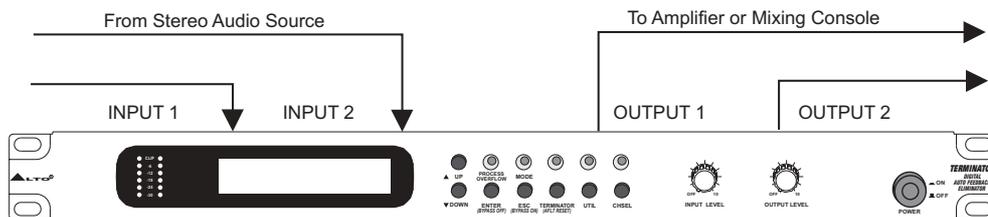
The TERMINATOR may be placed almost anywhere: on a table, on top of an amp, next to a mixing console. If it will be on furniture, check the rubber feet provided to the bottom of the unit. Make sure to place the TERMINATOR away from other audio equipment that may induce fields, and away from the signal wiring. It is possible that TERMINATOR may pick up noise fields generated by other equipment such as large power amplifiers, in this case, move the TERMINATOR until the noise goes away.

b. Application Examples

- Line Instrument

When connecting audio cables and/or turning power on and off, make sure that all devices in your system have their volume controls turned down. TERMINATOR has two 1/4" TRS inputs and two XLR balanced inputs and two 1/4" TRS outputs and two XLR balanced outputs allowing the TERMINATOR to be used in a classical Stereo In and Stereo Out connection.

Connect two audio cables to the INPUT 1 and INPUT 2 of the TERMINATOR from a double source, and two other audio cables from the OUTPUT 1 and OUTPUT 2 of the TERMINATOR to a double channel amplification system or two mixer inputs.



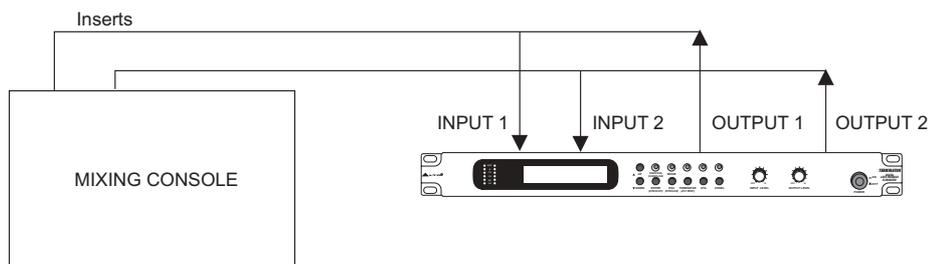
- Mixer

Interfacing to a Mixing Console

The TERMINATOR can accept stereo sends at all system levels. The input circuitry of the TERMINATOR can easily accept professional levels while having enough input and output gain to interface with the low signal levels of home recording systems.

The TERMINATOR may be connected to a mixing console connecting the unit directly to the channel insert socket of a single channel that is to be processed. Another way of interfacing the TERMINATOR to a mixer or recording console would be in-line between the output of your mixing console and the input of a tape deck or power amplifier. This last setup would be used only if you wanted to process the entire mix.

Using Inserts



In the above figure it is described the situation in which you want to apply the TERMINATOR to a couple of channels arriving to a mixing console, in order to apply the desired process to single instrument's signals; in this case you will have to use a mixer which features individual channel inserts. Insert jacks on the back of a mixer provide a way of 'inserting' external processing equipment into the signal path. The insert occurs after the input amplifier, and before the channel fader; essentially it is the same as connecting the source (instrument or mic) into the TERMINATOR before the mixer's channel input. Usually, insert connections require a special, stereo-splitting Y-cord to be connected, known as TRS connector. This connector has a stereo jack which plugs into mixer's channel insert socket, and a couple of jacks (send and return) which will plug into TERMINATOR via suitable jack-XLR adapters or 1/4" TRS connectors. Fitting this kind of cabling will virtually insert into one mixer's channel the process. Take good care in adjusting TERMINATOR input and output levels, in order to satisfy the dynamics needs of both the processed channels.

Do not use for the TERMINATOR the effects send/return connections found on most mixers for effect modules, as they could lead to heavy frequency response alterations.

Improper level setting when using a processor is the most common cause of noise and distortion problems.

5. OPERATIONAL OVERVIEW

Switching ON the TERMINATOR, after an initialization procedure, the last stored preset will be loaded. Changes not saved **will be lost**.

To load exactly the last preset configuration running before shutdown of the TERMINATOR, it's necessary to store these modifications using the STORE function available into the Utility Menu. After the initialization procedure, on the LCD it will appear the first field of the Utility Menu and the Utility LED will turn ON.

Utility Key (13): To access the Utility Menu, it's necessary to push the **UTILITY** key (13).

If the unit is already working on Utility Menu (**UTILITY LED (4) = ON**), each further use of the button will have no effect.

Each preset either Factory or User is made up by 12 filters + Threshold each channel, Terminator Mode, Search Mode, Gain Mode and a 6 characters name.

Using the Utility Menu is possible to access the following functions:

Filter Reset: When the menu issue is Filter Reset, pressing **ENTER** after a confirmation request all automatic and manual filters belonging to the channel formerly selected by means of the key **CHSEL** will be reset.

When the system is in Terminator Mode, pressing and holding the **TERMINATOR** key for some seconds and pressing **ENTER** after a confirmation request all automatic and manual filters belonging to the channel set on Search Mode will be reset.

MIDI Setup: The MIDI Setup utility allows the user to set up the TERMINATOR MIDI configuration. The configurable MIDI parameters are:

- **MIDI Channel:** Allows to define the MIDI Channel to associate to the TERMINATOR when connected to remote MIDI devices. When MIDI Channel is set to OFF, the TERMINATOR will ignore whatever MIDI command coming from the external MIDI devices.
- **MIDI Output:** When this function is set as ON is possible to ECHO on the MIDI Output of the TERMINATOR all the incoming MIDI messages.

Filter View: This function shows the user all the characteristics of the filters' settings: mode, frequency, band width, attenuation.

Load Preset: This function allows the loading of one of the 65 available presets, where the first 4 presets (1,4) are factory preset, and the presets from 5 to 65 are the User's configurable presets and all not initialized (Empty) when the unit is shipped.

To Load a preset:

- Select "Load Preset" using **UP/DOWN** buttons
- Press **ENTER** button to access further sub menu
- Select the chosen preset using **UP/DOWN** buttons
- Press **ENTER** to load the preset or press **ESC** button if you decide to not load anymore the preset

Once terminated the sequence above, on the display will appear the name of the selected preset and the system will go back to the starting menu.

Store Preset: This function allows the storing on one of the 61 available memory locations the modified (using the Editing Menu) user's presets, starting from the available factory preset.

To Store a preset:

- Select "Store Preset" using **UP/DOWN** buttons
- Press **ENTER** button to access the further sub menu
- Select the memory location (Empty or already occupied from a previous user's preset) where to store the new user's preset using **UP/DOWN** buttons
- If you want to give up, press **ESC** to go back to the main menu without storing the new preset otherwise press **ENTER** to store the new preset. The user can choose the identification name for the new preset using 6 characters max. The blinking character show the character will be modified using the **UP/DOWN** buttons. When chosen the character, press enter to confirm the character itself and pass to the next one. Pressing **ESC** before the 6th character, the old name will be maintained as name of the new preset. Pressing **ENTER** on as confirmation of the 6th character, the new preset will be stored with the new name. There is no possibility to correct a confirmed character, if necessary to change again the name, repeat the storing process from the beginning.

Once terminated the sequence above, on the display will appear the name of the new stored preset and the system will go back to the starting menu.

Terminator Setup: This utility is designed to set the operating modes of the unit:

- **Terminator Mode** that allows the user to select between the use of feedback suppression filters with constant or variable Q. When variable Q is selected, the system, in the case of persistent feedbacks, uses the previously set filters, enlarging their band, in order to suppress feedbacks which change moderately in frequency.

When Terminator Mode is set on Notch Qvar, the system spares automatic filters by reducing the Q factor of existing filters if a feedback at frequency near other already suppressed occurs. The maximum, width a filter can assume is $1/3\text{Oct}$. This slows down the system slightly.

- **Search Mode** selects the channel to be processed, in order to optimize speed of the DSP engine. Search Mode can be set on Only CH1, Only CH2, CH1&CH2. This decides the channel searched for feedback. When searching for two channel, the system is slower than in the Only CH1, Only CH2 modes.

- **Gain Mode** allows the user to set the automatic feedback suppression filters timeout; if Gain Mode = Gain Var, in absence of feedbacks the suppression filters are slowly excluded from the signal path, unless a feedback occurs again. If Gain Mode = Gain Cst, suppression filters are left in place, until they are required by a feedback at another frequency.

When Gain Mode is on Gain Var, all the automatic filters will be reset after a while (in Terminator Mode). The channel(s) set on Search Mode will be affected. This slows down the system slightly.

The maximum speed is achieved by working following procedure:

1. Setting Terminator Mode on Notch Qcst
2. Setting Gain Mode on Gain Cst
3. On a single channel (Search Mode: Only CH1 or Only CH2)

Threshold Setup: This utility allows to set the threshold value (0,...,99) beyond which a monochromatic (sinusoidal) signal is treated as a feedback and intercepted.

When the system is in Terminator Mode, by means of the **UP/DOWN** keys it's possible to modify the threshold value of the channel selected for search, i.e. if in Terminator Setup (function Search Mode) the search is set on "CH1", only the first channel threshold will be affected. Besides, into the Utility Menu it is available the function Threshold Setup, useful for a basic setup of each channel threshold. The channel selected by means of the key **CHSEL** will be affected. (NOTE: inside the Utility Menu, each modification of a parameter must be confirmed pressing **ENTER**.)

Filter Edit: Accessing this utility it is possible to set the single filter's operational mode:

1. **Filter Mode:** In Manual Mode the user can assign a filter that won't be changed by the machine (advisable for fixed mics), while in Automatic Mode the filter will be available to the DSP engine's needs (advisable for hand mics).
2. **Frequency Adjust:** Selects the filter central frequency from 20Hz to 20KHz.
3. **Frequency Fine:** Selects the filter central frequency from 20Hz to 20KHz.
4. **Band Width:** Selects the filter band with from $1/70\text{Oct}$ to $1/3\text{Oct}$ in 6 steps.
5. **Gain:** Selects the filter gain from 0dB up to -45dB with steps of 3dB (16 steps)

CHSEL Key (14): This key selects the channel on which to edit parameters. When (**CHSEL** LED (5)) is off, it is possible to select the channel, when this LED is on, the **CHSEL** key is disabled.

TERMINATOR Key (12): This key starts the feedback search engine. The Threshold value of each channel will be displayed. This is confirmed by the LED (**TERMINATOR** LED (2)) on and by the display, on which there will be on a double row the list of the inserted suppression filters. Each filter will be indicated by a symbol:

The symbol 'M' indicates the filter is Manual

The symbol '*' indicates the filter is Automatic but not yet active

The symbol '0' indicates the filter is Automatic and has parameters: $1/70\text{ Oct} / -45\text{dB}$

The symbol '1' indicates the filter is Automatic and has parameters: $1/50\text{ Oct} / -45\text{dB}$

The symbol '2' indicates the filter is Automatic and has parameters: $1/30\text{ Oct} / -45\text{dB}$

The symbol '3' indicates the filter is Automatic and has parameters: $1/7\text{ Oct} / -45\text{dB}$

The symbol '4' indicates the filter is Automatic and has parameters: $1/5\text{ Oct} / -45\text{dB}$

The symbol '5' indicates the filter is Automatic and has parameters: $1/3\text{ Oct} / -45\text{dB}$

The Terminator Search LED (2) is blinking when the feedback control engine is running; the blinking speed varies according to the number of found feedbacks.

The Manual Filters LEDs (6) show (LED = ON) the number of manual filters inserted by the user during Bypass operation, they act as VU-meters.

Output Attenuation: This control allows the digital output volume setting. This parameter is a "system parameter" and its modification acts on all the presets.

Up/Down Button (8/9): These buttons are used to move inside the menus and to modify the parameter's value

Enter/Esc Button (10/11): These buttons are used to access or to leave the several menus, or to confirm or not the parameter's value.

6. GET IT STARTED

1. Setup your system with correct microphone levels.
2. Press **ESC** key for about 3 seconds.
3. The system is now in **BYPASS** mode.
4. Using the provided VU-Meters adjust the input level of the Terminator to match your system dynamics.
5. Use the output level control to feed correct levels to mixer or power amp.
6. Press **ENTER** to quit **BYPASS** mode.
7. Refer to Terminator Setup section (see above) to configure the Terminator settings, or load one of the Factory Presets.
8. Press **TERMINATOR** key for about 3 seconds and then **ENTER** to reset all the automatic filters. To reset also manual filters, press **UTIL** key, select Filter Reset item and press **Enter** twice.
9. Press **TERMINATOR** key to start feedback detection.
10. Position the microphones on stages, and do a sound check, trying to simulate feedback (ie. loud singing near loudspeaker systems). Do not saturate the Terminator, because feedback signals can be masked by distortion.
11. If the feedbacks are not promptly removed, adjust the threshold using the **DOWN** key (more sensitive) and **UP** key (less sensitive). Only the active channel threshold will be affected.
12. On the display the situation of feedback removal is showed: each channel features a row of 12 characters representing the 12 feedback filters status. Refer to the **Terminator** Key description.

7. PROCESSES FUNCTIONAL DATA

Terminator Setup

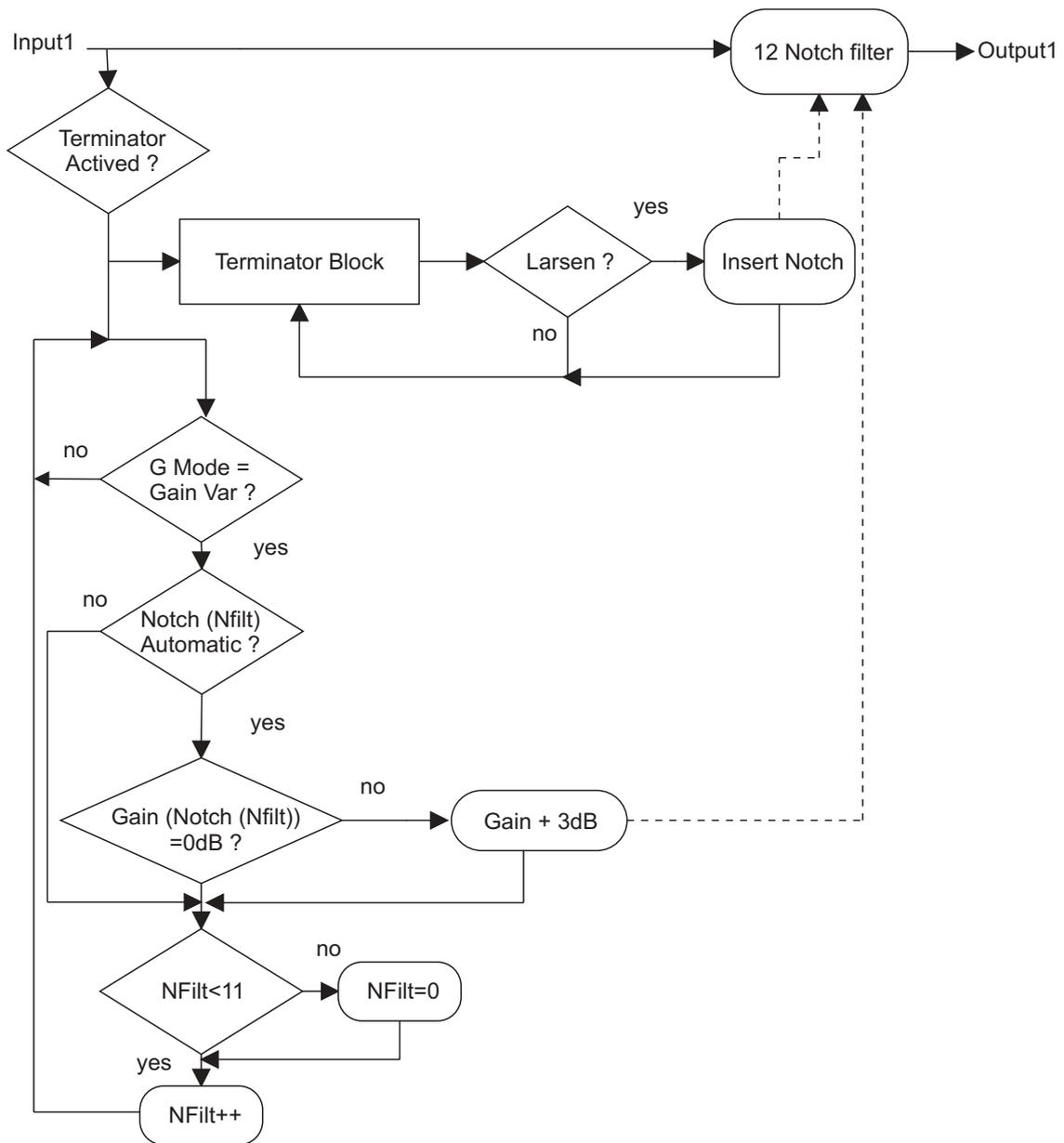
Selectable Manual Filters Number: 01-12 notch filters.
Threshold: min-max in 100 steps.
Antilarsen Mode: Only Ch1, Only Ch2, Ch1 & Ch2.
Reset all Filters.
Automatic Larsen Search with constant Q notches.
Automatic Larsen Search with variable Q notches.
Automatic notch filter Erase.
Manual user-selectable filters.

Manual Filter Edit

Frequency Adjust: 20Hz/20kHz step 10/27 Oct.
Fine Frequency Adjust: 20Hz/20kHz step 10/729 Oct.
Filter Attenuation: 0/-45dB step 3dB.

8. TERMINATOR BLOCK SCHEME

8.1 System Process Flowchart



8.3 MIDI

The device accepts MIDI commands only if the utility LED is on and the system is on the main menu. MIDI standard functions implemented:

a. Program change: change preset

With MIDI Sys-Ex it's possible to control all the device parameters (with Terminator LED OFF). The device accepts MIDI Sys-Ex commands only if the utility LED is on and the system is on the main menu.

Preset Factory

Name	QV12GC									Factory-Preset 01			
Terminator Mode					Search Mode					Gain Mode			
Q-variable					CH1&CH2					G-constant			
	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	Thr
CH1	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10
CH2	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10

Name	QV12GC									Factory-Preset 02			
Terminator Mode					Search Mode					Gain Mode			
Q-variable					CH1&CH2					G-variable			
	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	Thr
CH1	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10
CH2	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10

Name	QV12GC									Factory-Preset 03			
Terminator Mode					Search Mode					Gain Mode			
Q-constant					CH1&CH2					G-constant			
	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	Thr
CH1	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10
CH2	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10

Name	QV12GC									Factory-Preset 04			
Terminator Mode					Search Mode					Gain Mode			
Q-constant					CH1&CH2					G-variable			
	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	F01	Thr
CH1	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10
CH2	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	AU	10

Terminator can store **61 User's Presets** (5 to 65)

b. Control change

- controller n° 14 Terminator OFF, Terminator ON (0, 1)
- controller n° 15 Threshold CH2 (0, ..., 99)
- controller n° 16 Threshold CH1 (0, ..., 99)
- controller n° 17 Terminator Mode: Notch Qvar Notch Qcst (0, 1)
- controller n° 18 Search Mode: Only CH2, Only CH1, CH1&CH2 (0, 1, 2)
- controller n° 19 Gain Mode: Gain Cst, Gain Var (0, 1)
- controller n° 20 to select # filter to edit
 0, ..., 11 notch 1, 2, ..., 11, 12 CH1
 12, ..., 23 notch 1, 2, ..., 11, 12 CH2
- controller n° 21 frequency adjust (0, ..., 26)
- controller n° 22 frequency fine (0, ..., 26)
- controller n° 23 filter mode: Manual, Automatic (0, 1)
- controller n° 24 filter gain -45, ..., 0dB (0, ..., 15) step -3dB

9. TECHNICAL SPECIFICATIONS

Analog Input section		
	Inputs	Analog variable gain, 2 XLR-F electronically balanced and 1/4" TRS
	Input Impedance	44KOhms
	Max. Input Level	15dBu (4.4V RMS)
	Sensitivity	-22dBu (63mV RMS)
Analog Output section		
	Outputs	Analog variable gain, 2 XLR-M electronically balanced and 1/4" TRS
	Output Impedance	<150Ohms
	Max. Output Level	17dBu on 600Ohms (5.5V RMS)
Digital/Analog Interface		
	Amplitude Response	20Hz - 20KHz, + 0.1 / - 1dB
	Signal to Noise Ratio	90dB ("A"-20Hz/ 20KHz)
	THD+N	0.03 % @ 1KHz -6dB (VU-meter level)
	Group Delay	700 μ s
	Sampling Frequency	46.875KHz
	Conversion	1 bit Sigma-Delta
Digital		
	Processor Speed	12 MIPS (Million Instructions Per Second)
	DSP Resolution	24 \times 32 bits
	Control	Microprocessor
MIDI Section		
	Connections	Input/Output/Thru
	Sockets	5-poles DIN (female)
	Mode	Photo-coupled
Power Supply		
	Connector Type	3-pole IEC, grounded
	Type	Servo controlled, stabilized
	Mains Supply	95-120V \sim /210-240V \sim , 60-50Hz
	Power Rating	9W
User Interface		
	Alphanumeric LCD Display	2 \times 20 characters
	Keyboard	7 user keys / 5 LEDs
	VU meter	2 \times 6 LEDs
Physical		
	Size	Standard 19" rack mounting
	Dimensions	483 (W) \times 232.5 (D) \times 44 (H)mm (19" \times 9.3" \times 1.7")
	Net Weight	3.8kg (8.38lb)

10. WARRANTY

1. WARRANTY REGISTRATION CARD

To obtain Warranty Service, the buyer should first fill out and return the enclosed Warranty Registration Card within 10 days of the Purchase Date.

All the information presented in this Warranty Registration Card gives the manufacturer a better understanding of the sales status, so as to purport a more effective and efficient after-sales warranty service.

Please fill out all the information carefully and genuinely, miswriting or absence of this card will void your warranty service.

2. RETURN NOTICE

2.1 In case of return for any warranty service, please make sure that the product is well packed in its original shipping carton, and it can protect your unit from any other extra damage.

2.2 Please provide a copy of your sales receipt or other proof of purchase with the returned machine, and give detail information about your return address and contact telephone number.

2.3 A brief description of the defect will be appreciated.

2.4 Please prepay all the costs involved in the return shipping, handling and insurance.

3. TERMS AND CONDITIONS

3.1 ▲LTO warrants that this product will be free from any defects in materials and/or workmanship for a period of 1 year from the purchase date if you have completed the Warranty Registration Card in time.

3.2 The warranty service is only available to the original consumer, who purchased this product directly from the retail dealer, and it can not be transferred.

3.3 During the warranty service, ▲LTO may repair or replace this product at its own option at no charge to you for parts or for labor in accordance with the right side of this limited warranty.

3.4 This warranty does not apply to the damages to this product that occurred as the following conditions:

- Instead of operating in accordance with the user's manual thoroughly, any abuse or misuse of this product.
- Normal tear and wear.
- The product has been altered or modified in any way.
- Damage which may have been caused either directly or indirectly by another product / force / etc.
- Abnormal service or repairing by anyone other than the qualified personnel or technician.

And in such cases, all the expenses will be charged to the buyer.

3.5 In no event shall ▲LTO be liable for any incidental or consequential damages. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you.

3.6 This warranty gives you the specific rights, and these rights are compatible with the state laws, you may also have other statutory rights that may vary from state to state.

SEIKAKU TECHNICAL GROUP LIMITED
No. 1, Lane 17, Sec. 2, Han Shi W. Road, Taichung, 401 Taiwan
<http://www.altomobile.com> Tel: 886-4-22313737
email: info@altomobile.com Fax: 886-4-22346757

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