OPERATING INSTRUCTIONS

AND

REFERENCE MANUAL

NAGRA-V

(PN 2031 001 150)

GUARANTEE

NAGRA/KUDELSKI certifies that this instrument was thoroughly inspected and tested prior to leaving our factory and is in accordance with the data given in the accompanying test sheet.

We guarantee the NAGRA V products of our own manufacture against any defect arising from faulty manufacture for a period of THREE years from the date of delivery.

This guarantee covers the repair of confirmed defects or, if necessary, the replacement of the faulty parts, excluding all other indemnities.

All freight costs, as well as customs duty and other possible charges, is at the customer's expense.

Our guarantee remains valid in the event of emergency repairs or modification being made by the user. However we reserve the right to invoice the customer for any damage caused by an unqualified person or a false manoeuvre by the operator.

We decline any responsibility for any and all damages resulting, directly or indirectly, from the use of our products.

Other products sold by KUDELSKI S.A. are covered by the guarantee clauses of their respective manufacturers.

We decline any responsibility for damages resulting from the use of these products.

We reserve the right to modify the product, and / or the specifications without notice.

ABOUT THIS MANUAL

This instruction manual is broken down into several sections. Each section covers different aspects of the machine, the settings, actual use of the machine, eventual problem localisation and technical specifications. They are divided into different chapters listed below.

All words or acronyms in this manual written in ***Bold Italic*** are all relating to the menus of the NAGRA V.

NAGRA would like to give special thanks to all those who have contributed to the elaboration of this manual. Various different organisations, companies and individuals have been very helpful in giving advice and technical information in different fields of expertise.

A.E.S.
Denecke Inc.
Peter Weibel Audio.
Merging technologies.

CHAPTER I

PARTS OF THE MACHINE

INTRODUCTION

The NAGRA-V is a 24 bit solid state audio recorder / player using a removable hard drive as its storage medium (HDD). The information is stored as a digital linear FAT16/32 Broadcast Wave Format. Also equipped with an AES input and output as well as M/S technology and weighing less than 3.5 kg (including batteries), makes the NAGRA-V the most versatile tool available.

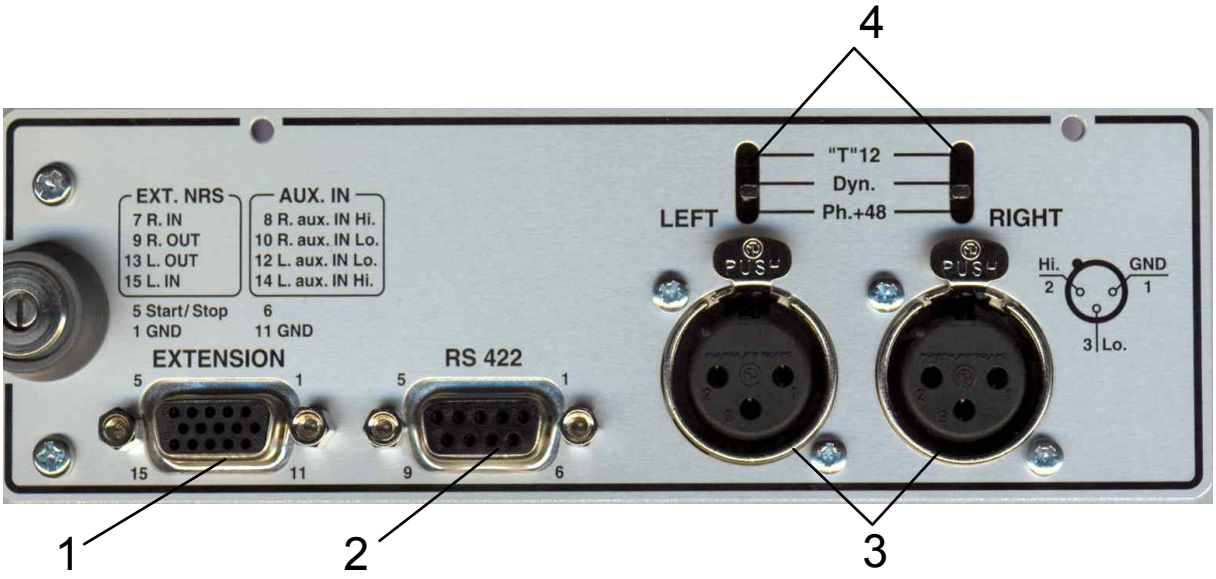
The front panel, metal chassis and features were all designed using the experience of previous NAGRA recorders which render the NAGRA-V easy to operate even in harsh environmental conditions. It is powered by a Lithium Ion rechargeable pack, NiCd, Ni Metal Hydride or eight standard "D" cells. The record autonomy with a Lithium Ion pack is approximately 10 hours. With two 7Ah Ni Metal Hydride packs, it is 6 hours and with 8 standard “D” cells, it runs approximately 5 hours.

A set of software menus allows the configuration of the machine for selections such as Analogue or AES or input or output routing, Time Code settings and machine configuration etc. Equipped with switchable microphone pre-amplifiers and built-in monitoring speaker and headphone output the NAGRA-V resembles a conventional NAGRA.

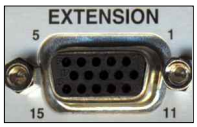
A full RS 422 communication port gives access to diagnostics for technical service, as well as PC communication using the NV-Com Software.

EXPLANATION OF THE PARTS OF THE MACHINE

LEFT SIDE PANEL



Extension Connector (1)

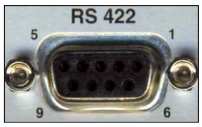


This 15 pin "D" type connector serves several purposes. It has a symmetrical transformerless Line Input (AUX), an external digital input used by the NAGRA-V as a digital audio input (special AES input cable required: P/N 7031 140 000), left and right IN / OUT connections for additional direct inputs and is wired for start stop option.
The connection details printed on the side panel are not entirely accurate the correct pinning of the connector is as follows:

Pin #	Connection
1	Ground
2	Not presently used
3	Not presently used
4	Not presently used
5	Start / Stop - connect this pin to ground to stop
6	Digital input (AES bus using a special cable P/N 7031 140 000)
7	External NRS Right channel IN
8	AUX IN right channel High
9	External NRS right channel OUT
10	AUX IN right channel Low
11	Ground
12	AUX IN left channel Low
13	External NRS left channel OUT
14	AUX IN left channel High
15	External NRS left channel IN

NOTE: If an external noise reduction system is connected to the NAGRA V then the two switches inside the machine need to be moved. These two switches S1 / S2 are on either side of the connector J12 on the box motherboard behind the modulometer. The normal operating position of these switches is that both are towards the exterior of the machine. That is to say S1 to the left and S2 to the right.

RS 422 Connector (2)



This is a standard 9-pin RS 422 symmetrical serial communication port for connection to the external world. The factory for test purposes uses this connector. For remote controlling the Nagra-V by PC or laptop, the same connector can also be used using the NV-COM software # 7031100000.

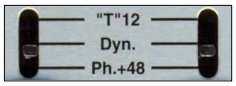
NOTE: A "lap-top" style PC is not always fitted with an RS 422 port. A converter RS 232 / RS 422 must in this case be fitted to the cable to allow the communication. (ND-PCA # 7010 540 000).

Microphone Input Connectors (3)

Any type of microphone can be connected to these XLR female input connectors. The sensitivity of the microphone inputs is selected on the front panel by the switches #6 and the levels can be controlled by the two potentiometers #5. They are wired according to DIN standard.

Pin #	Connection
1	Ground
2	Audio signal High
3	Audio signal Low

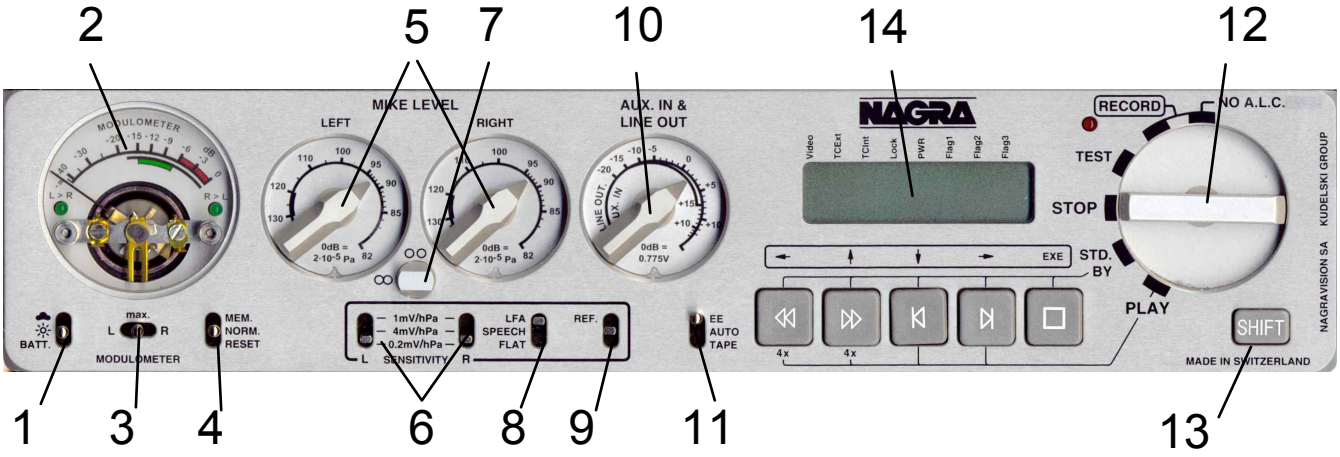
Microphone Powering Selectors (4)



Each of the microphone inputs can be switched using the switches #4 on the left side panel of the machine, according to the type of microphone to be used. The possible selections are Dynamic, +12V "T" power or Phantom +48V. These switches are especially short to avoid accidental modification and need to be operated with a small screwdriver or pen.

NOTE: The powering requirements of any particular microphone can be found in their respective documentation.

FRONT PANEL



Light / Battery Switch (1)

This three position switch has several functions which are depending on how it is used:

Cloud position means modulometer and display backlights are ON

☼ Sun positon means modulometer and display backlights are OFF

BATT. Position can have several operations:

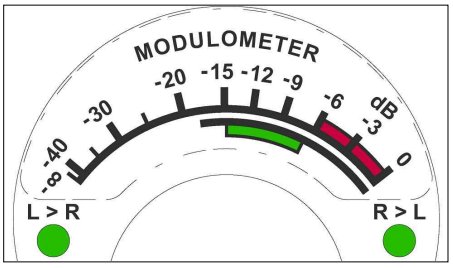
- The meter will indicate the state of the batteries in the battery box. The green area on the meter gives the corresponding power indication assuming the correct type of batteries is selected in the menu.
- Temporary backlight of the modulometer and display.
- Selection of MONO in the headphones while held down.
- If pressed during power-up of the machine, the type of batteries or external power selected will be automatically set to lowest acceptable input voltage. (See Battery menu)
- The LCD display will scroll through the presently selected menu settings, the default settings are:

MASTER	Reference frequency is the internal master clock
48 KHZ	Sampling rate selected
BWF 24	Record format and bit rate on the HDD
ANALOG	Analogue input selection
POT OUT	Aux IN / Line pot selection set for Line Output
LEV AUTO	Modulometer selection in automatic (not present if modulo is set before line out).
LINE OUT	Monitoring via Line Output
SPK AUTO	Loudspeaker mode selection in automatic

If the BATT position is pressed twice then the LCD display will scroll through the Time Code settings. The default TC settings are:

25 FPS	Selected Time Code frame rate
INT. GEN.	Record source
TC. EXT.	Reference for chase mode
FIX. CLK	Internal clock for sync mode

Meter (2)



The NAGRA V can be supplied with either a single or double pointer modulometer. The double meter is greatly appreciated in Cinema or two track applications while in Music or broadcast applications the single pointer instrument is often preferred. In both cases, the meter is microprocessor controlled, and has ballistics similar to those of a modulometer. It can also be used to indicate the condition of the power source. Fitted with two leds, it will also show the level of the corresponding channel in the "2 Channel" menu setting or the "Highest" when set to the "Stereo" mode.
The meter scale is calibrated from -□ to 0 in dB however, if the meter is selected to monitor the input signal (internal jumpers) and there is an indication above the 0dB point, this means that the A/D converter will be overloaded. The red area (-6 to 0 dB) is the headroom area. When the BATT switch is pressed, the green area gives information about the power status. See more information in chapter 4.
The channel being indicated depends on the position of the meter selection switch #3 on machines fitted with the single pointer version.

Attention: From the box motherboard 9131 300 000 B, when moving the 2 internal jumpers, the meter can be set before or after the Line Output potentiometer. This can only be done by a Nagra Service Center. See also chapter 4.

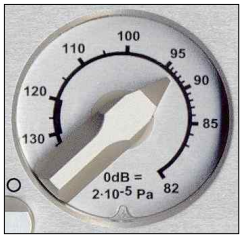
Meter Selection Switch (3)

The meter selection switch allows the operator to decide which channel, Left, Right or MAX, will be displayed on the meter. The MAX position will indicate the highest level obtained between the two channels and the leds will indicate which channel this corresponds to. From the box motherboard 9131 300 000 B, the switch will monitor the selected channel in the headphones in Solo mode (mono). Older boards can be modified to obtain this function. In the case that the machine is equipped with a double modulometer, the switch #3 does not influence the modulometer but only the solo selection for the headphones.

Mem / Norm / Reset Switch (4)

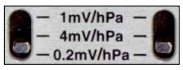
This is a three-position switch. In the NORM position the meter will indicate in the normal manner according to the signal on the input or output (depending on the selection). In the MEM position the highest obtained level (since the last reset) will be indicated. The reset position is a snap-switch position and is used to reset the MEM mode. This switch can be moved freely at any time without affecting the recording. In stereo operation of the machine the function of this switch is linked to switch #3.

Mike Level Potentiometers (5)



These two potentiometers are used to finely control the sensitivity of the microphone inputs. If the sensitivity selector is set to 0.2 mV/hPa and the level potentiometer is set to 82 dB (maximum gain) and the modulometer shows 0 dB, this corresponds to an acoustic level of 82 dBspl.
The bold black area on the scale from 120 to 130 dB is an important indication. If the potentiometer is set inside this area for the meter to indicate 0 dB, it means that a 100 dB dynamic range is present. If the potentiometer needs to be adjusted between 130 dB and 150 dB for the meter to indicate 0 dB, then this indicates that the input signal is so strong that the microphone pre-amplifiers are overloaded. Above the 120 dB mark indicating 0 dB on the meter will not cause the input stages to overload but the pre-amp noise will increase.

Sensitivity Selectors (6)



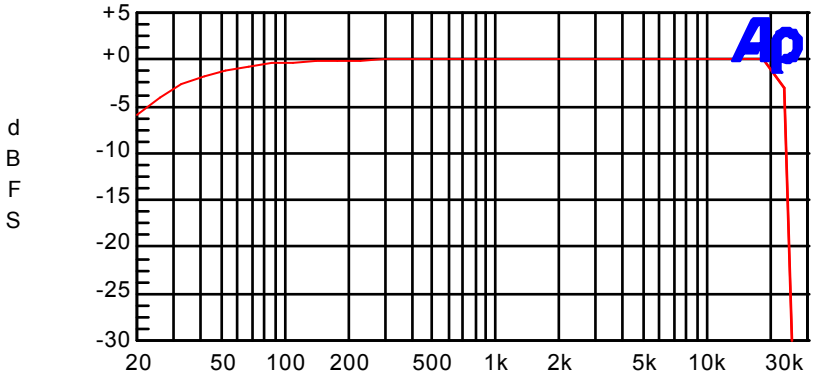
These two switches are used to select the desired sensitivity of the microphones connected to the microphone inputs. The possible selections are 1 mV/hPa, 4 mV/hPa and 0.2 mV/hPa. Depending on the type of microphones used, those switches must be set to the corresponding sensitivity. These switches are especially short to avoid accidental modification and need to be operated with a small screwdriver or pen.

Rotary Lock (7)

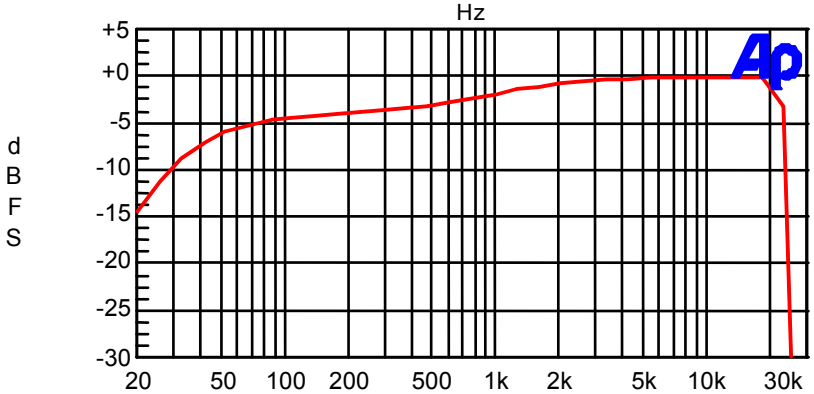
Used to lock the two mike pots mechanically together. When the button is in the horizontal position "∞" then the two potentiometers are mechanically locked together irrespective of their individual positions. In the vertical position " ○○ " the potentiometers are totally independent. In order for the button to be moved to the horizontal position it must be slightly depressed.

LFA / Speech / Flat (8)

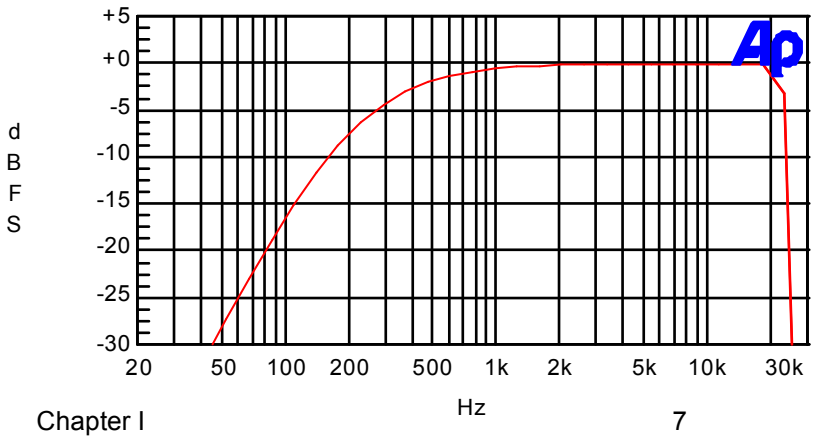
This is the filter selection switch. The filters available are the same as those on other NAGRA models and act on both the microphone and Line Inputs. The corresponding curves for the filters are shown:



FLAT filter response curve
(Measurement at AES bus output)



LFA filter curve
(Measurement at AES bus output)

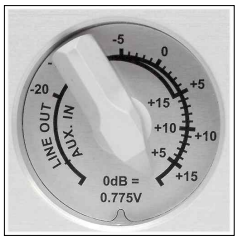


Speech filter curve (Measurement at AES bus output)

Reference Switch (9)

By pushing the switch upwards, the internal reference generator can be activated. As long as the switch is held in this position, a sine wave of 1 kHz (at 48/96 kHz, 919 Hz at 44.1/88.2 kHz), will be present at the outputs, if the NAGRA-V is in the test position. When the reference switch is held in the upper position during record, this signal will be recorded. No indication is given on the modulometer. While the reference signal is activated, the input signals are muted. The reference level is factory set to –18 dB.

Aux In and Line Out Potentiometer (10)



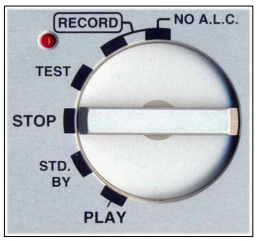
This potentiometer has two different functions according to the choice made in the menu mode. If the menu is selected to ***LINE OUT*** then this pot will adjust the Line Output level of both channels simultaneously, as well as the headphone and loudspeaker level. Its position is memorised by the microprocessor of the machine. That is to say, if the pot is set to the +6 dB position, then 0dB on the meter will give a Line Output of 1.55 V or +6 dBm. If the menu is now changed to use this pot to control the ***AUX IN*** input then the initial output setting will be stored in the memory of the machine and will remain at 1.55V. Once the menu is set to the ***AUX IN*** mode then this pot serves to adjust the level of the AUX Line Input coming from the 15 pole "D" type EXTENSION connector. Equally if the user changes the use of this pot back to ***LINE OUT***, then the previously set off the AUX IN level will be stored in the memory. These modes can be reached using a “shortcut” by pressing the SHIFT key to go rapidly to input or output adjustment (depending on the settings made in the menus).

EE / Auto / Tape (11)

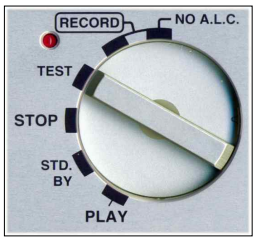
EE position: Only the input signals will be available at the outputs (EE means Electronic-Electronic). **TAPE position**: This position simulates the behaviour of a tape transport. The output signals are sounds coming from the disk, the input signals when in the record mode or in test mode, the recorded sounds when playing back, rewinding, etc.... and muted in stop. **AUTO position**: This position will automatically select the EE mode or TAPE mode depending on the status of the transport. **Note**: When ***CAM. RET*** (camera return) is selected, the camera return signal is available on the speaker and headphones only in **TAPE** position. Switching between **TAPE** and **AUTO** position is a fast way to select **CAM.RET.** or **LINE OUT** as monitoring source

Main Function Selector (12)

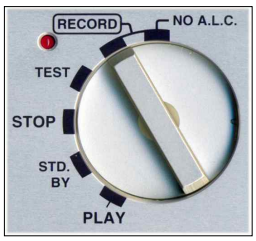
The rotary main function selector is the principle-operating switch for the NAGRA-V. It is a six position rotary selector. Operation of each position is explained below. The present settings of the menus of the machine will be scrolled through on the front panel display each time the machine is switched ON.



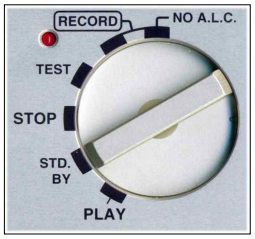
STOP. This is the main OFF position of the machine. None of the circuits of the machine are powered in this position. When this position is selected the machine will switch off after a few seconds if in the ***Power Delay*** menu, ***Manual*** is not set.
If ***Manual*** is selected, the PC will remain operational. To stop the machine in this mode the SHIFT button should be pressed and held for minimum 2 seconds while the Main selector is set to STOP.



TEST. In this position all the circuits are powered allowing the adjustment of levels and signal monitoring. This can be considered as a "stand-by before record" position. All menu verification and settings can be made in this position. If the ***PREREC*** is set to ***ON***, the record led will start blinking, and meaning that the closed loop recording (into memory) is active.



RECORD. The record position, marked RECORD is the standard position used for recording and the internal limiters (if fitted) NV-LIM #7031 130 000 will be active and turned on (in the limiter sub-menu). When recording, the red led beside the main function selector will be alight.
When recording, pressing the grey STOP key will automatically create a new take number without interruption in the recording process. The position "No A.L.C." is the position for recording without the internal limiters (if fitted).



STD. BY. In this position the grey push-button switches are activated and will act for rewind, fast forward, skip then stop in both directions and STOP features.
Access to all the menus & settings of the machine is also enabled.

Rewind at 80 times nominal speed.

Fast Forward at 80 times nominal speed

Skip back by one take and then STOP. The first time this is pressed it will skip to the beginning of the current take.

Skip forward by one take and STOP.

STOP during rewind or fast forward.

This is the normal PLAYBACK position. The NAGRA V will go into playback mode either from where the machine was after the previous play, or from the beginning of the last recorded take if the machine had previously been in record mode. Once the play mode has been selected the five grey push-button switches below the display also become active (see below).

Rewind at four times nominal speed.

Forward at four times nominal speed

Skip back followed by PLAY by one take each time it is pressed.
The first time this is pressed it will skip to the beginning of the current take.

Skip forward followed by PLAY by one take each time it is pressed.

Toggles between Play and Pause.

Shift Key (13)

Menu mode. The SHIFT key must be pressed (and kept pressed) in order to move through the menus on the LCD display on the front panel of the NAGRA V. When it is pressed the five grey transport keys operate using their shifted ARROW features. As soon as the SHIFT key is released then it will act as an ESC and the display will return to the main display screen chosen. While in the menu mode the ***STOP*** key becomes the ***EXECUTE*** function. When the shift key is pressed rapidly twice, it stays in the menu mode (Flag 1 on the display is on). To remove the menu mode, press the SHIFT key once again or move the main rotary selector to another position. A full description of the menus is explained later in this manual.

Sync mode. When the shift key is pressed and held while moving the rotary selector to the PLAY position, the machine turns on the SYNCHRONIZER. The sync mode turns off by moving the rotary selector.

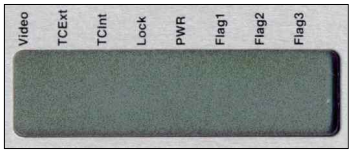
Power delay. In the case that the ***POW. DELAY*** menu is set to ***MANUAL***, press and hold the shift key while turning the rotary selector to the STOP position. Keep the shift key still pressed for 2 seconds until the machine turns OFF.

Speaker. Turning ***ON***, ***OFF*** or selecting ***AUTO*** switching the speaker without going into the menus, can be made by keeping the shift key pressed while pushing the BATT switch. Every time this function is executed, it will scroll on the display through the 3 different possibilities.

In/Out pot. This give access to the mode of operation of the third potentiometer on the front panel of the machine (AUX IN & LINE OUT) in the case that in the menu, the line potentiometer of the NAGRA V is set to the ***POT.SHIFT*** position. That is to say that it will adjust the input signal if the SHIFT key is kept pressed and it will adjust the OUTPUT signal if the SHIFT key is not pressed.

Recall 1 Shortcut: When the shift key is pressed and also the left arrow key, the template recall menus are immediately displayed.

LCD Display (14)



This is a 14 segment 8 digit back lit LCD display, permitting alpha-numeric indication of a large quantity of different information and allowing internal settings of the machine to be made in the MENU mode. In normal operation it will indicate the current take number and time from the beginning of it. It is also used to display the internal STATUS of the machine, remaining time available on the cartridge to be recorded etc. The display will be illuminated if the illumination switch # 1 is put in the "cloud" position.

It can be used to display the following:

Menu Tree
Take Number and time from start of take
Remaining Time on the cartridge/HDD (related to bit & sampling rates)
Time Code
Error codes

Flags on top of the display:

Video	If a valid video versus TC format is connected
Tcext	If external time code is present
Tcint	If during playback the time code is accurate
Lock	If the machine is locked in chase mode
PWR	If the batt. or ext. voltage drops below limit
Flag 1	If the SHIFT button was pressed twice (menu lock)
Flag 2	Not used
Flag 3	Not used

RIGHT SIDE PANEL

Banana Output Connectors (1)

This is the telephone output connection. It is a mono output fitted with a transformer with output impedance of 600 Ω from 300 Hz to 5 kHz, and is used for connection to a standard switched telephone line. The output level of this connection can be selected in the ***TEL LEVEL*** position of the menu mode to be either 1.55V or 4.4V. When in operation, the return feed from the telephone can be heard in the headphones or on the internal loudspeaker if selected.

Line Output Connectors (2)

These two 3 pole XLR female connectors are the standard analog audio transformer-less outputs. The level of which can be controlled by the Line Output potentiometer on the front panel (providing it has been previously selected). The nominal output level on these connectors is 1.55V for 0 dB on the meter.

Pin #	Connection
1	Ground
2	Audio signal High
3	Audio signal Low

WARNING: Be sure not to connect these outputs to a mixer supplying 48V phantom as this will damage the outputs.

AES Output Connector (3)

The 3 pole male XLR AES output connector is a digital output corresponding to the format of the AES bus used throughout the professional audio industry. The resolution is of 16 bits or 24 bits depending of the output settings. This connection allows direct connection to any other digital equipment equipped with an AES interface

Headphone Output Jack (4)

This is a standard ¼" Stereo Jack connector. The level of the headphone output can be adjusted using the headphone level control. When the NAGRA-V is connected to a standard telephone line the return feed of the line is always available in the headphones. The output pot will also affect the headphone level.

Headphone and Speaker Level Control (5)

Rotary volume control for the headphones. This potentiometer acts as if it is in series with the output level potentiometer.

External Sync. or Video Input (6)

If the NAGRA-V is fitted with the internal Time Code option then this is the connector where a video signal (PAL, NTSC, NTSC B/W, 75 Ohms internally loaded) or an external work clock can be imported. The external sync input is yet another way to synchronise the internal clocks of the NAGRA-V. The advantage of this 5V logic input is that it can be used to control the VCXO (Voltage Controlled Crystal Oscillator) from an external source. The input can be 44.1 kHz, 48 kHz, 88.2 kHz or 96 kHz with a logic voltage level from min. 0.5 V to 5.0 V. This signal can be fed to the machine through the BNC connector.
Operation of the Time Code is covered in detail in CHAPTER 3 of this manual.

Time Code In/Out Lemo Connector (7)

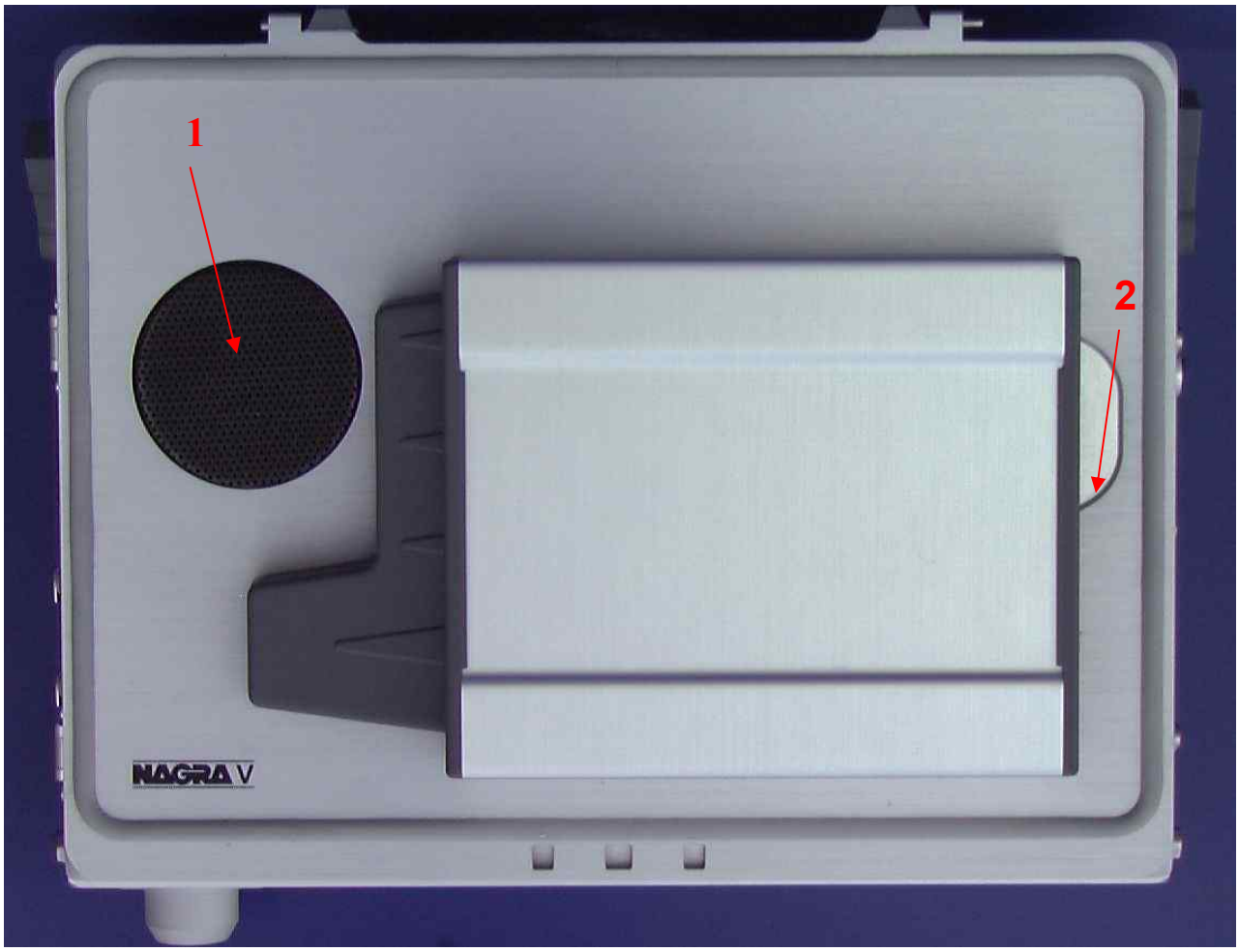
The time code input and output is located on a 5 pole LEMO connector, the pinning of which corresponds to that of the IV-STC, the NAGRA-D and T-Audio-TC. The time code system of the NAGRA-V is more versatile than that of the IV-STC or NAGRA T-Audio. It offers possibilities that were not previously available and also requires care on the part of the operator to ensure that the correct information is being recorded and displayed at all times.
Operation of the Time Code is covered in detail in CHAPTER 3 of this manual.
(QCTCU cable # 7016909000 – LEMO to open-ended TC cable)

Camera Monitor Return (8)

This input can be used to return the audio signal from a camera to the headphones (or speaker) of the Nagra-V. If in the menu ***CAMERA RETURN*** is set, the selection between the return signal or the Nagra-V inputs or playback signals is made by the EE/AUTO/TAPE selector. In the TAPE position, only the camera return signal goes to the speaker (headphones). This return signal can not be recorded on the disk.
The return level can only be adjusted via the menu settings. See chapter 2.

Note: Early Nagra-V's have "MON." instead off "CAM. RET."printed on the panel

TOP DECK



Internal Speaker (1)

This small built-in loudspeaker can be used to listen to the recordings. The Line Out level potentiometer controls the volume of the internal loudspeaker on the front panel of the machine and in conjunction with the headphone level pot. The speaker can be switched ON, OFF or AUTOMATIC in the menu mode or with the combination of the SHIFT button & the BATT switch.

Front of the HDD drawer (2)

A little switch permits the powering of the HDD drawer. In the power on position, on the left side of the drawer, a little bracket will appear and locks it mechanically inside the carrying bay of the Nagra-V.

Attention: Never remove or insert the HDD from a Nagra-V if it is in the power on mode. Always shut down the machine, change the drive, put the power swicth on the drawer to on and turn on the Nagra-V.