NV5500
Universal Sync Generator

User's Guide

Miranda

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- **Revision**: 2.1
- **Software Version**: -na-
- **Part Number**: UG0031-01

Notice

FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Declaration of Conformance (CE)

All of the equipment described in this manual has been designed to conform with the required safety and emissions standards of the European Community. Products tested and verified to meet these standards are marked as required by law with the CE mark. (See Symbols and Their Meanings on page v.)

When shipped into member countries of the European Community, this equipment is accompanied by authentic copies of original Declarations of Conformance on file in NVISION Broadcast Products offices in Grass Valley, California USA.

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Technical Support Contact Information

Miranda has made every effort to ensure that the equipment you receive is in perfect working order and that the equipment fits your needs. In the event that problems arise that you cannot resolve, or if there are any questions regarding this equipment or information about other products manufactured by Miranda, please contact your local representative or contact Miranda directly through one of the appropriate means listed here.

- Main telephone: 514-333-1772
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  In Europe, the Middle East, African or the UK, call +44 (0) 1491 820222 (9 am to 6 pm, GMT)
  In France, call +33 1 55 86 87 88 (9 am to 5 pm, GMT + 1)
  In Asia, call +852-2539-6987 (9 am to 5 pm, GMT + 8)
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Note Return Material Authorization (RMA) required for all returns.

Change History

The table below lists the changes to the Universal Sync Generator User's Guide.

- User's Guide Part # UG0031-01
- Software version: -na-

Rev #	Date	ECO #	Description	Approved By
	Oct 92	—	Original (MN5000-00)	—
2.0	22 Oct 08	14426	Rewritten.	D.Cox
2.1	30 Mar 09	15703	Format change.	D.Cox

Restriction on Hazardous Substances (RoHS)

Miranda is in compliance with EU Directive RoHS 2002/95/EC governing the restricted use of certain hazardous substances and materials in products and in our manufacturing processes.

Miranda has a substantial program in place for RoHS compliance that includes significant investment in our manufacturing process, and a migration of Miranda product electronic components and structural materials to RoHS compliance.

It is our objective at NV to maintain compliance with all relevant environmental and product regulatory requirements. Detailed information on specific products or on the RoHS program at Miranda is available from Miranda Customer Support at

1-800-719-1900 (toll-free) or
1-530-265-1000 (outside the U.S.).

Important Safeguards and Notices

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions appear throughout the manual where they apply. Please read and follow this important information, especially those instructions related to the risk of electric shock or injury to persons.

Warning

Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any service other than that contained in the operating instructions unless you are qualified to do so.

Symbols and Their Meanings

The lightning flash with arrowhead symbol within an equilateral triangle alerts the user to the presence of dangerous voltages within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance/service instructions.

The Ground symbol represents a protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.

The fuse symbol indicates that the fuse referenced in the text must be replaced with one having the ratings indicated.

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as complying with applicable Underwriter's Laboratory (USA) regulations and recommendations.

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as essentially complying with all applicable European Union (CE) regulations and recommendations.

General Warnings

A warning indicates a possible hazard to personnel which may cause injury or death. Observe the following general warnings when using or working on this equipment:

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- This equipment is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the equipment inputs or outputs.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.
- Do not wear rings or wristwatches when troubleshooting high current circuits such as the power supplies.
- To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- Have qualified service personnel perform safety checks after any service.

General Cautions

A caution indicates a possible hazard to equipment that could result in equipment damage. Observe the following cautions when operating or working on this equipment:

- When installing this equipment, do not attach the power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Use only the specified replacement parts.
- Follow static precautions at all times when handling this equipment.
- This product should only be powered as described in the manual. To prevent equipment damage, select the proper line voltage on the power supply(ies) as described in the installation documentation.
- To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage range selection.
- Some products include a backup battery. There is a risk of explosion if the battery is replaced by a battery of an incorrect type. Dispose of batteries according to instructions.
- Products that have (1) no on/off switch and (2) use an external power supply must be installed in proximity to a main power output that is easily accessible.

Table of Contents

Table of Contents

1. Preface

Chapter 1 provides an introduction to the NV5500 User's Guide. It presents the following topics:

Chapter Structure

The following chapters provide information regarding the NV5500 Universal Sync Generator:

- Chapter 1, Preface, (this chapter) tells you how to use this guide.
- Chapter 2, NV5500, describes the NV5500, from a user's standpoint and from a technical standpoint.
- Chapter 3, Misc. Topics, provides a connection, maintenance, and other information.
- Chapter 4, Specifications, presents the electrical, mechanical, and other specifications for the NV5500.

An Index is also available for your reference.

The PDF Document

This guide is provided in PDF format, allowing you to use Acrobat's "bookmarks" to navigate to any desired location. You can also easily print a hardcopy. Please note:

- Use the Table of Contents or the bookmarks page to jump to any desired section.
- Many hyperlinks are provided within the chapters.
- Use the Index to jump to specific topics within a chapter. Each page number in the index is a hyperlink.
- Use Acrobat's 'Go to Previous View' and 'Go to Next View' buttons to retrace your complete navigational path.
- Use the 'First Page', 'Previous Page', and 'Next Page', and 'Last Page' buttons to go to the first, previous, next, or last page within a PDF file.

Note To display the navigation buttons, right-click the Tool Bar area, and check 'Navigation'.

- Use Acrobat's extensive search capabilities, such as the 'Find' tool and 'Search' tool to perform comprehensive searches as required.

Terms, Conventions and Abbreviations

The following conventions are used throughout this guide:

- The symbol ▲ denotes either an example or a special message.
- Entries enclosed in single quotes denote the names of control panel buttons and knobs, or menu items.
  - Choose ‘Aux’ to ...
  - Press ‘Keyer 2’ button ...

2. NV5500

Chapter 2 provides a description of the NV5500. It presents the following topics:

Overview

The NV5500 is a universal sync generator. It generates NTSC, PAL, and digital audio synchronization signals locked to a common reference frequency.

It generates these formats from a single time base.

NTSC 75% color bars or black burst
PAL 100% color bars or black burst

48 kHz AES and SDIF-2 word clock
44.1 kHz AES and SDIF-2 word clock
44.056 kHz (44.1 kHz/1.001) AES and SDIF-2 word clock

The NV5500 eliminates the pops and clicks associated with sample slips owing to unlocked digital audio sample rates. It supports direct audio dubs between NTSC- and PAL-referenced VTRs and DVTRs as well as video-locked audio mixers and RDATs.

The NV5500 can lock to a 5 MHz external "atomic" reference, an NTSC video input, or PAL video input. When no input is present, it uses an ultra-stable "ovenized" crystal oscillator for its master time base. A 5 MHz output is provided for locking external devices to the internal oscillator.

The NV5500 is intended to function as the master time base reference for your plant. Subsequent downstream generators are intended to lock to the NV5500 as their master frequency reference and then use their own internal gen-lock to fine-tune the timing at each video or audio equipment node.

▲ The NV5500 does ***not*** provide gen-lock.

The NV5500 is designed to be installed and operated with very little effort. The input and output connections are all made with industry-standard BNC and XLR connectors. The NV5500, once installed, should operate continuously with minimal operator intervention.

Functions

The NV5500 generates both PAL and NTSC video simultaneously, locked to the same time base. The internal time base can be locked to an NTSC video input, a PAL video input, or a 5 MHz reference. If no input reference is used, an internal oscillator provides the common time base. Generating the PAL and NTSC signals locked to the same reference ensures that digital audio sample rates generated by equipment locked to video will be frequency-locked.

Each video signal type has 4 independent outputs. These outputs are selectable at the front of the panel. Operators can choose color bars or black burst. PAL bars are 100% modulated; NTSC bars are 75% modulated.

The internal 5 MHz signal is also provided as an output for locking additional external devices to the master time base. The stability of the internal oscillator is 0.25 ppm.

The NV5500 also generates 3 AES/EBU digital audio synchronization signals, providing effective sample rates of 48 kHz, 44.1 kHz, and 44.056 kHz. Each output can be independently configured as digital silence or tone. The tone may be further configured as 1 kHz or 500 Hz, and full-scale digital level or –20 dB in reference to full scale digital.

▲ The 44.056 kHz generator actually provides 999.0 Hz or 499.5 Hz tones.

Two outputs of each digital audio sample rate are available in SDIF-2 word clock format.

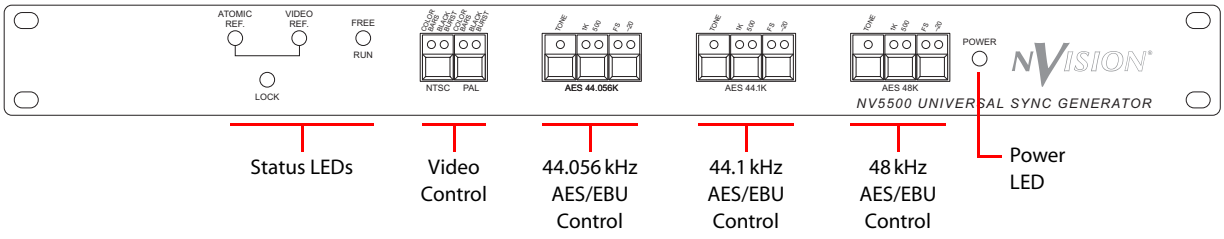
All connections are made with BNCs, except the AES signals which use male XLRs. All connections are located at the rear of the frame. The operator makes all signal format selections using switches at the front of the frame. The switches are clearly marked and illuminated.

Front panel indicator LEDs are present for input reference type and lock status, free-run status, and power status.

The NV5500 requires 1 rack unit of space and less than 25 Watts. Its frame and power supply are UL listed.

Operation

All operator status LEDs and controls are located at the front panel:



The green ‘Power’ LED is on when the power supply is functioning and the line cord is plugged in. There is no on/off switch. The NV5500 is designed to run continuously after installation and power-up.

If an external reference input is present (at the rear), either the ‘Video Ref.’ LED or the ‘Atomic Ref.’ LED is illuminated, according to what type of input is applied.

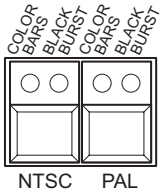
Atomic inputs should be 5 MHz sine or square waves with a 50 Ω source impedance. Sine waves may have a signal level of 1 V rms or larger and square waves may have logic levels ranging from 1 V p-p to full CMOS levels.

Video should be a standard 1 V p-p signal. A 75 Ω terminator is built into the circuit. The NV5500 determines whether the input is NTSC or PAL automatically. Once the input reference has been acquired by an internal PLL, the output signal time base will be stable and accurate to the specifications of the external input. The steady state of the green LED labeled 'Lock' indicates that the input loop has acquired lock. During acquisition, it is possible for the green lock LED to blink on and off until lock is acquired. Input reference signals should be accurate to ± 5 ppm.

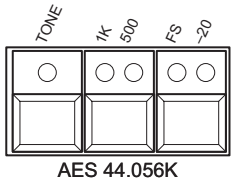
If no external reference is applied, the internal oscillator is used as the master time base and the green 'Free Run' LED will be illuminated. The 'Atomic Ref.' LED, the 'Video Ref.' LED, and the lock LED will be off. The internal oscillator requires 10–20 minutes to reach thermal equilibrium. Its stated stability is ± 0.25 ppm.

The NV5500 generates the two video output formats from the common reference clock. The subcarrier frequency is digitally synthesized with 32-bit resolution to guarantee exceptional frequency accuracy for both NTSC or PAL operation. Each video output is digitally generated, converted to analog, and then low-pass filtered before being buffered by 4 individual output amplifiers. The 4 outputs of each video type provide ample fanout. Individual amplifiers preserve channel isolation for long cable runs with many distributed loads. All outputs are voltage mode with a 75 Ω source impedance.

The operator may select video output as either color bars or black burst for both video types. For NTSC, the bars are 75% modulated; for PAL, the bars are 100% modulated. Selection between bars or black burst is made (at the front panel) on the switches. The green LED on a switch indicates bars and the yellow LED on the switch indicates black burst. There is one switch for PAL and one switch for NTSC.



Each AES/EBU digital audio output is actually a bi-phase serial data stream running 64 times the nominal audio sample rate. For example, if the sample rate is 48 kHz, the nominal data rate is 3.072 MHz. The content of each data stream is controlled by 3 switches at the front of the panel.



The first switch is labeled 'Tone'. If the green LED on the switch is on, a tone is generated. If the green LED is off, digital silence is generated. The second switch selects a nominal frequency of either 1 kHz or 500 Hz. The green LED on the switch indicates 1 kHz; the yellow LED indicates 500 Hz.

The third switch controls the amplitude. The green LED (FS) indicates that the output is full-scale digital. The yellow LED (–20) indicates that the output is 20 dB below full scale.

The switch functions are the same for all 3 output rates: 48 kHz, 44.1 kHz, and 44.056 kHz.

Each AES/EBU output is provided in accordance with the AES/EBU specifications for that audio sample frequency.

Configuration

The NV5500 internal time base can be configured for 4 different modes of operation:

Free run — No reference input is applied. The unit will stabilize to ± 0.25 ppm within 10–20 minutes of power-up. The green 'Free Run' LED will be illuminated.

Atomic — A 5 MHz signal[1] is applied to the 'Atomic' input at the rear of the NV5500. The NV5500 locks to this master clock. The green 'Atomic Ref.' LED will be illuminated and the green 'Lock' LED will stop flashing when lock has been obtained.

NTSC — NTSC video is applied to the 'Video' input at the rear of the NV5500. The NV5500 locks to this master clock. The green 'Video Ref' LED will be illuminated and the green 'Lock' LED will stop flashing when lock has been obtained.

PAL — PAL video is applied to the 'Video' input at the rear of the NV5500. The NV5500 locks to this master clock. The green 'Video Ref' LED will be illuminated and the green 'Lock' LED will stop flashing when lock has been obtained.

The NV5500 automatically distinguishes NTSC and PAL video input.

Applications

The NV5500 is used whenever you need to synchronize the digital audio sample rates of equipment that derive their time base information from a video source. In particular, the NV5500 makes it possible to perform direct digital dubs between PAL, NTSC, RDAT, and other kinds of audio equipment.

Figure 2-1 shows two DVTRs, one PAL and the other NTSC, locked to their respective video references from the NV5500. The AES signals can now be directly connected between the two machines resulting in a click-free digital audio dub at a 48 kHz sample rate.

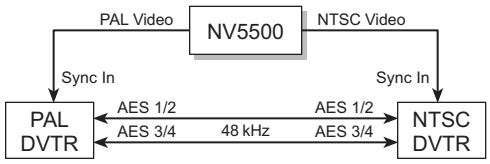


Figure 2-1. Click-Free Digital Audio Dub

Any piece of audio equipment that licks to video and runs at a 48 kHz sample rate, can now be used in an integrated plant environment.

Figure 2-2 shows an NV5500 time base reference and an NV3512 asynchronous AES switch used in tandem to provide access to, and from, any digital audio signal source or destination in an inte-

1. Typically referenced to a rubidium or cesium crystal.

grated plant environment. All equipment derives its synchronization signal from the NV5500 as either video, AES, or SDIF-2 format inputs.

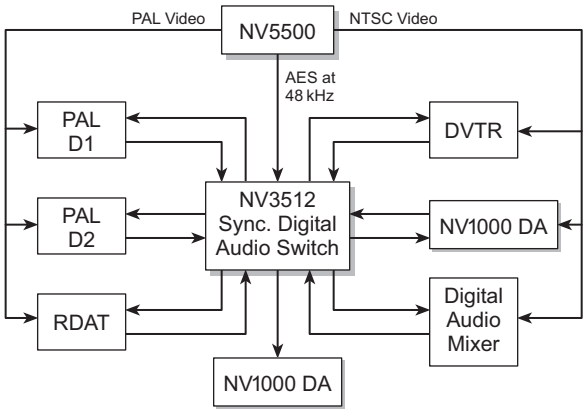


Figure 2-2. Digital Audio Switch Application

Figure 2-3 shows an NV5500, an NV3512 synchronous AES switch and an NV4448 used as a core for total synchronous plant integration. (The NV4448 is a sample rate converter that can be used to convert unlocked audio signals to the 48 kHz master rate in an asynchronous mode. It can also convert synchronously to 48 kHz from 44.1 kHz or 32 kHz sample rates that are referenced to either the PAL or NTSC video timing signals.)

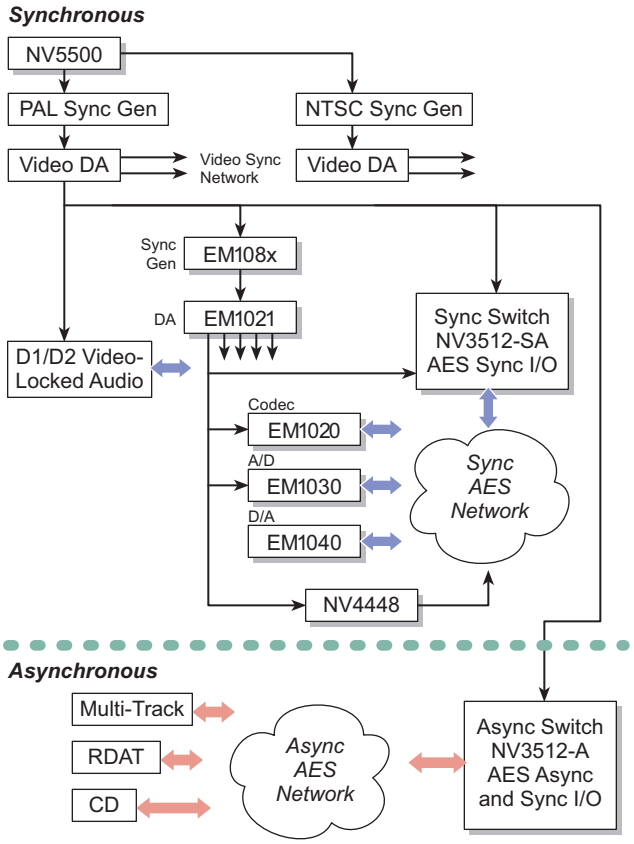


Figure 2-3. Total Synchronous Plant Integration

Inputs and Outputs

Inputs

The atomic[2] input reference signal must oscillate at 5 MHz with a stability of ± 1 ppm or better. The internal circuitry can lock to the external signal within a ± 5 ppm range. The signal is expected to be a 1 Vrms sine wave into 50 ohms, resistive. A CMOS or TTL or 1 V p-p square wave should also work with negligible impact. The connector is a BNC.

Video reference inputs should be stable to ± 1 ppm as well. The input capture range is ± 5 ppm, which should be within the specifications of most video test signal generators. The video level should be 1 V p-p terminated into 75 ohms. This termination is built into the NV5500. The input processing circuitry can automatically distinguish between PAL and NTSC formats. The connector is a BNC.

In free-running mode, the internal oscillator will stabilize to ± 0.25 ppm within 10–20 minutes after power-up. At the rear of the NV5500, a 5 MHz output is provided for synchronizing external devices to the NV5500. It is a TTL output, source-terminated with 50 ohms. This provides a typical 1.7 V p-p square wave into a 50 Ω load.

Outputs

NTSC video is provided on 4 BNC connectors. The video outputs are independently driven and source-terminated with 75 ohms. They provide a 1 V p-p video signal into 75 ohms. All outputs may be selected, as a block, to be either black burst or color bars (75% modulated).

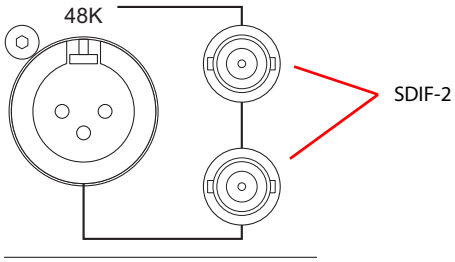
PAL video is provided on 4 BNC connectors. THe video outputs are independently driven and source-terminated with 75 ohms. They provide a 1V p-p video signal into 75 ohms. All outputs may be selected, as a block, to be either black burst or color bars (100% modulated).

Three AES/EBU data streams are provided simultaneously at 44.056 kHz, 44.1 kHz, and 48 kHz sample rates. Each output is provided at the rear of the NV5500 on XLR connectors. Each output is transformer-coupled and provides a source impedance of 110 Ω and an output level of 5 V in accordance with the AES/EBU specification.

Each AES data stream can be configured as either digital silence or a tone. The operator may select the tone as either 1 kHz or 500 Hz. The operator may select an amplitude of either full scale digital or –20 dB with respect to full scale digital. The 440.056 kHz generator actually provides 999.0 Hz or 499.5 Hz tones.

2. The term “atomic” refers to the fact that the signal is typically generated by a rubidium or cesium crystal.

Six SDIF-2 word clock signals are also available. There are two at each frequency:



They are TTL-level signals capable of driving 75 Ω loads. The connectors (at the rear of the NV5500) are BNCs.

The 5 MHz output is provided in a BNC connector with a 50 Ω source termination. It can drive a 1.7 V p-p square wave into a 50 Ω load. If an external 5 MHz atomic reference is used, this output will be a buffered, hard-limited version of the reference input. If a video reference is used, there will not be a 5 MHz output. If an external reference is not used, the output will be a buffered version of the internal oscillator output.

Summary

The NV5500 Universal Sync Generator provides a complete integrated time base for PAL, NTSC, and digital audio reference signals. Direct digital transfers between video-referenced material are possible without the clicks or pops caused by dropped samples. The NV5500 can provided video directly to the destination machines, or it can feed an existing NTSC or PAL video signal generator. The digital audio signals can then be distributed to audio equipment requiring and SDIF-2 or AES reference.

- The NV5500 does ***not*** provide gen-lock.

It provides 4 PAL and 4 NTSC video outputs as well as one AES/EBU data stream and two SDIF-2 word clocks at each of 3 sample rates, 48 kHz, 44.1 kHz, and 44.056 kHz. It can lock to an external video reference or an atomic standard clock. In free-run mode, its long-term stability is ± 0.25 ppm.

The NV5500 requires one rack unit of space and consumes less than 25 Watts. The frame and power supply are UL listed.

3. Misc. Topics

Chapter 3 provides the following:

Installation

The NV5500 is very easy to install. It is shipped as a single rack-mountable unit. All components are assembled in a single unit.

1 Attach the (1RU) NV5500 to your existing rack. Allow backpanel access because all signal connections are at the rear of the frame. (All operator controls are on the front panel.)

Air flow is from back to front in the NV5500. Air enters through the side panels and is expelled through the holes in the center of the front panel. Keep the front panel area clear at all times.

2 Apply line power (at the rear of the frame). The frame accepts either 90–130 VAC or 180–270 VAC. Be sure that the internal power switch is set according to your power source. See Power Supply Voltage on page 13. The wrong voltage will damage the NV5500.

3 Make signal connections:

AES/EBU signals use standard XLR connectors. The connectors on the unit are male.

SDIF-2 word clock signals use BNC connectors. There are two BNCs for each of the 3 signal frequencies.

Video inputs, video outputs, and atomic reference input use BNCs. There is one BNC for the 5 MHz oscillator output.

4 If the NV5500 fails to power up or fails to perform after power-up, refer to Trouble-Shooting on page 14. (Give it 20 minutes or more to warm up if you intend to operate the unit in free-run mode.)

Interfacing

All NV5500 interconnections use industry-standard connectors.

Reference inputs to the NV5500 should be point-to-point connections only.

All video outputs provide voltage-mode outputs with source termination of 75 ohms. The 5 MHz reference output is 50 ohms. The AES/EBU outputs are source-terminated with 110 ohms and are transformer-coupled in accordance with the AES/EBU specifications. The SDIF-2 outputs provide TTL-level signals into 75 Ω terminations.

The NV5500 can be expanded with either conventional fanout DAs or with standard cable loop-through techniques. If the output drivers are used in the loop-through mode, exercise the usual care with respect to transmission lines and distributed loads.

Figure 3-1 shows the connectors at the rear of the NV5500:

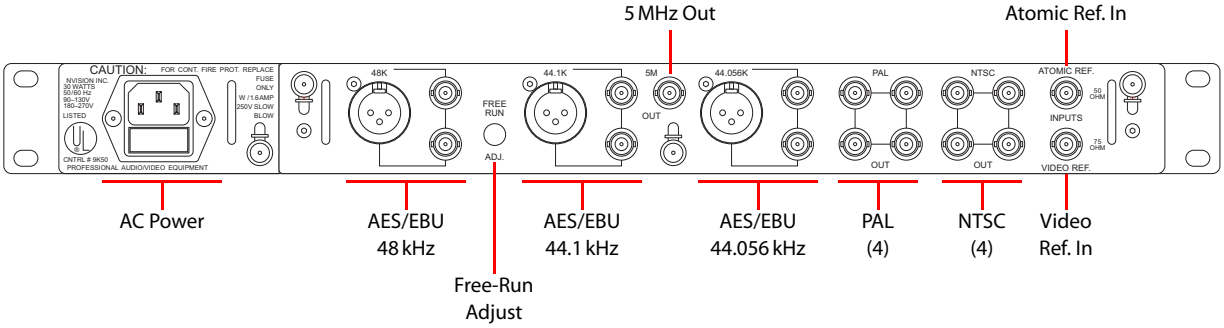


Figure 3-1. NV5500 Connectors (Rear View)

Maintenance

The NV5500 requires very little maintenance.

Free-Run Frequency

The free-run accuracy might require adjustment, particularly during the first year of operation. The process requires a non-metallic adjustment tool and a calibrated frequency counter.

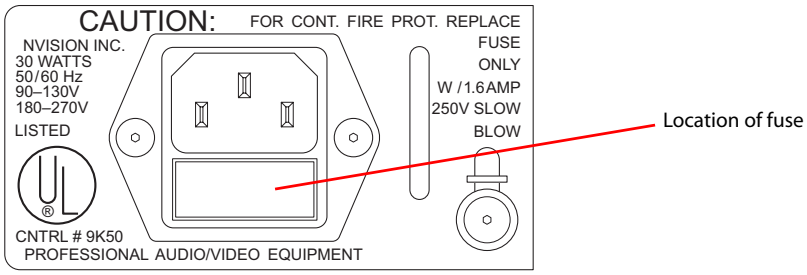
- The adjustment tool is like a slotted screwdriver with a shaft about 3″ [75 mm] long. It must be non-metallic or mostly non-metallic because metal will affect the tuner you are adjusting.

Connect the 5 MHz output of the NV5500 to the input of the frequency counter. Be sure that the NV5500 has been on for at least 20 minutes and that no external reference is applied.

Insert the adjustment tool through the hole in the rear panel. Engage the tool with the screw that is about 2″ inside the hole. Turn the screw clockwise or counter-clockwise until you achieve the desired frequency.

Power Supply Fuse

If you need to replace the fuse, it is located in the power connector itself:



Pry open, and pull out, the small fuse tray, replace the fuse, and reinsert the tray. The tray might or might not hold a spare fuse.

Power Supply Voltage

Normally, you will receive the NV5500 configured for the power requirements of your country. If you must change the power supply from 115V nominal to 230V or vice versa, it is relatively easy to do. The steps are more complicated to explain than to do:

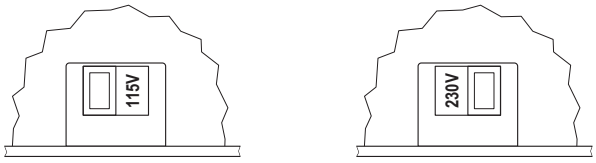
1 With a 2mm allen wrench, loosen the hex screw to the right of the handle on the power supply module. Move it to the "up" position in its slot and tighten it there temporarily.

2 On the side of the NV5500, you will find a number of Phillips head screws. Remove the screw nearest to the power supply rear panel—just one screw.

3 Gently but firmly pull the power supply unit out—far enough so that you will see the voltage switch recessed in an opening in the aluminum power supply enclosure. The opening is on the right.

The power supply might fit very snugly and you might need to exert some force, but it will pull out. You do not need to remove the power supply unit completely to make the change.

4 Find the switch on the right side of the power supply and slide it left or right as required. In one position, the switch says 115V and in the other position it says 230V. Choose the position you want:



5 Push the power supply back in all the way. Reinsert and tighten the Phillips head screw on the side of the NV5500. Loosen the hex screw near the power supply handle. Move it to the bottom of its slot and retighten the hex screw.

Applying the wrong voltage to the NV5500 will damage it. From the factory, the NV5500 has a label that tells you what voltage it uses. If that label is missing, you will have to perform this manual adjustment before the NV5500 can be used.

Trouble-Shooting

The NV5500 has no customer-serviceable parts other than the fuse and power switch.

▲ These servicing instructions are for use by qualified personnel only. To reduce the risk of electrical shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

The following list identifies typical service problems.

1 No output on any connector.

Check that the green 'Power' LED at the front of the unit is illuminated. If it is not, verify that power is connected and the fuse is not blown. See the procedure under Power Supply Fuse.

Verify that the power supply is selected for the proper line voltage. See the procedure under Power Supply Voltage. If after making these checks, the green LED is still not on, the power supply has most likely failed. Consult Miranda service for a power supply exchange.

2 No output on a single connector.

If a signal is present and functioning on one or more connectors, but is not present at a particular connector, the particular output driver has failed. Consult Miranda service.

3 No output on a group of connectors.

If, for example, all 4 PAL outputs are non-functional, a common video generator part has failed. Consult Miranda service.

4 The 'Lock' LED blinks continuously.

The input loop circuitry cannot lock to the reference input.

Verify that the input reference signal is present and that it is applied to the correct input connector. Atomic references should be connected to the 'Atomic Ref.' input (50 Ω) and a video reference should be connected to the 'Video Ref.' connector (75 Ω).

Verify that the input reference signal has the correct signal levels. Atomic reference signals should be at least 1 Vrms. Video reference signals should be 1 V p-p when terminated.

Verify that the input signal is within ±5 ppm of the nominal frequency. For an atomic reference, this should be ± 25 Hz at 5 MHz. For NTSC video, this should be ± 0.78 Hz at 15,734.265 Hz (horizontal) and for PAL, this should be ± 0.78 Hz at 15,625.0 Hz (horizontal).

If problems persist, the input PLL has most likely failed. Consult Miranda service.

5 Destination equipment appears unlocked.

This problem will require a very accurate frequency counter, a scientific calculator,[1] and some mathematical calculations.

Because you cannot expect the counter to be exactly calibrated, the only way to verify the "locked" state of the oscillators is to calculate the ideal ratios of the input reference or the 5 MHz internal oscillator to the output oscillators.

This ratio is then multiplied by the measured value of the input reference or the 5 MHz internal oscillator to calculate the expected output frequency for each of the output word clocks, as well as the expected output video horizontal line rate.

1. The calculator that comes with Windows® might be sufficient.

The expected output can then be compared to the actual measurement output and the error can be determined. If the error is within ±1 ppm (0.0001%), the loop can be considered "locked."

Here is a step-by-step example:

a measure the frequency of the input reference signal (or the 5 MHz internal oscillator). If an input reference is not used, measure one of the SDIF-2 word clocks and verify the other outputs relative to it.

b Write this number down.

c Measure each suspect SDIF-2 word clock output or analog video output. Video horizontal or vertical frequency will need to be extracted from the composite video output.

d Write these numbers down.

e Calculate the error by first calculating the ratio of the measured frequencies at the SDIF-2 and video outputs to the measured reference frequency.

f Ratio measured = number in step d / number in step b.

g The error = (ratio ideal – ratio measured) / (ratio ideal)

h Multiply the result from step g by 1,000,000 to convert to ppm.

i The result from step h should be less than ± 1 ppm.

These are the ideal ratios:

NTSC horizontal	15,734.26574 / 5,000,000	0.003 146 853
PAL horizontal	15,625.00 / 5,000,000	0.003 125 000
48 kHz	48,000.00 / 5,000,000	0.009 600 000
44.1 kHz	44,100.00 / 5,000,000	0.008 820 000
44.056 kHz	44,055.94496 / 5,000,000	0.008 811 189

Note that some pieces of older equipment were not designed correctly for generation of AES/EBU digital audio. Common mistakes include equipment that locks to video and produces 47.952 kHz or 44.056 kHz.

Also some lesser techniques for generating AES data used PLLs that drop pulses and then do not provide appropriate filtering to ensure low levels of short-term jitter. The NV5500 cannot remedy these problems. Fortunately, they are the exception, not the rule.

Standards

These are the time base accuracy requirements for various standards:

Parameter	Specification
PAL B, G, and H	Subcarrier = 4,433,618.75 ± 5 Hz or ± 1.1277 ppm.
PAL I	Subcarrier = 4,433,618.75 ± 1 Hz or ± 0.225 ppm.
NTSC M	Subcarrier = 3,579,545.00 ± 10 Hz or ± 2.79 ppm.
AES/EBU	Grade 1 = ± 1.0 ppm.

Glossary

AES/EBU	Audio Engineering Society/European Broadcast Union.
ATR	Audio tape recorder.
Audio	Sound element of a television program.
Bi-phase	A data encoding format for serial transmission.
D1	Component digital (4:2:2) videotape format.
D2	Component digital videotape format.
DAC	Digital to analog conversion (converter).
Delta-sigma	Analog to digital conversion technique.
Duplex	Bi-directional.
ECL	Emitter-coupled logic.
FCC	Federal Communications Commission (U.S.).
FET	Field-effect transistor.
Fiber	A short reference to fiber-optic (glass core) cable.
Fiber-optic	Glass transmission cable used in modern telecommunications systems.
HDTV	An abbreviation for high-definition television.
HDVS	An abbreviation for high-definition video system.
I/O	An abbreviation for input and output.
IC	Integrated circuit.
LED	Light-emitting diode. In the NV5500, an LED is an indicator lamp.
Monaural	Single audio channel.
MOV	Metal oxide varistor.
MUX	Multiplexer.
nm	Nanometer (billionth of a meter).
NTSC	national Television Systems Committee. The term also refers to the 525-line standard broadcast specifications approved by the FCC in 1953 for commercial color television in the U.S.
Oversampling	An technique that increases the sampling rate to improve output signal integrity.
PAL	Phase alternate lines. The term refers to the European, Asian, and Australian 625-line color television standard.
PROM	Programmable read-only memory.
PWM	Pulse width modulation.
RAM	Random-access memory.
S/N	An abbreviation for signal-to-noise ratio.

Simplex	One-directional.
SMPTE	Society of Motion Picture and Television Engineers.
ST	A type of fiber-optic connector.
Stereo	A system of sound reproduction using two precisely phased channels of audio.
Stereo pair	The left and right channels of stereo audio.
STL	Studio transmitter link.
Switcher	A device that performs simple (or complex) video transitions (i.e., cuts, dissolves, wipes, keys).
Synchroniza-tion	The process whereby two machines are controlled by identical time bases.
Timecode	Standard for encoding time in hours, minutes, seconds, and frames of video.
TTL	Transistor-transistor logic.
VCXO	Voltage-controlled crystal oscillator.
VDE	Verband Deutscher Elektrotechniker.
Video	Picture element of a television signal.
VTR	Video tape recorder.

4. Specifications

Chapter 4 provides specifications for the NV5500. It presents the following topics:

General Specifications

Table 4-1. Mechanical Specifications:

Parameter	Specification
Power supply	AC line, 90–130 VAC or 180–270 VAC selectable, 45–65 Hz. Fuse 1.6 A, 250 V.
Power consumption	18 Watts
UL Listed	Yes
Dimensions	1.72″ (1 RU) × 19.0″ W × 16.87″ max. D (43.7 mm × 482.6 mm × 428.5 mm)
Weight	10.14 lb (4.6 kg)

Reference Inputs

Table 4-2. NV5500 Composite Video Reference:

Parameter	Specification
Interface	PAL or NTSC, automatic selection.
Impedance	75 Ω
Frequency	50 Hz (PAL) or 59.94 Hz (NTSC)
Capture range	± 5 Hz (5 MHz)

Outputs

Table 4-3. Video Outputs:

Parameter	Specification
Number of outputs	4 PAL, 4 NTSC
Format	75% NTSC bars, 100% PAL bars, or black, selectable by video format
Interface	Composite video, 75 Ω coaxial cable, BNC

Table 4-4. AES Output:

Parameter	Specification
Number of outputs	3. One each at 44.056 kHz, 44.1 kHz, and 48 kHz
Format	Digital silence or tone (1 kHz or 500 Hz), full-scale digital (FSD) or 20 dB below FSD
Interface	AES 110 Ω balanced, XLR

Table 4-5. SDIF-2 Output:

Parameter	Specification
Number of outputs	3. One each at 44.056 kHz, 44.1 kHz, and 48 kHz
Format	Square wave word clock
Interface	TTL level into 75 Ω coaxial cable, BNC (5 MHz)

Table 4-6. Clock Output:

Parameter	Specification
Number of outputs	1, buffered internal oscillator
Format	Square wave
Interface	1.7 V into 50 Ω coaxial cable, BNC

Performance

Table 4-7. Free-run performance:

Parameter	Specification
Short-term stability	≤ ± 1 ns
Short-term accuracy	≤ ± 0.25 ppm; ≤ ± 1.1 Hz at 4.43 MHz; ≤ ± 0.9 Hz at 3.58 MHz;
Long-term accuracy	Drift ≤ 1 ppm per year, adjustable

Table 4-8. Reference-Locked Performance:

Parameter	Specification
Short-term stability	≤ ± 1 ns, additive

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