INSTRUCTION MANUAL

Model HDG-821

High Definition SDI and Component Analog Test Pattern Generator with Bi-level, Tri-level sync and AES3 or AES11 (DARS) Generation

For firmware and hardware version 1.I

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Important Safeguards and Notices

Information on the following pages provides important safety guidelines for both Operator and Service personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, 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 servicing other than that contained in the operating instructions unless you are qualified to do so.

Symbols and Their Meaning in This Manual

READ THIS MANUAL: To gain knowledge of the Link product, user must read and understand the operator's manual before using this product. There are features known to the user, only if the manual is read.

The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of "dangerous voltage" 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 (servicing) instructions in the literature accompanying the appliance.

This 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 text must be replaced with one having the ratings indicated.

Important Warnings and Cautions

Warnings:
Always use good engineering practice. It is highly recommended to mount this equipment in a well ventilated equipment rack. It is also recommended to use a blank one RU spacer between mounting frames.

- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water and disconnect ac power before installing any options.
- This product 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 product inputs or outputs.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.
- If equipped with redundant power, this unit has two power cords. To reduce the risk of electrical shock, disconnect both power supply cords before servicing.
- This equipment may employ laser(s). If it does, they comply with the current construction requirements of the code of Federal regulations, title 21, chapter I, subchapter J, sections 1010.2 and 1010.3 and sections 1040.10 and 1040.11.
- Do not attempt to view light output of the laser transmitter, eye damage may result. Always use an optical power meter to verify laser output.

To prevent injury:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch un-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Cautions:

- When installing this equipment, do not attach power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- Verify that all power supply lights are off before removing power supply or servicing equipment.
- Use only specified replacement parts.
- Follow static precautions at all times when handling this equipment.
- Leave the back of the frame clear for air exhaust cooling and to allow room for cabling. Slots and openings in the cabinet are provided for ventilation. Do not block them.
- Front door is part of fire enclosure and should be kept closed during normal operation.
- This product should be powered on as described in the manual. To prevent equipment damage select the proper line voltage at the ac input connector as described in the installation documentation.
- To prevent damage to this equipment read the instructions in this document for proper input voltage range selection.
- To reduce the risk of electric shock, ensure that the two power supply cords are each plugged into a separate branch circuit.
- Circuit boards in this product are densely populated with surface mount and ASIC components. Special tools and techniques are required to safely and effectively troubleshoot and repair modules that use SMT or ASIC components. For this reason, service and repair of Link products incorporating surface mount technology are supported only on a module exchange basis. Customers should not attempt to troubleshoot or repair modules that contain SMT components. Link assumes no liability for damage caused by unauthorized repairs. This applies to both in- and out-of-warranty products.

North American Power Supply Cords

This equipment is supplied with molded grounding plug (NEMA 5-15P) at one end and molded grounding connector (IEC 320-C13) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.

International Power Supply Cord

This equipment is supplied with molded grounding connector (IEC 320-C13) at one end and stripped connectors (50/5 mm) at the other end. Connectors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Other IEC 320-C13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

Notes:

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, in which case the user will be required to correct the interference at his own expense.

General Description

The HDG-820/821 Series by Link Electronics™ is a series of broadcast High Definition Pattern Generators, providing the user with high quality, low cost system to produce HD Test Patterns. The HDG-821 is a self contained product for standard 19 inch rack mounting. This unit is a multi-format generator can be used where various HD signals are required. Tri-level sync is on all analog component outputs, RGB or YUV. Sync output can be selected as Bi-level (black burst) or Tri-level.

The HDG-821 is a high definition video test pattern generator in a stand-alone one rack (RU) chassis. The unit has two serial digital outputs at 1.485 Gb/s and YUV/RGB analog outputs. The digital and analog outputs are simultaneous on the rear panel, and contain the same test pattern. The HDG-821 can be a free running (stand alone) unit or a gen-lock unit with a pair of looping BNC connectors on the rear panel. The gen-lock provides infinite adjustments of horizontal and vertical timing and gen-lock indication.

The user may embed internal audio tones on the digital video output if desired. There are two audio groups supported, which will allow for eight channels. The channels can be enabled on an individual basis. The internal tones generated are adjustable from 400Hz to 10 KHz with amplitude adjustment from -30 dbfs to 0 dbfs and silence. The unit will generate one of the two types of audio AES3 or AES11 (DARS). There are also two BNC connectors for AES output, which will allow four channels of audio for monitoring.

There are a total of thirty test signals available, including SMPTE, EIA and Full Field Bars. There are twenty three different HD formats available plus NTSC or PAL black burst. It also has a unit identification that can be enabled to uniquely identify up to 100 different units. It also has the ability to flash the unit identification on and off or the Id. Can be changed to a frame or second counter making the video active so that one can see if the video has been frozen when going thru other equipment.

The HD SDI output has a resettable ANC embedded time code. The output also has ANC embedded Active Format Description (AFD) in which the AFD value can be changed and the inserted line can be changed. There is a Video Payload Identifier (VPID) embedded in the SDI output. The SDI output also has a CEA-608 test message and a CEA-708 test message embedded on it. This allows you to test the ability of other equipment to read and pass this data.

The Link Electronics product design, performance and reliability are reflected in the New-Generation of Link Electronics products. A pair of lighted push buttons and an optical rotary encoder changes and selects between various menus. User friendly operation is a key concept of this instrument. The 20X2 Vacuum Fluorescent Display, shows data for operational functions. The user may choose to have all of the selections saved for power up defaults.

Specifications

OUTPUTS:

HD/SDI: ..... Two 75 Ω BNC's, 800mV ±10%
YUV or RGB Analog: ..... One set of three 75 Ω BNC's
Y, G, B, & R: ..... 1Vpp, ±10% @ 100% Color Bar
U & V: ..... 0.7Vpp, ±10% @ 100% Color Bar
Sync: ..... Bi-level or Tri-level one 75 Ω BNC, 0.6Vpp±10%
AES/EBU Audio: ..... Two, AES3-ID or AES11, 75 Ω BNC

AUDIO:

Frequency: ..... 400 to 10K Hz (100 Hz increments)
Amplitude: ..... 0 to -30dBFS plus silence (1dBFS increments)

SERIAL RS-232:

Serial Control: ..... RS-232, DB-9 Connector, (Future development)

REFERENCE INPUT (HDG-821 ONLY):

Analog Black Burst: ..... High Impedance Loop, >50K ohms
Level: ..... 1Vpp +/- 3dB
Configuration: ..... Single ended

ELECTRICAL:

Input Power: ..... Auto Detection 90 to 264VAC
Frequency: ..... 47 to 63 Hz
Consumption: ..... 12 Watts
Compliance: ..... Designed to meet UL Approval

MECHANICAL:

Height: ..... 1.75 inches
Width: ..... 19 inches
Depth: ..... 9 inches
Weight: ..... 4.75 Lbs.

ENVIRONMENTAL:

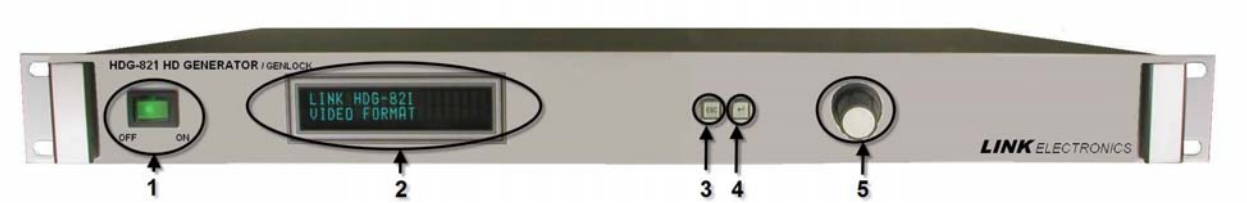
Temperature: ..... 0^{o} to 50^{o} C (ambient)
Humidity: ..... 10% to 90% non-condensing

- Specifications and designs are subject to change at any time without notice.

Output Formats

720 Progressive Formats							
Active Samples	Active Lines	Frame Rate	20 bit Frequency	Samples	Total Lines	Standard	SMPTE
1280	720	60 Hz	74.25 MHz	1650	750	NTSC	296M
1280	720	59.94 Hz	74.175 MHz	1650	750	NTSC	296M
1280	720	50 Hz	74.25 MHz	1980	750	PAL	296M
1280	720	30 Hz	74.25 MHz	3300	750	NTSC	296M
1280	720	29.97 Hz	74.175 MHz	3300	750	NTSC	296M
1280	720	25 Hz	74.25 MHz	3960	750	PAL	296M
1280	720	24 Hz	74.25 MHz	4125	750	FILM	296M
1280	720	23.98 Hz	74.175 MHz	4125	750	FILM	296M
1080 Progressive Formats							
Active Samples	Active Lines	Frame Rate	20 bit Frequency	Samples	Total Lines	Standard	SMPTE
1920	1080	30 Hz	74.25 MHz	2200	1125	NTSC	274M
1920	1080	29.97 Hz	74.175 MHz	2200	1125	NTSC	274M
1920	1080	25 Hz	74.25 MHz	2640	1125	PAL	274M
1920	1080	24 Hz	74.25 MHz	2750	1125	FILM	274M
1920	1080	23.98 Hz	74.175 MHz	2750	1125	FILM	274M
1080 Interlaced Formats							
Active Samples	Active Lines	Frame Rate	20 bit Frequency	Samples	Total Lines	Standard	SMPTE
1920	1080	60 Hz	74.25 MHz	2200	1125	NTSC	274M
1920	1080	59.94 Hz	74.175 MHz	2200	1125	NTSC	274M
1920	1080	50 Hz	74.25 MHz	2640	1125	PAL	274M
1080 Progressive Segmented Frame Formats							
Active Samples	Active Lines	Frame Rate	20 bit Frequency	Samples	Total Lines	Standard	SMPTE
1920	1080	30 Hz	74.25 MHz	2200	1125	NTSC	RP 211
1920	1080	29.97 Hz	74.175 MHz	2200	1125	NTSC	RP 211
1920	1080	25 Hz	74.25 MHz	2640	1125	PAL	RP 211
1920	1080	24 Hz	74.25 MHz	2750	1125	FILM	RP 211
1920	1080	23.98 Hz	74.175 MHz	2750	1125	FILM	RP 211
1035 Interlaced Formats							
Active Samples	Active Lines	Frame Rate	20 bit Frequency	Samples	Total Lines	Standard	SMPTE
1920	1035	60 Hz	74.25 MHz	2200	1125	NTSC	260M
1920	1035	59.94 Hz	74.175 MHz	2200	1125	NTSC	260M

Front Panel Controls



1. Power Switch; turns the unit off or on, will be lit when on.

2. 20X2 Vacuum Fluorescent Display; shows the current menu or information display.

3. Escape Button; allows user to back out of a menu level or a menu selection.

4. Enter Button; allows user to enter the next menu level or to make a menu selection.

5. Rotary Knob; allows user to change the menu or to make a menu selection.

Rear Panel Connections

1. AES output; these outputs will be the same and can be AES3 or AES11 (DARS).

2. HD SDI output; these outputs will be the same with test pattern video.

3. HD component output; these outputs will be YUV or RGB with test pattern video or they can be Tri-level sync outputs.

4. Sync output; this output can be Tri-level sync or it can be Bi-level sync (NTSC/PAL black burst).

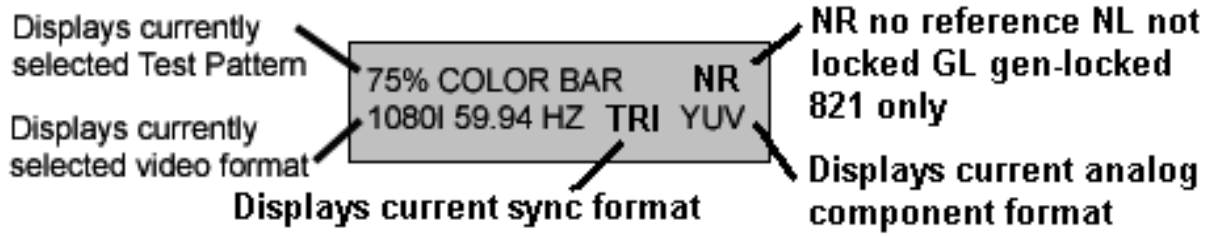
5. RS-232 plug; future use.

6. Looping Reference input; this input is not required unless you want to gen-lock the output. It must be a NTSC/PAL black burst input with one BNC looped to a 75Ω termination.

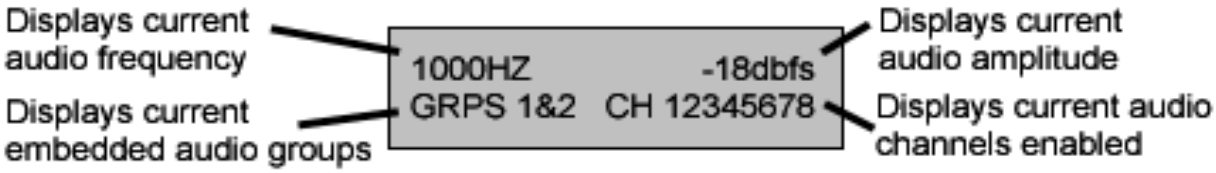
7. Power Receptacle; 120/240V AC plug that holds a ¼ X 1¼ 250V 600mA slow blow fuse.

Information Displays

Video Information Display



Audio Information Display



With the rotary knob the user can switch between these too Information displays. The unit will power up with the Video Information Display. Pressing escape from either information display will bring up the Firmware Display which will show you the version of the current software that the unit is running on. Pressing the enter button from either information display will bring you to the Video Formats first level menu. The first level menus are as follows:

Video Formats
Pattern Selection
Audio Selections
Analog Settings
Timing Adjustments
Number Display Setup
ANC Data Setup
Load & Save Settings

Each first level menu has its own sublevel menu(s) that can be reached by pressing the enter button from that first level menu. The Video Information Display can be reached by pressing the escape button from any one of the first level menus. Pressing the enter button will bring you down a menu, and pressing the escape button will bring you up a menu.

Note: No settings can be changed in the information displays or in the first level menus.

Video Formats Menu

Video Formats:

720 Progressive:
- 60 Hz
- 59.94 Hz
- 50 Hz
- 30 Hz
- 29.97 Hz
- 25 Hz
- 24 Hz
- 23.98 Hz

1080 Interlaced:
- 60 Hz
- 59.94 Hz
- 50 Hz

1080 Progressive:
- 30 Hz
- 29.97 Hz
- 25 Hz
- 24 Hz
- 23.98 Hz

1080 (Progressive) Segmented Frames:
- 30 Hz
- 29.97 Hz
- 25 Hz
- 24 Hz
- 23.98 Hz

1035 Interlaced:
- 60 Hz
- 59.94 Hz

Pressing enter on any of the above formats will change it to the current format. On the lower right of the display the word “ON” will be present if the format is the currently selected format. If the word “NA” is displayed that means that format is not applicable because of either the reference input or bi-level sync has been selected.

Note: Most monitoring and testing equipment can not tell the difference between 1080I 60/59 from 1080S 30/29 or 1080I 50 from 1080S 25 however the unit does produce these formats.

Pattern Selection Menu

Pattern Selection:

- 100% Color Bar
- 75% Color Bar
- SMPTE Bar
- 75% CLR Bar/5 Step
- Luma 5 Step
- Luma 10 Step
- Luma Ramp
- Chroma 5 Step
- Chroma 10 Step
- Chroma Ramp
- SDI Pathological
- SDI EQ
- SDI PLL
- Luma Multiburst
- Luma Sweep 1-30 MHz
- Luma Pulse & Bar
- Chroma Multiburst
- Chroma Sweep 5-15 MHz
- Chroma Pulse & Bar
- 100% White
- 75% Yellow
- 75% Cyan
- 75% Green
- 75% Magenta
- 75% Red
- 75% Blue
- 50% Gray
- Black
- Luma Zone Plates
- Chroma Zone Plates

Use the rotary knob to change to next test pattern. Changing the menu to a different test pattern automatically changes the outputs to that test pattern.

Note: All 30 test patterns are available with all 23 video formats.

Audio Selections Menu

Audio Selections:

Audio Type Select:
- AES3 (normal)
- AES11 (DARS)

Audio Group Select:
- GRP1 & GRP2
- GRP3 & GRP4

Audio Channel Enable:
- Channel 1
- Channel 2
- Channel 3
- Channel 4
- Channel 5
- Channel 6
- Channel 7
- Channel 8

Frequency Selection:
- Frequency = 400 to 10k Hz (increments of 100 Hz)

Amplitude Selection:
- Amplitude = 0 to -30 dBFS plus silence (increments of 1 dBFS)

Pressing enter on any of the above channels in the Audio Channel Enable submenu will turn that channel on. On the lower right of the display the word “ON” will be present if the current channel has been turned on. The other Audio Selections submenus automatically update with the rotary knob.

Note: The AES output BNC’s will always have audio on them no matter what groups or channels is enabled or disabled.

Analog Settings Menu

Analog Settings:

- Component Selection:
  - YUV Outputs
  - RGB Outputs
  - Tri-level Outputs
- Sync Selection:
  - Tri-level Sync
  - Bi-level Sync
- DC Offset Control:
  - Luma DC Control:
    - Adjust Luma Offset
  - Chroma DC Control:
    - Adjust Chroma Offset

Pressing enter on YUV Output or RGB Output in the Component Selection submenu will enable that output. On the lower right of the display the word “ON” will be present if the current output has been enabled. If the word “NA” is display for the Bi-level sync that means the selected format is not applicable for bi-level sync. The DC Offset Control submenus automatically update with the rotary knob.

Note: The DC Offsets are preset at the factory. If they are to be changed you should use the proper test equipment to monitor these adjustments.

Timing Adjustments Menu

Timing Adjustments:

Horizontal Timing:
Horizontal = 0 to maximum pixel count for current output format

Vertical Timing:
Vertical = 0 to maximum line count for current output formats

Horizontal and vertical timing adjustments automatically update with the rotary knob. Pushing the rotary knob in will switch between fine and course adjustments. Fine adjustments are in increments of 1 pixel or line, and course adjustments are in increments of 100 pixels or lines.

Note: NTSC black burst reference will only properly lock to the 59.94 Hz, 29.97 Hz and 23.98 Hz formats, and PAL black burst reference will only properly lock to the 50 Hz and the 25 Hz formats. See Operational Notes.

Number Display Setup Menu

Number Display Setup:

Display Selection:
- Display Disabled
- Display Unit ID
- Display TC Frames
- Display TC Seconds
- Flash Unit ID

Unit Identification:
- ID Number = 0 to 99

Flash Rate of ID:
- Flash Rate = 99 to 1

Pressing enter from these three menus allows you to adjust the selections. The adjustments automatically update with the rotary knob. Then pressing enter or escape will back you out of these adjustments.

Unit ID is a number (00 - 99) that will show up in the lower right hand corner of the video to uniquely identify that unit. Flash Unit ID means that the unit Id will flash on and off creating an active video. So the fastest flash rate will be 99 and the longest flash rate will be 1. Display TC Frames allows the time code frames to be displayed instead of unit Id. Display TC Seconds allows the time code seconds to be displayed instead of unit Id.

ANC Data Setup Menu

ANC Data Setup:

Reset Time Code:

Set HH:MM = 00:00 to 23:59(Push rotary knob in to switch between minutes and hours, then press enter to reset)

AFD Insertion Value:

00 Bar Data or FF
02 FullFrame 16:9
03 PillarBox 14:9
04 LetterBox > 16:9
08 FullFrame 16:9
09 PillarBox 4:3
10 FF 16:9 Protect
11 PillarBox 14:9
13 PB 4:3 Alt 14:9
14 FF 16:9 Alt 14:9
15 FF 16:9 Alt 4:3
01, 05, 06, 07, & 12 Reserved
(FF = Full Frame, > = with aspect ratio greater than, Protect = all image areas protected, Alt = with alternate ratio center, PB = Pillar Box)

AFD Insertion Line:

9-20 Line = 9 to 20 or Off

Caption Insert Line

9-20 Line = 9 to 20 or Off

Pressing enter from these four menus allows you to adjust the selections. The adjustments automatically update with the rotary knob. Then pressing enter or escape will back you out of these adjustments.

The HDG-821 will embed a CEA-608 CC1 3 line roll-up test message that reads 3 Line Roll-up 608 CC1 Test. It will also embed a CEA-708 Service 1 3 line roll-up test message that reads 3 Line Roll-up 708 S1 Test. The caption lines will alternate between white no underline and red with underline. This allows you to test the ability of caption decoders and other equipments ability to pass captions. AFD insertion allows you to test the ability of a down-converter to read and react to AFD.

Load and Save Settings Menu

Load & Save Settings:

Save Current Settings:
Saving Selections

Load Factory Default:
Loading Defaults

To save your current settings press enter from Save Current Settings Menu, now the unit will power up with the current settings that you have entered. To load factory defaults press enter from Load Factory Default menu now the settings have been changed to factory defaults.

Factory Defaults:

Video format	= 1080I 59.94 Hz
Test pattern	= 75% Color Bar
Component	= YUV
Audio Type	= AES3
Audio frequency	= 1000 Hz
Audio amplitude	= -18dBFS
Embedded groups	= 1 & 2
Embedded channels	= 1 2 3 4 5 6 7 8
Horizontal timing	= 0 pixels
Vertical timing	= 0 lines
Display type	= disabled
ID number	= 00
Flash rate	= 99
Sync	= Tri-level
TC minutes	= 00
TC seconds	= 00
AFD value	= 16:9 all image areas protected
AFD line	= 09
Caption line	= 09

Note: To configure unit to start up with factory defaults you must first load factory defaults then save current settings.

Operational Notes

NTSC\PAL Reference

The unit automatically detects a NTSC or PAL reference input. It will automatically switch to a format that is gen-lockable with the reference input if one is not all ready selected. It also limits the format selections to only those that are gen-lockable to the reference input.

Free Run Frequency:

These units have the free run frequency preset at the factory. However, if the user decides he wants to speed up or slow down that frequency they can. Power down the unit and open it up (remove the lid). Install a jumper at J12; J12 is near the front panel. Now power up the unit while holding the rotary knob in, release the knob and an "Adjust Oscillator Frequency" menu will be displayed. Rotate the knob until you get the desired frequency. You will need to use the proper equipment to be able to tell what frequency you're at. Now power down the unit and remove jumper at J12. Close the unit up (install the lid) and power up the unit. The unit is now going to free run at the frequency you selected.

Product Warranty

Ten Year Limited Warranty (Original Customer)

Link Electronics Inc. warrants its product to be free from defective material and workmanship for a period of TEN-YEARS from date of shipment, including parts and labor. This warranty excludes the HDE-3000 High Definition Closed Caption Encoder; note, Labor performed at the Link Electronics factory in Cape Girardeau, Missouri.

This warranty does not extend to products which have been subjected to misuse, neglect, accident, incorrect wiring, alteration, improper installation, or used in violation of instructions from Link Electronics. Link Electronics makes no other warranties, express or implied, of merchantability, fitness for a particular purpose, or otherwise. Link Electronics liability for any cause, including breach of contract, breach of warranty, or negligence, with respect to products sold by it, is limited to repair or replacement by Link Electronics, at its sole discretion.

The product must be shipped to Link Electronics, freight costs prepaid. Repaired or replaced equipment shall be shipped customer surface freight only, to be paid by Link Electronics. This warranty is in lieu of all other warranties, expressed or implied, with respect to the condition or performance of any Link Electronics products, its merchantability, or fitness for a particular purpose.

The product warranty will be null and void, if a specific component part should become obsolete by the manufacturer. If the component part becomes obsolete and not available through distribution, Link Electronics, Inc will not be responsible for repair or replacement of a Link Electronics manufactured product.

In no event shall Link Electronics be liable for any incidental or consequential damages, including loss of profits. This WARRANTY supersedes all previous warranties, whether implied, written or verbal.

SERVICE INFORMATION

In the event that the Link Electronics equipment should fail, you should contact the Customer Service Department and request a Return Authorization (RA) number. At that time, the details of how the repair should be processed will be discussed.

All inquiries relating to either parts replacement or warranty service should be directed to:

LINK ELECTRONICS, INC.
2137 Rust Avenue
Cape Girardeau, Missouri 63703
Attention: Service Department
Phone: (573)334-4433
Fax: (573)334-9255