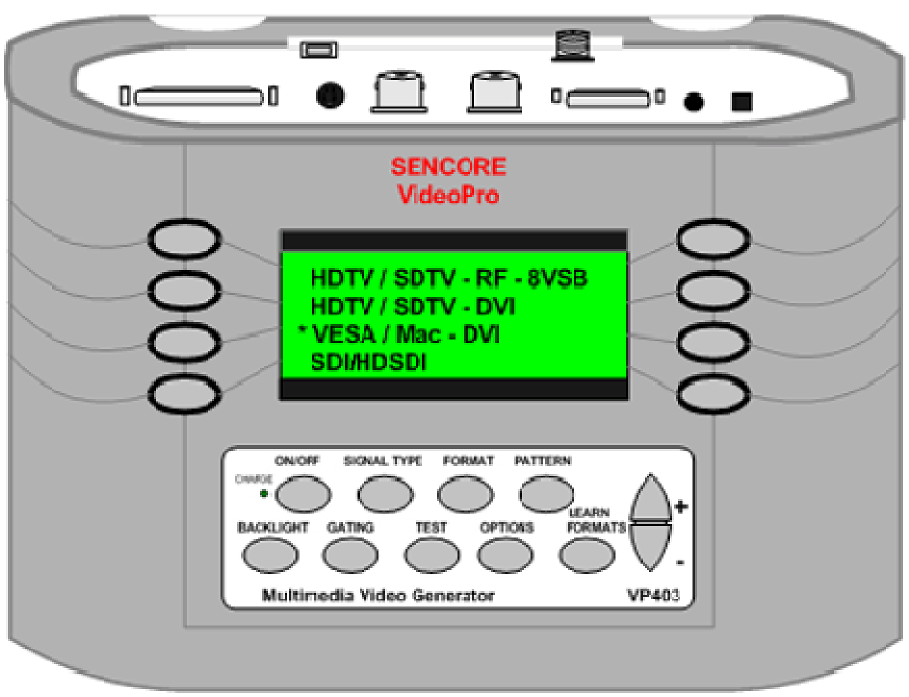
VP400 Series
VideoPro

Multimedia Video Generators
VP400, VP401, VP402, VP403, VP403C, VP400SH, VP401SH, VP403SH, VP403CSH

Operation Manual



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Introduction

This manual documents the operational features and applications of the VideoPro 400 series generators from Sencore. The VideoPro 400 series includes models VP400, VP401, VP402, and VP403, VP403C and "SH" suffix models. These models offer various signal options to satisfy your testing requirements. The chart below summarizes the signal type differences among the models. The VP403 includes all signal output options including NTSC RF, DVI, and ATSC RF. The VP402, VP401, and VP400 do not include various outputs, as indicated by a "NO" in the chart.

VideoPro Multimedia Video Generators

Sencore Model # s	Composite NTSC/PAL	S-Video NTSC/PAL	Y Pb Pr Component HDTV/SDTV	R G B H V Analog VESA Mac	NTSC – RF, Ch. 2, 3, 5, 6	D.V.I. VESA/Mac /HDTV	ATSC – RF 8 VSB, Ch. 2-4, 7-10, 30-32
VP400	YES	YES	YES	YES	NO	NO	NO
VP401	YES	YES	YES	YES	NO	YES	NO
VP402	YES	YES	YES	YES	YES	NO	YES
VP403	YES	YES	YES	YES	YES	YES	YES

"SH" suffix models add SDI/HDSDI output signals to the generator.

Specifications

Video Formats

Storage: 100 total
VESA/Mac 38 standard formats from 640x350 to 1920x1024
NTSC NTSC
PAL PAL, PAL-Y
SDTV 420i29, 480i30, 480i59, 480i60, 480p59, 480p60
HDTV 720p59, 720p60, 960p59, 1080i25, 1080i29, 1080i30, 1080p50, 1080p59, 1080p60, 1080s23, 1365x1024

Video Outputs (VP400, 401, 402, 403)

DTV: SDTV: YPbPr, RGB, DVI
HDTV: YPbPr, RGB, DVI
NTSC: Composite, S-Video, RGB
PAL: Composite, S-Video, RGB
Computer: VGA/Mac: RGB, DVI

Horizontal Timing

Frequency: 1.5 kHz – 250 kHz
Total pixels: 32 to 4095
Active range: 16 to 4094 pixels

Vertical Timing

Frequency: 1 Hz – 1 kHz
Active lines: 1 – 4095
Scan Types: Progressive, Interlace

Sync Types

Separate Digital Horizontal and Vertical
Digital and Analog Composite
Tri-level HDTV
Bi-level

NTSC RF channel Output (402, 403)

Channels: CH2, CH3, CH4, CH6
Carrier Level: 10 dBmV +/- 3 dBmV
Carrier Accuracy: +/- 50 kHz

ATSC RF Channel Output (VP402, 403)

Channels: CHs 2-4, 7-10, 30-32
MER: >30 dB

Audio output

Channels: Two channels
Frequency: 1 kHz (left), 2 kHz (right)
Connector: 3.5mm phone jack stereo

SDI (‘SH’ only): SMPTE 292M, 10 bit 1.485 Gb/s
525i (720x486@59.94) ITU-R/BT.601-4
625i (720x576@50i) ITU-R/BT.601-4

HDSDI (‘SH’ only): SMPTE 259M, 10 bit 270 Mb/s
Formats: 720p @60, 59.94, 50 Hz
1080i, 1080p @30, 29.97, 25, 24, 23.98 Hz

Patterns: SMPTE Bar, Staircase, H_Stair, Pluge, Needle, HiLoTrk, Overscan, Sharpness Window1, Window2, Raster, DecodAdj DecodChk, ColorBar, Croshhatch, Converge, Linearity, Anamorphic, Ramp Regulate, Checker, Multiburst, Focus
Still Picture Images VP403C: Hiking Couple, Girl
Video Clips 403C: Hot Air Balloons (720p), Hawaii Scenes (1080i)
Gray levels/Colors Displayed: 16/16

Test (Sequence)

Storage: 100 steps
Edit method: PC
Parameters: Load Format & Pattern
Auto time: 0.1 sec. to 24 hours
Name: 8 characters

User Interface

Display: 20x4 char. LCD/backlight
Pushbuttons: 9 function, 8 menu select

Computer Port

Type: RS-232C
Baud Rate: 9600
Handshake: none, Xon/Xoff
Connector: 9 pin D-Sub receptacle
Download: Copy Formats and Firmware updates via PC

DDC (Display Data Channel)

Read EDID data & display supported formats
Version supported: DDC-2B (read only)

Power

Battery: (6) AA Batteries NiMh
Use time: 8 hours with NiMh
AC: 12V Charger/Adapter PS
Re-charge 400/401: ~8 hr, 402/403:~4 hr
Frequency: 48 to 66 Hz
Voltage: 86 – 250 VAC (auto)

Weight & Size

VP400, VP401: 1.5 lbs.
VP402, VP403: 2.0 lbs
VP400, VP401: 6 x 8.25 x 2 in.
VP402, VP403: 6 x 8.25x 3.5 in

Battery Information & Installation

Battery Types Used

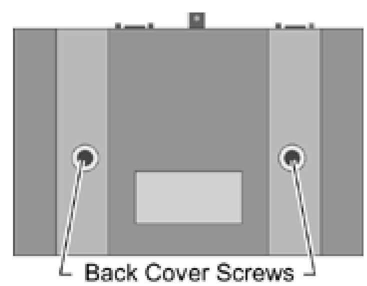
The VideoPro generator is supplied with six (6) AA rechargeable Nickel Metal Hydride (NiMH) cells. These 1800 mA/H rated cells will operate the VP400/401 generator about 8 hours and the VP402/403 generator about 4 hours on a full charge. The batteries can normally be recharged 1000 times before needing replacement.

No other type of rechargeable battery can be used in the Sencore 400 series generators. You can use non-rechargeable alkaline AA cells with the generator, provided that you NEVER use the external power supply with the generator while the alkaline cells are in the generator. Attempting to operate the generator or recharge alkaline cells may result in operator injury or generator damage. For this reason, use of alkaline cells is not recommended. Never mix battery types in the generator.

AC Power Supply

The AC power supply that comes with the generator has an input voltage range of 100-240 VAC from 47 to 63 Hz. The output is rated at 12.0 VDC @ 1 Amp. This is sufficient to operate the generator and recharge the batteries at the same time. Attempting to operate the generator or recharge the batteries with any other type of external power supply may cause operator injury and/or damage to the generator! Furthermore, do not use or modify the generator for use with vehicle 12VDC power. These voltage sources are unregulated and can approach voltages of nearly 14V, causing circuit stress and possible premature circuit failure.

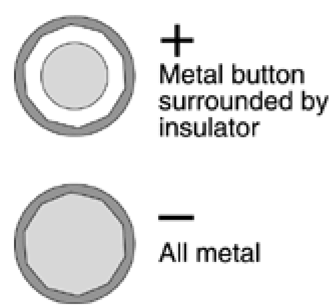
Battery Installation



1) Place the generator face down on a suitable padded surface.
2) Remove the two back cover screws shown in the top figure.
3) Lift the back cover off the generator and locate the six battery holders. (The VP402/VP403 require additional disassembly.)
4) Install the batteries, making sure to match up their polarities for each battery holder. The supplied batteries may not have any printed polarity indication. The outer metal can is the negative terminal. The insulated metal button, as shown in the end view in the lower figure, is the positive terminal.
5) Replace the back cover and retaining screws.
6) When the generator is shipped from the factory, the supplied batteries may not be fully charged. Connect the supplied AC power supply and charge the batteries for at least 8 hours.

Low Battery Indication

A “BATTERY LOW’ message blinks on the LCD when the NiMH batteries need recharging or alkaline cells need replacement.



Making Connections VP400/401

SDI/HDSDI Serial Digital BNC Connector

NTSC/PAL Composite BNC Receptacle

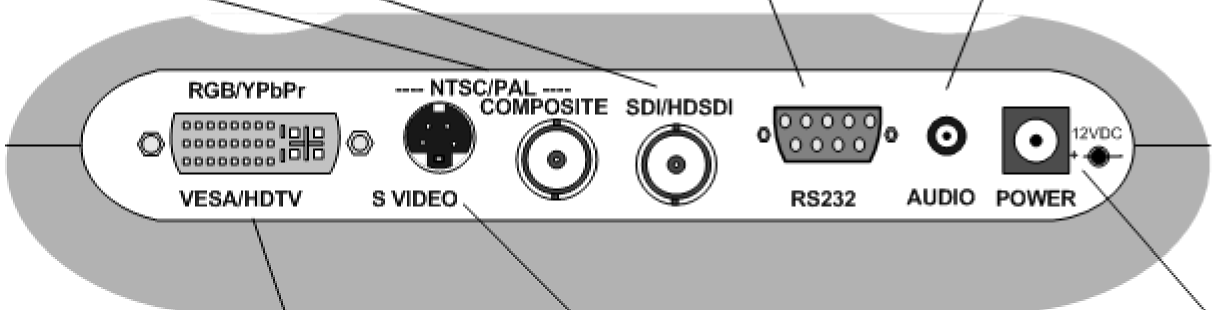
RS-232 Port-9 Pin D-Sub Plug

Pin #	Signal (DTE)
1	No Connection
2	Data In (Rx)
3	Data Out (Tx)
4	DTR Out
5	Ground
6	No Connection
7	RST Out
8	CTS In
9	No Connection

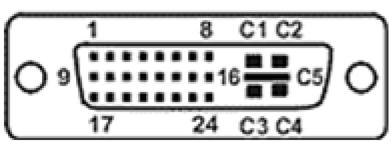
Factory Defaults: 9600 Baud, 8 Data Bits, No Parity, 1 Stop Bit, Xon-Xoff

Stereo Audio 3.5 mm Phone Jack

Tip - Left Channel (1Khz)
Ring - Right Channel (2Khz)
Sleeve - Ground



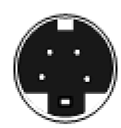
DVI Connector - DVI Option



Pin#	Signal	Pin#	Signal
1	TMDS D2-	13	TMDS D3+
2	TMDS D2+	14	+5V
3	D2/4 Shield	15	Ground
4	TMDS D4-	16	Hot Plug Det.
5	TMDS D4+	17	TMDS D0-
6	DDC Clock	18	TMDS D0+
7	DDC Data	19	D0/5 Shield
8	Vert. Sync	20	TMDS D5-
9	TMDS D1	21	TMDS D5+
10	TMDS D1+	22	Clock Shield
11	D1/3 Shield	23	TMDS Clock +
12	TMDS D3-	24	TMDS Clock -

C1-Red, Pr C2-Green, Y C3-Blue, Pb
C4-Horiz. Sync C5-Analog Ground

S-Video Receptacle 4 Pin mini-DIN

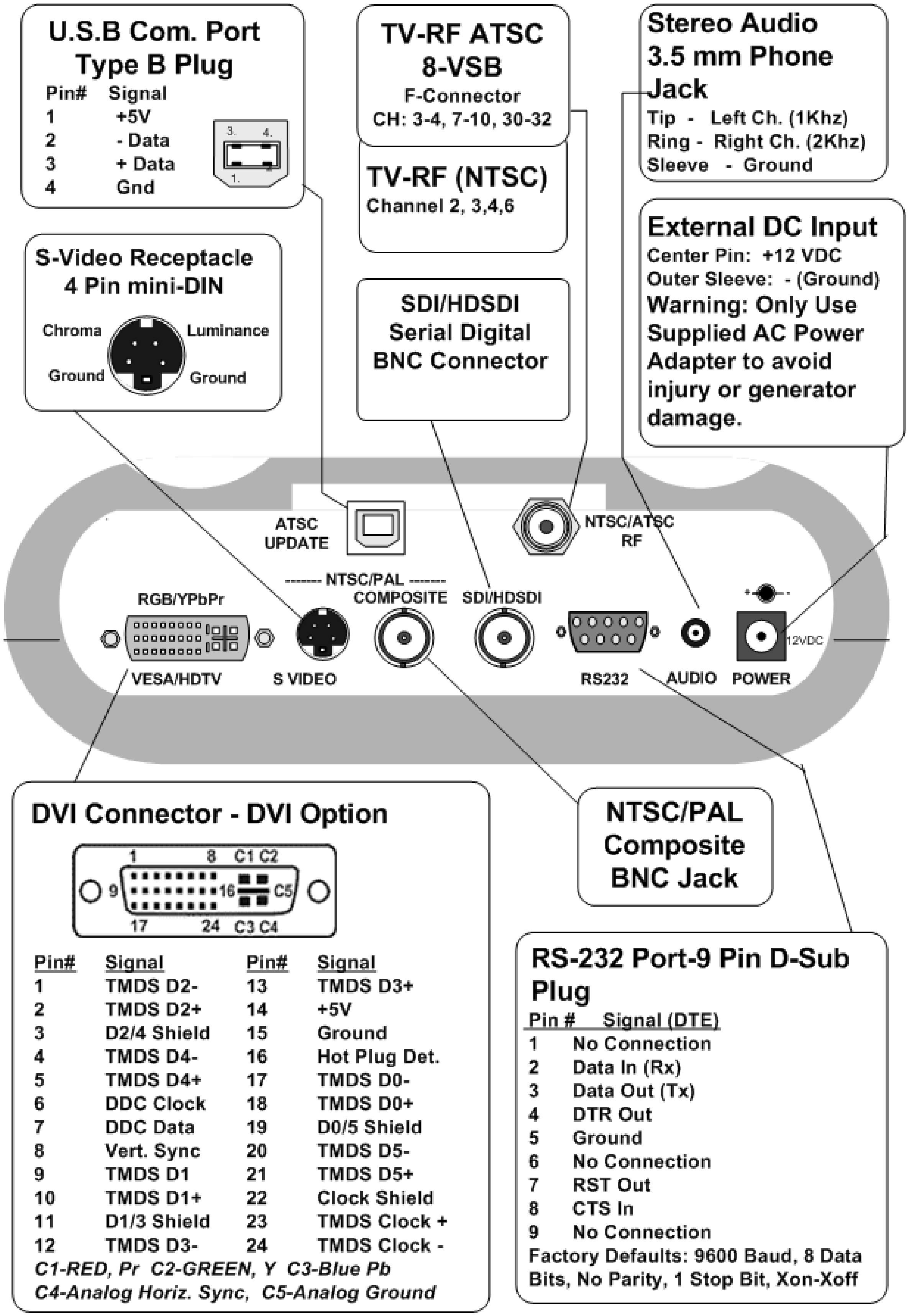


External DC Power/ Battery Recharge Input

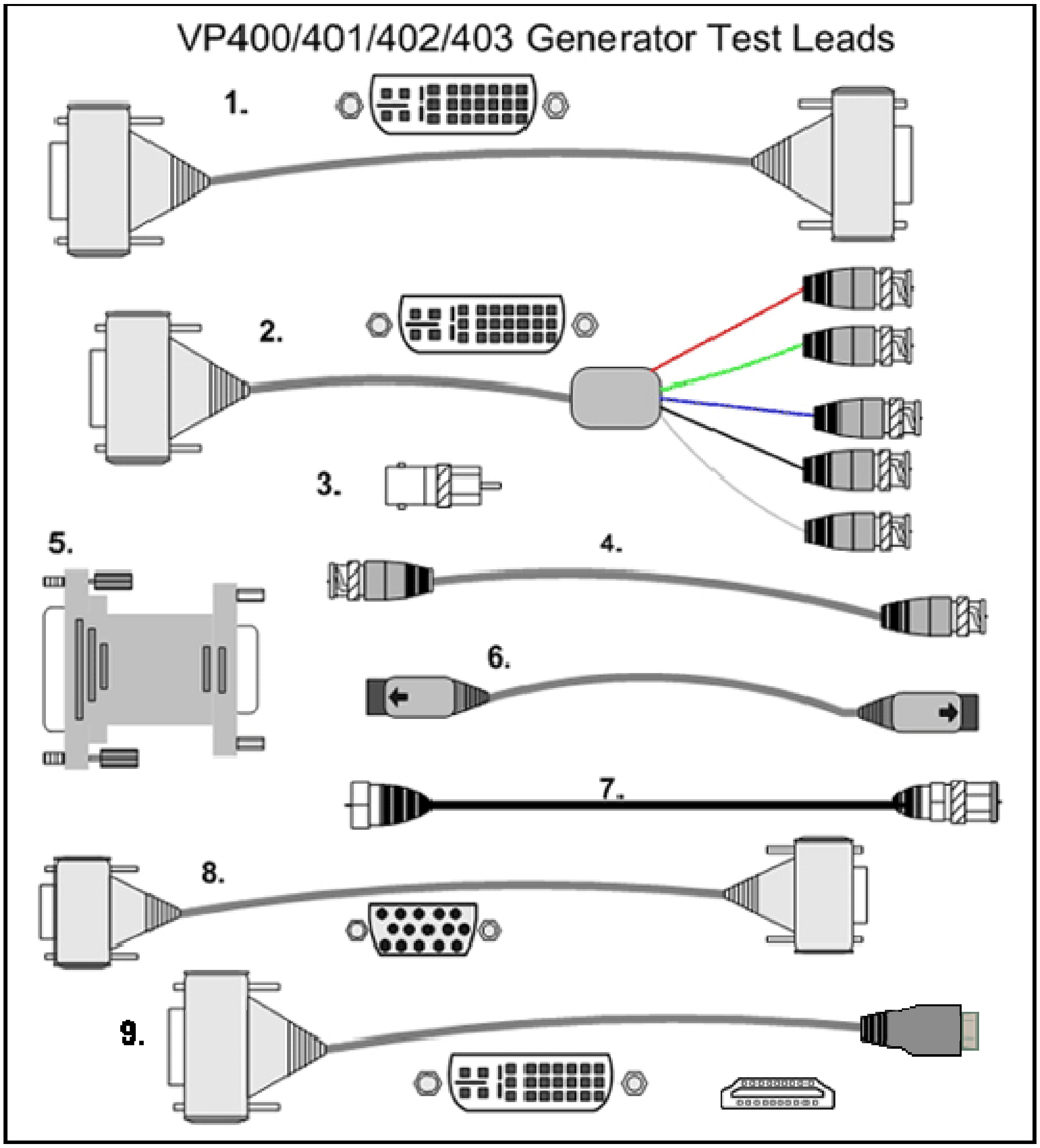
Center Pin: +9.0 VDC
Outer Sleeve: - (Ground)

Warning: Attempting to use an external power supply source other than the supplied AC power supply may cause operator injury and/or damage the generator.

Making Connections VP402/403



Test Lead Accessories

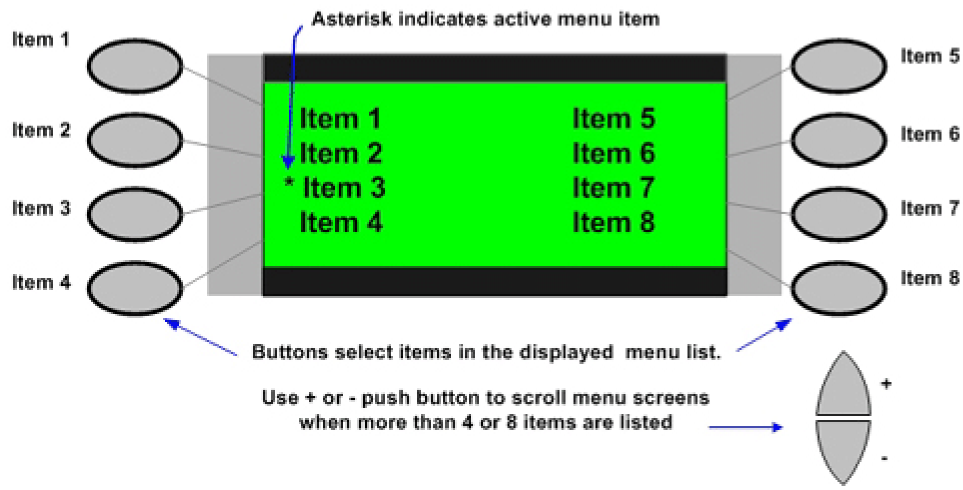


1. DVI-I male to DVI-I male single link 6 ft. cable (39G1060) – Connects the DVI output of the generator to the DVI input of a display. **(Supplied with VP401 and 403)**
2. DVI-I male to 5 BNC 6 ft. cable (39G1059) - Adapts the generator's DVI analog outputs to the RGBVH or component inputs of a display.
3. BNC to RCA phono plug adapter (26G1255) – Adapts a BNC connector to an RCA male phono plug. Use to adapt the BNC connectors to male phono connectors required by most Y, Pb, Pr inputs. (5 Supplied)
4. Coaxial BNC to BNC 6 ft. cable (39G232) – Connects the NTSC/PAL output jack of generator to the video inputs of a display.
5. DVI-A to VGA HD-15 F Adapter (39G1061) - Adapts the analog DVI outputs of the generator to a standard VGA HD-15 plug configuration.
6. SVHS 4 pin mini-din connector cable (39G270) – Connects the S Video output jack of the generator to the Y/C or S Video input of a display.
7. Coaxial 6ft. cable "F" to Quick F connectors (39G189): - Connects the RF output jack of the VP403 to the antenna or cable input of a display. **(Supplied with VP402, VP403)**
8. **(Optional - all models)** VGA HD-15M to VGA HD-15M 6 ft. cable (39G798) – Used to connect the output of the DVI to VGA adapter (39G1061) to the VGA HD-15 input of a display.
9. **(Optional - all models)** Connects a DVI output to an HDMI input (DH1000 cable).

Front Panel Controls & Indicators

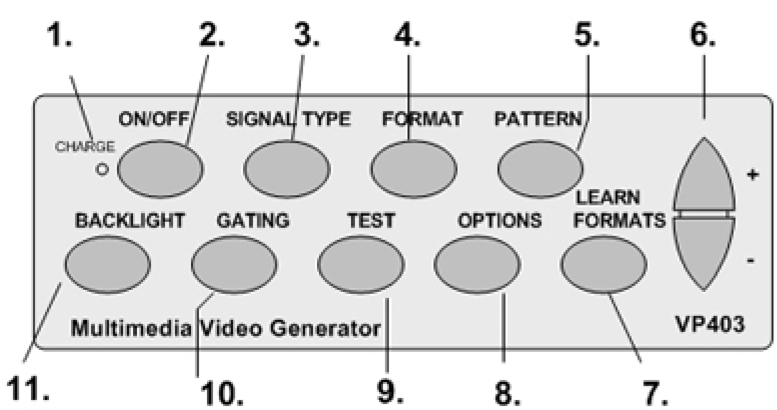
LCD Window

The LCD window displays either a selection menu or a user message. Most often a selection menu is displayed. The selection menu may show from 1- 8 items. The figure shows a selection menu with 8 items. Often only 1-4 items are shown, allowing more definition to the displayed selections. Pressing the pushbutton beside the listed item selects and activates that item. Pressing the + or – pushbuttons scrolls up or down to additional menu screens containing more selection items. The + or – pushbuttons are used to select additional menu screens when more than 4 or 8 items may be selected.



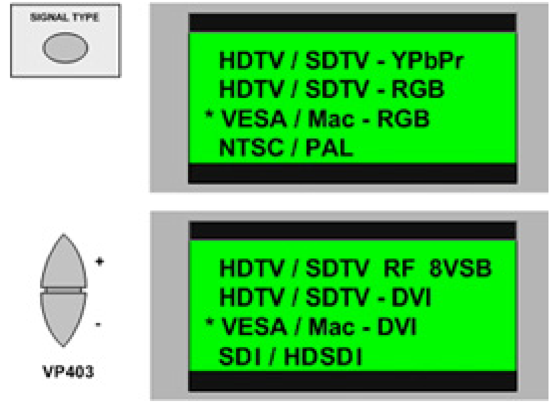
Controls

1. CHARGE Light – Lights when external power adapter/charger is connected.
2. ON/OFF pushbutton – Push and hold down for approximately 1 second to turn generator on or off.
3. SIGNAL TYPE pushbutton – Selects a menu(s) listing the various signal types that can be produced by the generator. See *Signal Types* section of this manual.
4. FORMAT pushbutton – Selects a menu(s) listing the various formats within each signal type that can be produced by the generator. See *Format* section of this manual.
5. PATTERN pushbutton – Selects a menu(s) listing the various video test patterns produced by the generator. See the *Pattern Description and Usage* section of this manual.
6. +/ - pushbuttons – Move up or down through menu displays to show multiple selection items.
7. LEARN FORMATS pushbutton – Selects a menu that provides DDC testing. Captures display DDC data using the EDID data.
8. OPTIONS pushbutton – Selects a menu listing generator control options.
9. TESTS pushbutton – Selects a menu listing the various special tests that can be performed by the generator. See the *Tests Menu* section.
10. GATING pushbutton – Selects a menu listing the various gating selections for video and sync. See the *Gating* section of this manual.
11. BACKLIGHT pushbutton – Turns LCD backlight on or off. With Power Save “ON” in the Options menu, the LCD light times off in approximately 30 seconds.



Signal Type Menu

A Signal Type menu(s) is displayed by pressing the Signal Type pushbutton. This menu lists the different output video signal types that may be produced by the generator. Pressing the + or – pushbuttons show additional signal type selections. An asterisk indicates the selected or active signal type. Pressing the pushbutton beside the signal types listed in the display selects that signal type for output by the generator.



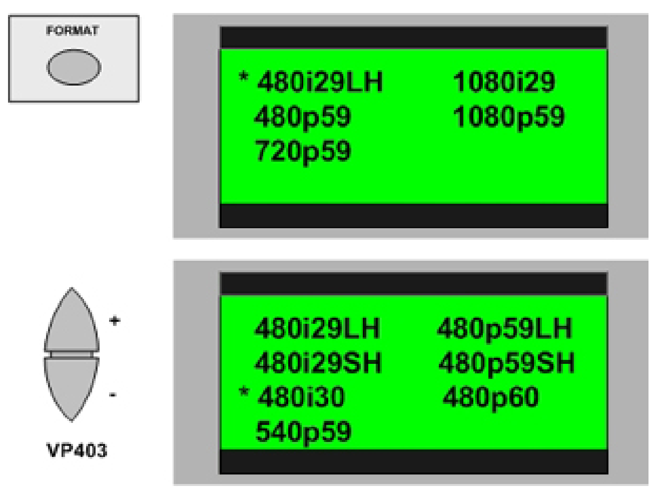
HDTV/SDTV – YPbPr: Analog luminance (Y) and color difference signals (Pb,Pr) per EIA standards commonly referred to as component video.
HDTV/SDTV – RGB: Analog red, green and blue video signals per EIA standards.
VESA/Mac – RGB: Analog red, green and blue video signals per VESA and Apple/Mac standards.
NTSC/PAL: Analog composite color base-band video signal via BNC connector or separate analog luminance (Y) and chrominance (C) video signal via S-video connector or RGB component video via analog pins of DVI connector per NTSC or PAL standards. NTSC RF video signals via RF connector on channel 2, 3, 4, or 6.

HDTV/SDTV – RF – 8VSB: TV Digital video with RF carrier modulated with 8 level vestigial side-band modulation, per ATSC standards, on channels 2-4, 7-10, and 30-32.
HDTV/SDTV – DVI: Single link digital video interface of red, green, blue HDTV/SDTV video signals via differential data and clock lines with a standard DVI connector.
VESA/Mac – DVI: Single link digital video interface of red, green, blue video signals per VESA and Apple/Mac standards via differential data and clock lines with a standard DVI connector.
SDI/HDSDI – Serial digital video interface of multiplexed Y, Cr, Cb video signals.
User: User defined video formats.

Format Menu

A Format menu(s) is displayed by pressing the FORMAT pushbutton. This menu is also automatically displayed when a new Signal Type is selected in the Signal Type menu. This prompts you to select the desired format to fully define the generator's output signal.

The Format menu(s) lists the different signal formats that can be produced for the selected Signal Type. Pressing the + or – pushbuttons shows additional format selections. An asterisk indicates the selected or active format. Pressing the pushbutton beside the format listed in the display, selects the format for output by the generator.



Note: Additional menu screen(s) is not shown

Appendix A lists the various signal formats provided by the Sencore 400 series generators. The generator may store up to 100 formats in non-volatile memory. Unused locations may be shown as "empty" on the format menu.

Pattern Menu

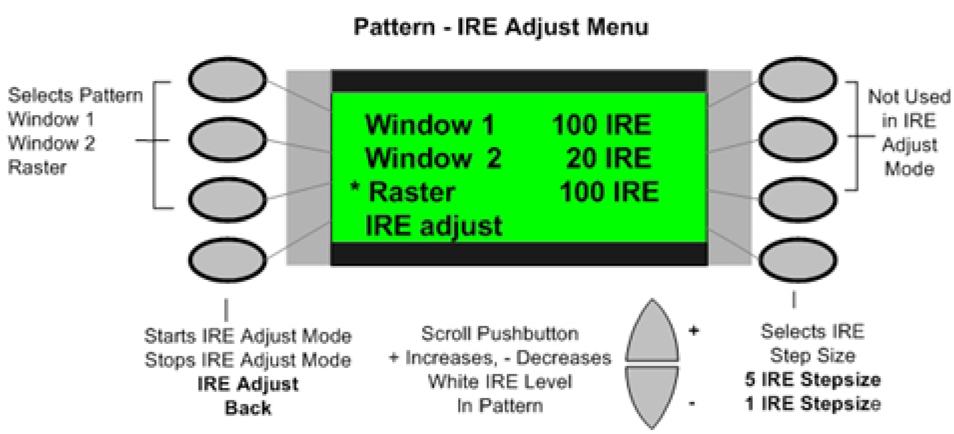
A video pattern menu(s) is displayed by pressing the Pattern pushbutton. This menu lists the different video test patterns that may be selected and produced by the generator. Pressing the + or – pushbuttons displays additional pattern selections. An asterisk indicates the selected, or active, pattern. Pressing the pushbutton beside a pattern listed in the display selects that pattern for output by the generator. See the *Pattern Description and Usage* section of this manual for information on each video pattern.

Note: While there are 23 internally generated video test patterns, not all are available on each signal type and format selection. The Pattern menus list the available video patterns for the signal type and format selected.

Window Pattern IRE Adjust Menu

The Pattern menu screen that lists the Window 1, Window 2 and Raster patterns includes a special test option listed as "IRE adjust" in the bottom line of the display menu. When in an IRE Adjust mode, the IRE level of the white portion of the Window 1, Window 2 or Raster video patterns can be changed from 0 to 100 IRE in 1 or 5 IRE steps. To start the IRE adjust mode, press the pushbutton beside the IRE Adjust selection in the display. Press the pushbutton to the bottom right of the display to select either 1 or 5 IRE steps. Press the + or – Scroll pushbutton to increment the IRE level of the selected pattern

Note: IRE adjustment is available only for this menu screen for the Window 1, Window 2 and Raster patterns. The window patterns in the HDTV/ SDTV - RF - 8VSB signal type are fixed in IRE level and do not include IRE adjustment.



Gating Menu

A Gating menu is displayed by pressing the Gating pushbutton. This menu lists options to modify the output video or sync signals. The gating options shown in this menu vary depending on the selected signal type and format. The middle of the Gating menu indicates the signal type and video pattern currently selected.

Menu shown for HDTV YPbPr signal type

ACS, DCS, DSS Gating: The right side of the gating menu provides three choices of sync types. The native sync type for the selected format is marked with an asterisk. The sync types are abbreviated as ACS (Analog Composite Sync), DCS (Digital Separate Sync, and DSS (Digital Separate Sync). Here is a brief description of each sync type.

> <u>ACS (Analog Composite Sync):</u> Vertical and horizontal sync pulses are included with the Y (luminance), G (Green), or Composite Video signals**.** Levels are analog, causing an approximate 0.3V sync signal swing.
>
> <u>DCS (Digital Composite Sync):</u> TTL-level vertical and horizontal sync pulses are separate from the video, but are combined on a single wire connection as a composite signal. DCS is used in analog RGB color video signal types.
>
> <u>DSS (Digital Separate Sync):</u> TTL-level vertical and horizontal sync pulses are separate and contained on separate connector pins and wires between the generator and display.

Red, Green, Blue Gating: The left side of the gating menu provides on/off control of the individual R, G, B video outputs. For example, pressing the pushbutton beside the RED display indicator turns on or off the red color. An asterisk indicates the color output is active. Color gating is not available in the YPbPr or ATSC RF signal types. When the color cannot be gated on or off, pressing the pushbuttons beside the RED, GRN and BLU display indicators will not turn off the output and the asterisk stays on.

Sync Polarity Gating: A Sync Polarity selection in the bottom left of the display switches the sync polarity from positive (+) to negative (-). This selection is available in the analog RGB signal type.

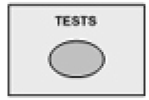
Trilevel, Bilevel Sync Gating: A sync type selection is available in the HDTV/SDTV YPbPr signal types. The sync type may be bilevel or trilevel.

> <u>Bilevel Sync:</u> Two-level sync pulse combined on the luminance or Y signal.
>
> <u>Trilevel Sync</u>: Three-level sync pulse combined on the luminance or Y signal.

Black Setup On/Off Gating: A black setup level may be added or deleted from the NTSC signal type. Pressing the pushbutton cycles the black setup from on to off. Black setup establishes black at 7.5 IRE level. Turning black setup off reduces the black level portions of the test pattern signals to 0 IRE.

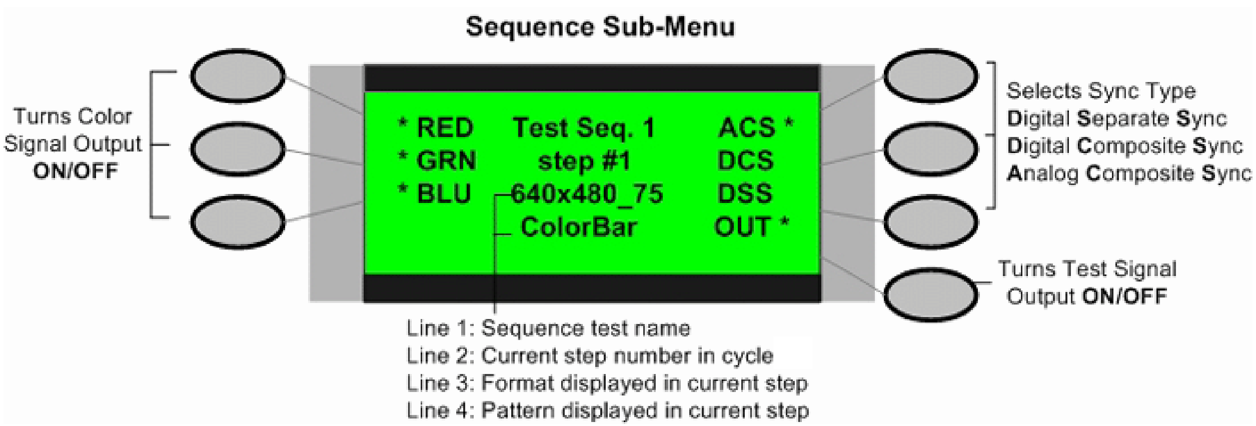
Tests Menu

Pressing the TESTS pushbutton displays a Tests menu. This menu lists special tests that can be selected. Pressing the pushbutton beside the items listed in the Tests menu display results in a sub-menu for that item. The sub-menus for these tests are explained in the following sections.



Sequence Sub-Menu

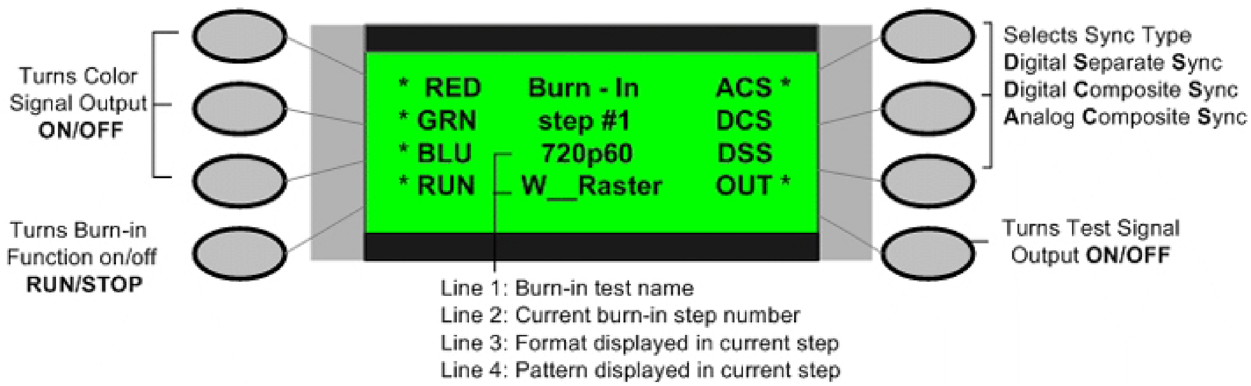
The Sequence sub-menu permits testing of a display by applying a sequence of defined formats and video patterns. Test sequences are created using custom editing software and a PC interface to the Sencore 400 series VideoPro Generators. Check with the factory on the availability of Video Generator Management (VGM) software. The firmware in the 400 series generators contains a sample sequence in memory.



In the Sequence sub-menu, pressing the + or – Scroll pushbutton increments through the defined sequence. Each sequence loads a specified format and pattern that is output by the generator. The generator output can be turned on or off during a sequence step with the pushbutton to the bottom right of the display. An asterisk indicates when the generator output is ON. The sync type can be selected with the pushbuttons to the right of the display. The red, green and blue video outputs can be gated on or off provided the selected format permits RGB gating.

Burn-In Sub-Menu

The Burn-In sub-menu enables you to cycle automatically and continuously through each of the video test patterns for the selected format. The pushbutton to the bottom left of the display is the Run/Stop button. Pressing the pushbutton to indicate "RUN" starts the generator cycling through each of the video test patterns. Pressing the pushbutton to indicate "STOP," results in a single continuous test pattern.



The generator output can be turned on or off during burn-in with the pushbutton to the bottom right of the display. An asterisk indicates when the generator output is ON. The sync type can be selected with the pushbuttons to the right of the display. The red, green and blue video outputs can be gated on or off, provided the selected format permits RGB gating (not with YPbPr or ATSC RF).

Audio Sub-Menu

The Audio sub-menu provides selections to turn on or off the left and right stereo audio outputs of the generator. Pressing the pushbutton beside the display toggles the left or right audio signal on or off as indicated in the display. The L Audio menu button turns on and off the RF audio modulation in the NTSC RF Signal type.

HDCP Sub-Menu

An HDCP sub-menu results when the HDCP field is selected in the TESTS menu by pushing the button beside the display item "HDCP." HDCP testing is an optional feature of a VideoPro generator equipped with DVI (VP401, VP403 models). A VideoPro equipped with the optional HDCP testing capability, provides high-bandwidth digital copy protection (HDCP) testing of HDCP compliant digital video displays. A VideoPro which does not include this testing option displays "HDCP Test HDCP Option Not installed" in the HDCP sub-menu. Press the button beside the display "Exit" field to return to the TESTs menu.

Options Menu

The Options menu appears when the OPTIONS pushbutton is pressed. The Options menu provides options regarding several of the operational system settings of the generator, including the Power Save function and format clear/reload memory management.

The Power Save function of the 400 series generators provides several power saving features. First, it turns off the LCD backlight after 30 seconds to conserve battery power. Second, it turns off the power to the instrument after approximately 30 minutes when pushbutton activity is not detected. These power saving features can be disabled by turning the Power Save function "OFF". Press the pushbutton beside the Pwr Save indicator to toggle the Power Save function on or off.

Note: You can turn the LCD backlight on or off with the front panel BACKLIGHT pushbutton.

The Pwr Save function operates differently when the AC Power Adapter is connected to the generator. After 30 minutes the generator remains on, but starts to cycle through its video patterns.

Pressing the clear formats (Clr Fmts) option pushbutton results in a second menu asking for confirmation to clear all formats in memory. Selecting "Yes" in this menu causes all video formats in factory default memory locations to be lost. Any user formats created with custom generator PC control software in those locations will be lost. There is no way to stop or undo this operation. The LCD window shows "All Formats Cleared" when the process is completed.

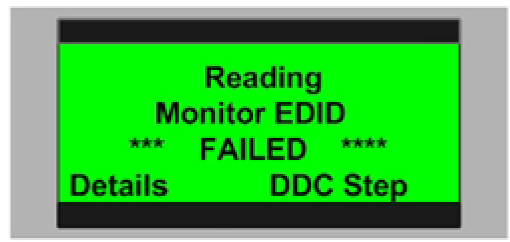
Pressing the pushbutton beside the reload formats (Reload Fmts) option in the display restores all factory default formats to their original memory locations. The LCD displays "Factory Formats Reloaded" when the process is completed. Pressing the FORMAT button displays the FORMATS menu to list the restored memory contents.

Learn Formats Menu

The Learn Formats function reads EDID format data from a VESA® DDC-compliant display connected to the generator's DVI output. A list of standard VESA video formats supported by the monitor is extracted from the EDID data and compared against all of the VESA formats in the generator's built-in library. A table is then built of all the matching formats. This table can be viewed by pressing the Details menu button. This table of formats is also used for the DDC Step function. If DDC comunication cannot be established with the display, the Learn Formats function reads "FAILED." For this function to operate, signal connection to the display must be made through the display's HD-15 (VGA) connector.

Details

Lists all of the matching VESA standard video formats from the last successful Learn Monitor operation. The list is not modified if the operation fails. The +/– buttons can be used to page through the list if there are more than eight (8) learned formats. You cannot select the formats using the menu buttons. However, you can go through all the formats using the DDC Step Test function.

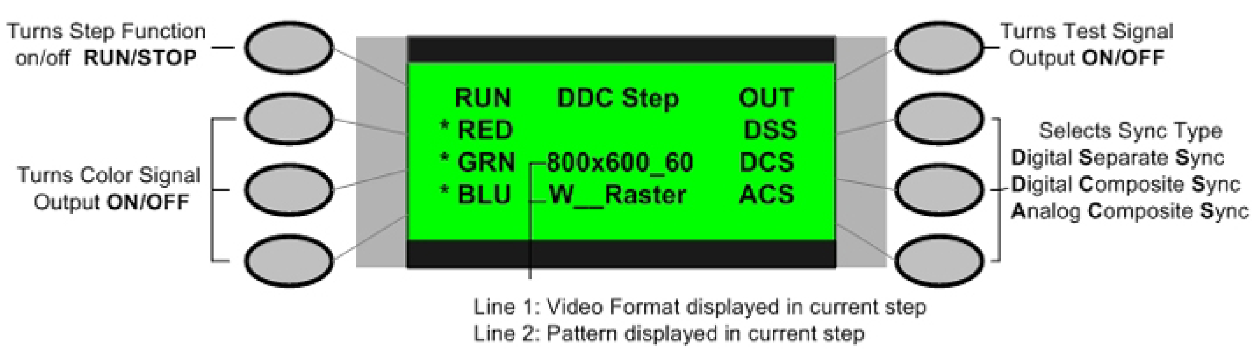


NOTE: It is possible that the display's EDID data will include non-VESA formats. These non-standard formats will not be listed.

DDC Step

The DDC Step sub-menu permits you to select and step through each of the video formats in the list produced by the Learn Formats functions. The generator outputs the resolution format selected from the list. To step through and select each format, press the + scroll pushbutton. The format selected is indicated in the center of the display. To turn the generators output signal on or off, press the pushbutton to the upper right side of the display. An asterisk beside the OUT indicator in the display indicates a signal is being output by the generator. The format and video pattern being output by the generator is indicated in the 2 bottom center lines of the display.

You may increment video patterns when testing displays in the DDC Step menu. Press the – Scroll pushbutton to select a new video pattern. Repeated presses step through all the available video patterns. Pressing the RUN button in the upper left of the display causes the generator to automatically cycle through all video patterns. When cycling patterns in the RUN mode, press the same upper left menu pushbutton, now shown as STOP, to restore manual pattern stepping. The video pattern being output by the generator is indicated in the bottom center line of the display.

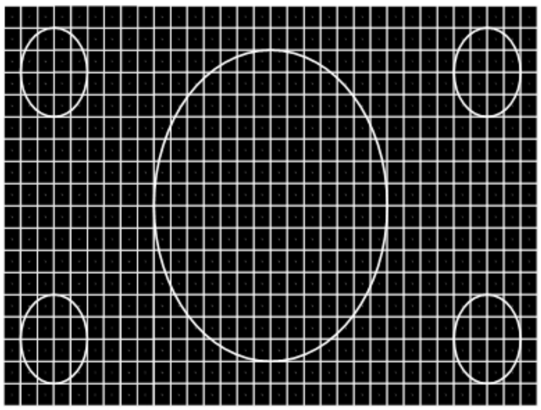


Pattern Description and Usage

The 400 Series VideoPro generators contains numerous test patterns for performance testing and aligning video displays, scan converters, processsors and other video equipment. The test patterns are selected within the Pattern menu. Press the front panel PATTERN pushbutton to select the Pattern menu(s). This section contains a brief description of each test pattern and how it would be used.

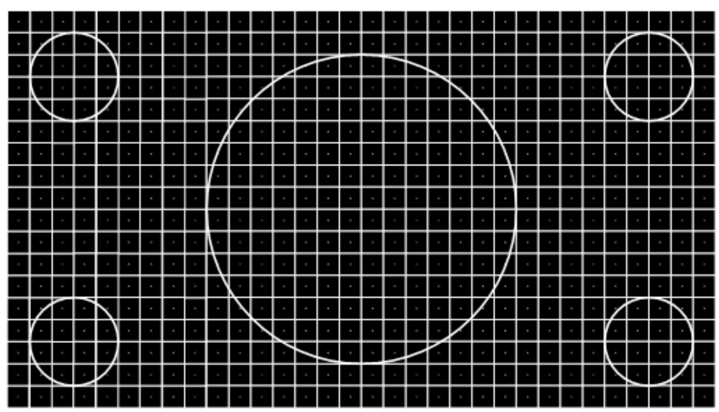
Anamorphic

Pattern Description: 32 horizontal by 18 vertical lines crosshatch forming a 16:9 aspect ratio pattern. When viewed on a display device with standard 4:3 aspect ratio, the pattern will appear stretched vertically, with crosshatch boxes forming tall rectangles. When pattern is displayed in non-HD 4:3 format (e.g. NTSC, VESA, or SDTV), and then stretched to 16:9 aspect ratio with a display device's anamorphic stretch feature, the crosshatch boxes should form perfect squares.



Anamorphic 4:3

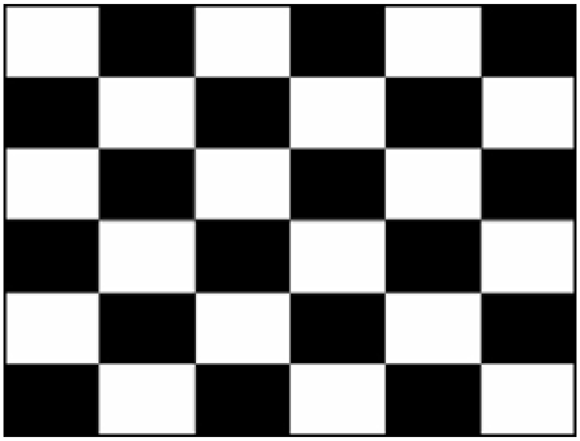
Pattern Usage: Used to check the accuracy of a display device's anamorphic stretch feature. If anamorphic stretch is working properly, and height and width are adjusted properly (check with Overscan pattern), each crosshatch box should be a perfect square.



Anamorphic 16:9

Checker

Pattern Description:
The Checker pattern alternates picture areas of black and white in a checkerboard pattern.

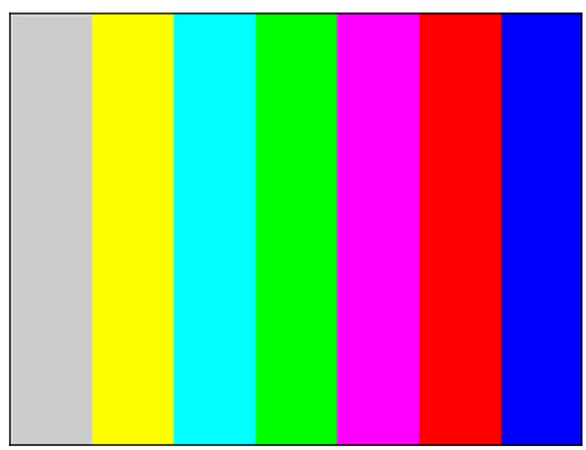


Pattern Usage:
Use this pattern to check the regulation of CRT video drive power supply circuits. The Checker pattern produces abrupt, maximum changes in CRT video drive current. Ideally, this should not cause the voltage supplied to the video drive circuits to change (good voltage regulation). If the power supply does not have good regulation, it will cause softening or ringing of the vertical line pattern transitions.

Color Bar

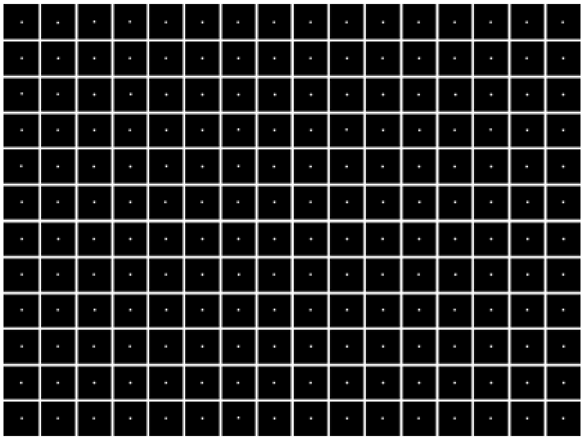
Pattern Description:
Seven equal-width vertical bars with 75% white (gray) at left, followed by three primary and three secondary colors. Color bars are at 100% saturation with 75% amplitude. Individual colors can be gated on or off (with the Video Gate buttons) to view only the red, green, or blue components of the pattern.

Pattern Usage:
Use as an overall check of a display device's capability to produce fully saturated primary and secondary colors. This is especially helpful in detecting full or partial loss of colors in an older display. It is also used as a reference input signal when troubleshooting and signal tracing color amplifier or color demodulator problems within a display device.



Crosshatch

Pattern Description:
16 white horizontal lines and 12 white vertical lines form square boxes on a black background (32 horizontal by 18 vertical lines in HD modes), with a white dot in the center of each box.

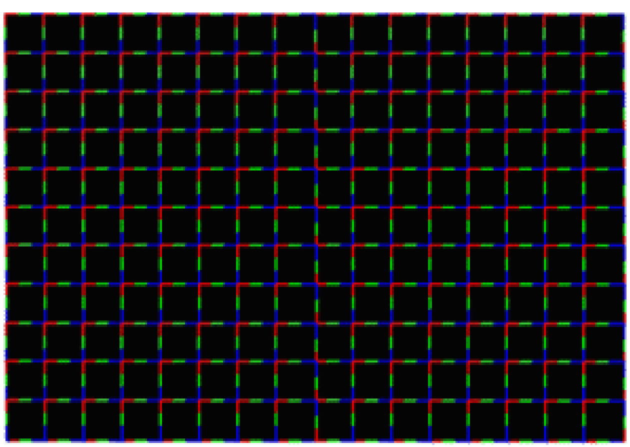


Pattern Usage:
The Crosshatch pattern is used to check and adjust convergence of red, green and blue pictures. The horizontal and vertical lines are usually best observed to detect color fringing resulting from misconvergence, and the dots are usually best observed to make fine adjustments.

Even if a display device provides an internally-generated crosshatch pattern for checking convergence, it is often best to double-check the convergence with an externally-generated pattern. Occasionally, a display's convergence on an internally-generated pattern doesn't match its convergence on external input video signals.

Converge

Pattern Description:
This pattern produces 9 horizontal lines and 17 vertical lines, forming square boxes on a black background. The lines produced are not white, but are broken into 3 equal segments that alternate between red, green and blue between intersecting lines. The resulting boxes have equal distance sides each with red, green and blue segments. The colored line segments alternate to give each box a red upper left corner and a blue lower right corner.

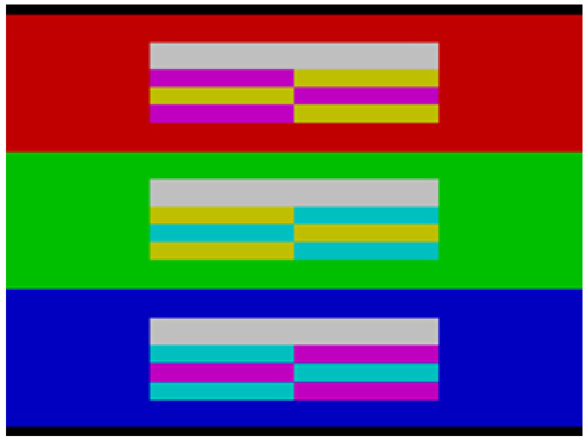


Pattern Usage:
Use to color converge a display throughout the entire picture area. When converged, the red, green and blue segments should form straight lines of equal thickness. The intersections of lines clearly show variations or steps from the straight ideal color converged lines. Use the color gating feature in the Gating menu to turn any one of the colors on and off for better indication of mis-convergence.

DecodAdj

Pattern Description:
The DecodAdj pattern contains three primary color sections with red on the top, green in the middle and blue on the bottom. Each primary color section includes a white reference bar, and below it, two secondary color bars in an alternating pattern of six bars. The two secondary colors are combinations resulting from mixing the primary color and each of the other two primaries.

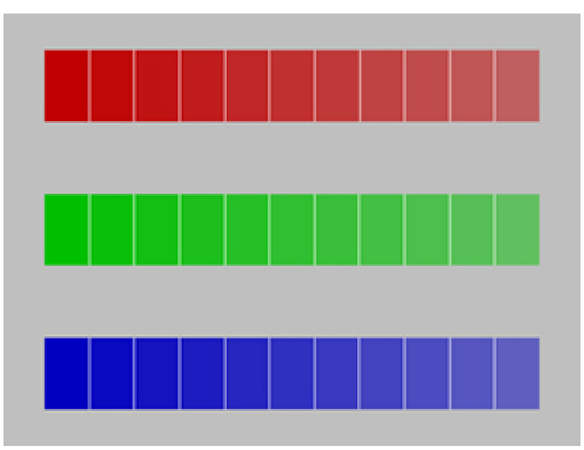
Pattern Usage:



Use to adjust a display's color decoder/matrix circuit for most accurate color reproduction. View each color primary section through its respective red, green and blue color filter.
A chroma gain control should be adjusted to match the intensity of the reference white bar in each section to that of the primary color surrounding it. A chroma hue control should be adjusted to match the intensity of the secondary color sections within each primary color block. Usually, the user menu Color and Hue controls are used to adjust the blue section, and then service menu controls are used to adjust the red and green sections. Service menu decoder/matrix adjustments typically include "RYR (red gain), RYB (red hue), GYR (green gain), GYB (green hue)" adjustments, or simply a number of "axis" settings.

DecodChk

Pattern Description:
Red, green and blue primary color blocks on a 75% white background. The red and green primary color blocks are divided into 11 sections which have decreasing color levels from left to right. The center, or 0 sections, for each color block are the standard 75% color level included in most test patterns. The color levels decrease in 5 % increments from the left to right.



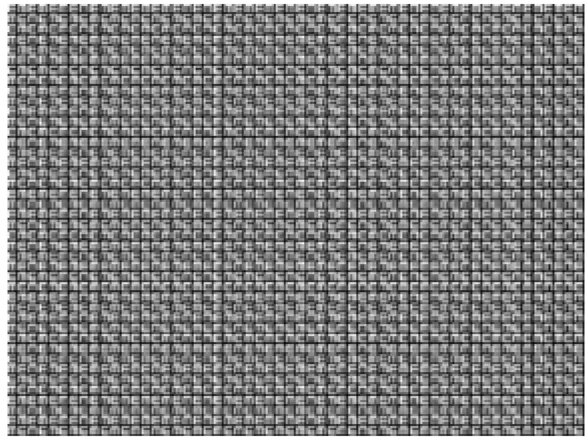
Pattern Usage:

The DecodChk pattern checks the performance of the color decoder to determine if the decoder has red or green color emphasis (often called "push") or de-emphasis. Ideally, with the color hue properly set using the blue section, the 0 center blue bar should be the same light intensity as the surrounding 75% white, when viewed through a blue filter. Looking through a red or green filter at their respective color bars should show the center 0 bars at the same intensity as the 75% white area.

Focus

Pattern Description:
The Focus pattern consists of capital letter "E"s and "M"s alternating across the screen. The pattern is sometimes called a MEME pattern. The closely spaced letters makes it easy to judge the effects of focus adjustments.

Pattern Usage:
The pattern is used as a reference signal for viewing the effects of focus adjustments across the entire screen. Since it is difficult for CRT displays to achieve uniform focus across the entire screen, multiple focus adjustments and/or a compromise setting of the focus control(s) is necessary to achieve acceptable focus. The focus adjustment method will be different depending on the number of focus controls and whether the device is designed to display video or computer data.

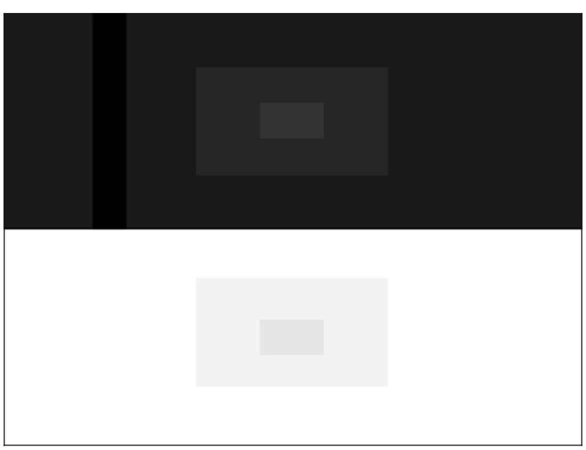


- A video display with only one focus control should be adjusted for optimum focus at the center of the screen (where most action occurs). A data display with only one focus control should be adjusted for compromise focus between the center of the screen and the edges of the screen (adjusting for sharpest focus at a midpoint usually works well).

- A video or data display with two focus controls is usually adjusted for best center focus with one of the controls and best edge focus with the other control.

HiLoTrk

Pattern Description:
The pattern is divided into a top half and a bottom half. The top has a black background with a box that is 2.5% above the black level. A smaller box within that is 5% above the black level. A blacker than black vertical bar that is 4 IRE units below black is positioned to the left of the box. The bottom half is a white background with a box that is 97.5% white. A box within that box is at the 95% white level.



Pattern Usage:
Use to set the contrast and brightness controls on fixed-pixel (non-CRT) displays. Start with the brightness high enough to see the black vertical bar. Decrease the brightness until the black bar just disappears into the surrounding black. Increase the brightness control as needed so that the 2.5% and 5% boxes are both visible. Set the contrast so you can distinguish the 95% and 97.5% boxes within the white bottom portion.

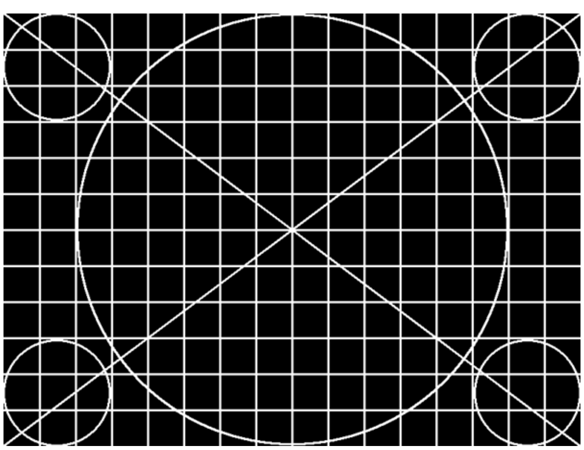
Horizontal Staircase (H_Stair)

Pattern Description:
Eleven equal-width horizontal bars step from 100 IRE white at the top of the pattern to black at the bottom (7.5 IRE for NTSC, 0 IRE for all other formats), forming a horizontal staircase.

Pattern Usage:
The H_Stair pattern is useful for visually checking gray-scale tracking performance of a display, especially a projector with red and blue overdrive at the sides of the display, due to insufficient correction for CRT side-to-side placement (with green in the center). Poor grayscale tracking performance is seen as a primary color tint (red, green, or blue), at the bright top or dark bottom of the pattern. To avoid the effects of color overdrive at the sides of the display when checking grayscale tracking, observe the top-to-bottom center of the display. To check the effects of color overdrive at the sides of the display, observe by eye or use a color analyzer to check the color at the left, center, and right end of one horizontal bar.

Linearity

Pattern Description:
Linearity is a combination pattern including circles and lines on a black raster background. The pattern includes circles in each corner and two circles positioned in the center. A large center circle extends to the top and bottom of the pattern. Crosshatch lines form 16 squares horizontally and 12 squares vertically and properly shaped circles on a display in a 4:3 aspect ratio. When viewed on a display in a 16:9 aspect ratio, the pattern appears stretched horizontally.

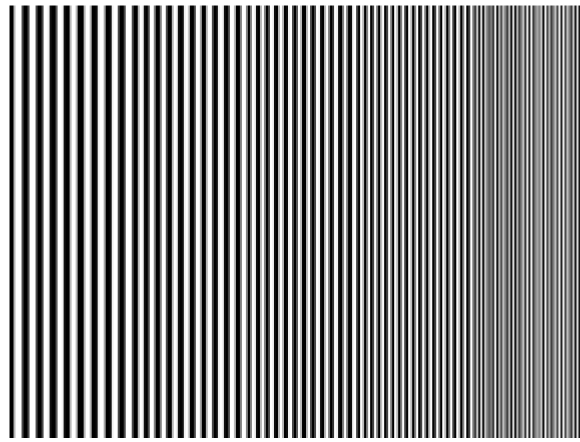


Pattern Usage:
Use the linearity pattern for deflection linearity testing and alignments. Use to set geometry controls on displays. Use for color convergence adjustments.

Multiburst

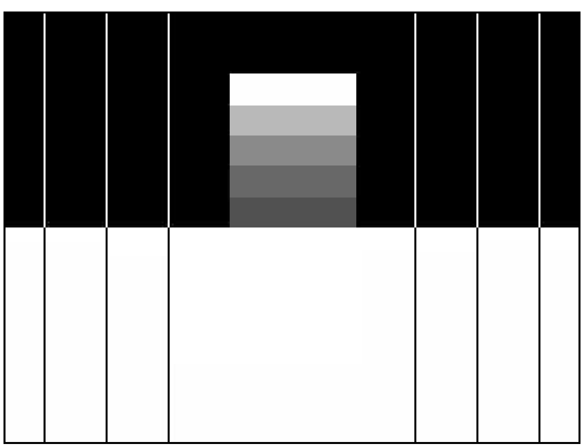
Pattern Description:
The Multiburst pattern consists of five equal-width vertical segments. Vertical segments are filled with alternating black and white stripes of one, two, three, four, and five pixel spacing (right to left). This pixel spacing directly corresponds to the horizontal resolution of the format being displayed. If, for example, the horizontal resolution of the current format is 640, the one pixel spacing is such that, if it were continued across the entire screen, there would be 320 white and 320 black stripes.

Pattern Usage:
Use to check a display device's capability to produce sharply defined stripes, at equal brightness, up to the format's full resolution. This pattern is also useful in adjusting the sharpness control. Starting with the sharpness control at its minimum setting, increase the control until all five bursts are at equal brightness levels. Do not adjust the control high enough to cause ghosting lines adjacent to the widest stripes.



Needle

Pattern Description:
This pattern is black on top and white on bottom with lines (needle pulses) drawn from top to bottom on each side of the pattern, through the black/white transition. Electrically, the needle pulse lines are the same width on the top and the bottom of the pattern. A five-step grayscale is positioned on the center of the upper black pattern area. The top grayscale block is 100% white.



Pattern Usage:
This pattern makes it easy to detect whether scan velocity modulation (SVM) is enabled on a display device. If SVM is enabled, the black lines on the bottom of the pattern will be thicker than the white lines on the top of the pattern.
This is also a good pattern for properly adjusting the contrast/picture/white level control for maximum white luminance level on a CRT-type display (use the HiLoTrk pattern for non-CRT displays). If the contrast/picture control is adjusted for a higher white level than the CRT display device is capable of producing properly, one of a number of distortion effects will be observed; blooming, raster distortion, or yellowed whites.

Blooming in CRT displays results in light from very bright pixels (phosphors) spilling over to adjacent pixels. This causes bright picture areas to become defocused and slightly larger than they should be. If a display blooms at high luminance levels, as the contrast control is adjusted to maximum, the top, white block in this pattern's grayscale will become slightly wider than the gray blocks below it.

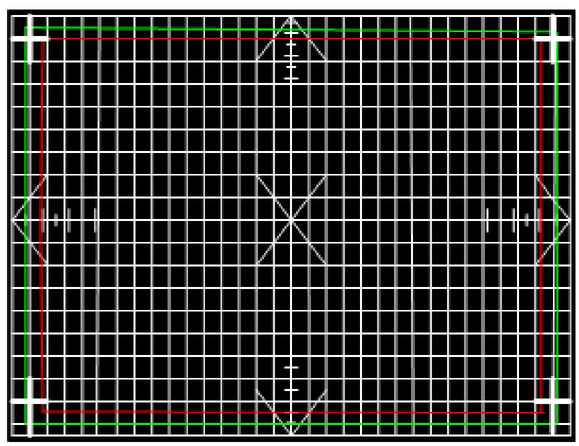
Raster distortion at high luminance levels are caused by high voltage power supply regulation problems. If the contrast/picture control is adjusted for a higher white level than the display power supply is capable of fully supporting on a short-term basis, the black lines on the bottom of the pattern will hook or bend outward.

Ideally, for an accurate picture, the contrast/picture control should be adjusted just below the point at which either blooming, raster distortion, or yellowing of the whites is evident. In a few cases, this may result in an unacceptably low white level for the picture, however, and a compromise white level adjustment may have to be made between an accurate picture and a bright picture.

Overscan

Pattern Description:
This pattern contains a 16 horizontal line by 12 vertical line crosshatch pattern (32 horizontal by 18 vertical lines in HD modes) with chevrons pointing outward at the center of each of the four edges. Four tic marks at the center of each of the four edges mark 5%, 10%, 15%, and 20% overscan. A green rectangle outlines the 5% overscan area and a red rectangle outlines the 10% overscan area. An "X" marks the electrical center of the pattern.

Pattern Usage:
Used to check and adjust for the proper geometry of a display, including picture centering, size, trapezoid (keystone) correction, pincushion (bow) correction, and linearity.



Horizontal and vertical centering controls should be adjusted to center the pattern on the display screen. The chevrons at each of the four edges make it particularly easy to see whether there is equal amount of overscan at the sides or at the top and bottom of the pattern.

The horizontal and vertical size controls should then be adjusted for the desired amount of either overscan or underscan. If overscan is desired, a display should usually be adjusted for slightly less than 5% overscan. The horizontal and vertical overscan should be adjusted to be an equal percentage, as judged by the green and red rectangles and the overscan tic marks.

Trapezoid correction control(s) should be adjusted to make the pattern's edges parallel to the edges of the display screen. The brighter crosses in the corners of the pattern should be adjusted to be equal distances from the edges of the screen.

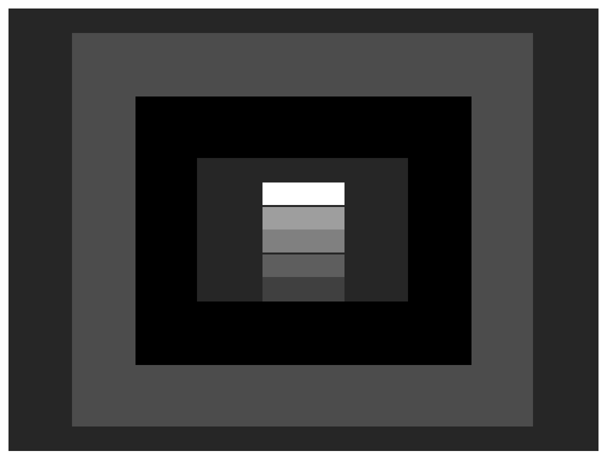
Pincushion correction controls should be adjusted to straighten the lines between the brighter corner crosses. Use the edge of the display screen or a flexible straightedge, such as a yardstick, to judge the straightness of the lines.

The horizontal linearity control should be adjusted to make the pattern boxes all the same width. The vertical linearity control should be adjusted to make the pattern boxes all the same height.

Pluge

Pattern Description:
The Pluge pattern (**P**icture **L**ine-**U**p **G**enerator **E**quipment – BBC development) is arranged in four concentric rectangular zones. The innermost rectangle is fixed at black (7.5 IRE for NTSC, 0 IRE for other formats) and has a five-step grayscale positioned on it. The second rectangular zone from the center alternates between two light levels, black and slightly blacker than black (7.5/0 IRE for NTSC, 0/-4 IRE for other formats). The third rectangular zone from the center is fixed at a light level slightly whiter than black (10 IRE). The fourth, outer rectangular zone is fixed at black. The average picture level (APL) of this pattern is very low.

Pattern Usage:
Use this pattern to check the DC restoration (black clamping) performance of a display device and to set the picture black level with a low APL pattern.



A display device with less than perfect DC restoration will exhibit alternating changes of brightness in the outer two rectangular zones, due to the display's inability to perfectly clamp black to a fixed level. This can be seen especially well with the brightness (black level) control adjusted to a slightly higher than normal setting. If the brightness level of the outer two rectangular zones remain constant as the second zone from the center alternates between black and blacker than black, the display has good DC restoration.

If a display has good DC restoration, its brightness (black level) control can be adjusted on either a low APL or high APL pattern, with no change in black level as you switch from one pattern to another. In that case, this pattern makes it very easy to accurately adjust the brightness control. With the brightness (black level) control first adjusted to a slightly higher than normal setting, reduce the brightness control setting until the brightness alternations in the second rectangular zone from the center are just no longer visible. The third rectangular zone from the center should still be visible as slightly whiter than black.
If a display device has less than perfect DC restoration, you will need to decide, based on the primary use of the display, whether the black level should be adjusted on a pattern with low APL or high APL. If the display will usually be viewed in a darkened room, adjust the brightness control with a low APL pattern, such as this Pluge pattern. If the display will usually be viewed in a bright room, adjust the brightness control with the pluge levels in a medium or high APL pattern, such as the SMPTE Bar pattern or one of the Window patterns set to a high IRE level.

Ramp

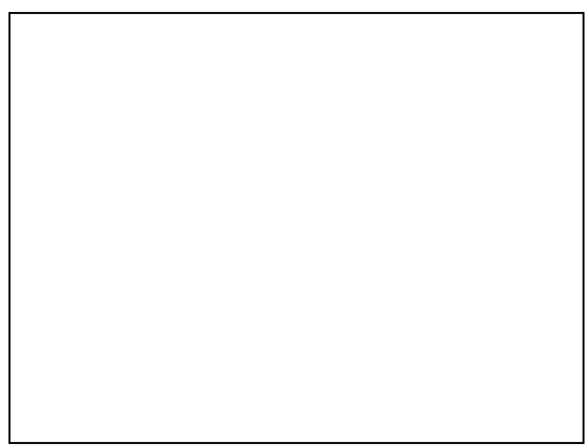
Pattern Description:
The Ramp pattern makes a smooth transition from 100% black on the left to 100% white on the right. When electrical video signal is viewed at horizontal scan rate, it appears as linear ramp from black level to white level.

Pattern Usage:
The Ramp pattern is useful for visually checking grayscale tracking performance of a display. Poor performance is seen as a primary color tint (red, green, or blue) at one or more light levels. It also checks the digitizing linearity of video signal processors. Poor performance is seen as vertical bands which interrupt the smooth transition from black to white.

Raster

Pattern Description:
This is a full field raster pattern. Pattern luminance level is adjustable from 100 IRE to 0 IRE in either 1 or 5 IRE steps. Individual colors can be gated on or off (in the Gating menu) to produce red, green, blue, cyan, magenta, and yellow rasters (not in YPbPr or ATSC RF formats).

Pattern Usage:
Use to check color purity and display chrominance uniformity. Color purity problems are usually caused by slight magnetization of some part of a CRT display device, often metallic CRT mounting brackets or the metallic CRT shadow mask, located just behind the phosphor screen in a direct-view CRT. This can usually be seen as areas of color on a white raster, but shows up better on a primary-color raster, especially red.

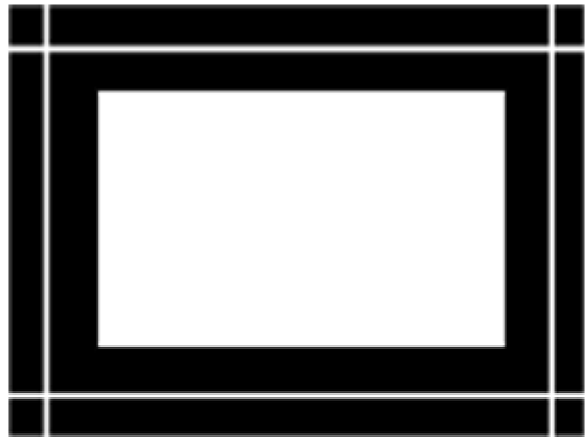


The Raster pattern may also be useful in detecting red and blue overdrive at the sides of a projection display, due to insufficient correction for CRT side-to-side placement.

Regulate

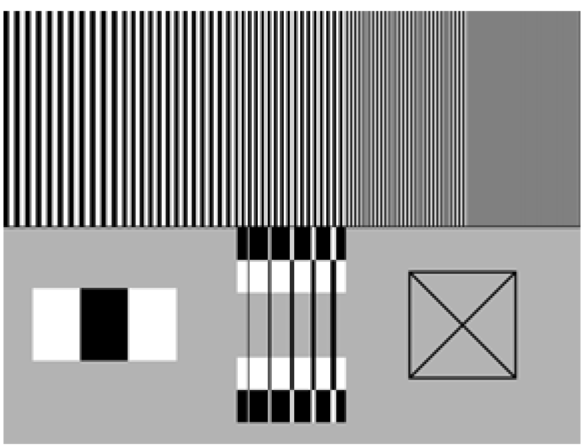
Pattern Description:
A single pixel white border surrounds an interior picture area which alternates between full white and full black.

Pattern Usage:
The Regulate pattern checks the regulation of CRT high-voltage and deflection power supply circuits. The pattern alternately produces maximum and minimum CRT beam current. Ideally, these current extremes should not cause the picture size to change. This can be judged by placing a thumbnail next to one of the border lines to see the amount of displacement (avoids optical effects from the alternating pattern). To a typical viewer, a one to two pixel shift is not noticeable in most picture material.



Sharpness

Pattern Description:
The Sharpness pattern consists of a top and bottom section. The top section consists of a multiburst bar sweep pattern with increasing frequency bars from left to right. The bottom section includes 3 blocks on the left which alternate from white to black. A box to the right contains diagonal lines from corner to corner. A bottom center section alternates black and white boxes with 5 vertical lines of increasing width passing through each box. The lines are white on the black boxes and black on the white boxes.



Pattern Usage:
Use to align contrast, picture, aperture, and scan-velocity modulation (SVM) adjustments on displays. These and other similar controls artificially enhance picture transitions between black and white. Ideal alignment settings would result in the bottom center vertical lines being straight along the edges, or the same width when passing through the black and white boxes. SVM performance commonly widens the black lines compared to the white. Excessive contrast control settings can also degrade the picture by causing white edges to become unclear or bloom into the black area.

A compromise is required when setting these controls on most displays. The best enhancement of transitions between black and white is desired without artificially creating transition artifact. Set scan velocity so it has little impact on the width of the black lines compared to the white lines when viewing the bottom center section. Set contrast, picture or other enhancement controls below the point where leading or trailing edges are observed on the lines in the bottom section. If the top multiburst section becomes too dull or unclear as you decrease resolution, you may have to increase the control for the best compromise.

SMPTE Bar

Pattern Description:
The upper two-thirds of the pattern consists of seven equal-width vertical bars, with 75% white (gray) at left, followed by three primary and three secondary colors. Color bars are at 100% saturation with 75% amplitude. Just below these bars is a section of short bars containing the blues complement color for each of the large bars containing blue. Under those color bars containing no blue (yellow, green, and red), the short bar is black. The bottom one-fifth of the pattern consists of the following seven signals, starting from left to right; 1) -I, 2) 100% white, 3) -Q, 4) black, 5) slightly blacker than black (4 IRE for NTSC, -4 IRE for other formats), 6) black, 7) slightly whiter than black (11 IRE for NTSC, +4 IRE for other formats).

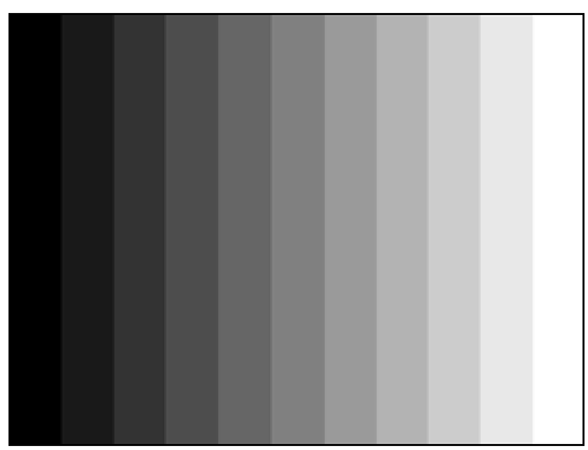
Pattern Usage:
Use to adjust color and hue through a blue filter with composite, S-video, or YPbPr signal inputs. While viewing the pattern through a blue filter, adjust the color control for equal brightness white/blue bars. Adjust the hue control for equal brightness cyan/magenta bars.

Note: RGB input signals aren't processed through a color decoder, thus no color adjustments with an RGB input signal; also, YPbPr inputs may not have both color and hue adjustments.

Also, use this pattern to adjust a display's black level at a medium APL. With the brightness (black level) control first adjusted to a slightly higher than normal setting, reduce the brightness control setting until the slightly blacker than black bar (under the large cyan bar) and the black bar (under the large red bar) are both just black. The slightly whiter than black bar (under the large blue bar) should still be slightly visible.

Staircase

Pattern Description:
Eleven equal-width vertical bars step from black at the left (7.5 IRE for NTSC, 0 IRE for all other formats) to 100 IRE white at the right.



Pattern Usage:
The Staircase pattern is useful for visually checking grayscale tracking performance of a display. Poor performance is seen as a primary color tint (red, green, or blue), especially at the bright or dark end of the pattern. The pattern is also useful for adjusting grayscale tracking by eye, when a color analyzer is not available. Adjust the display cutoff/bias controls for a neutral dark gray tone at the dark end of the pattern. Adjust the display drive/gain controls for a neutral bright gray tone at the bright end of the pattern. The pattern is useful as a reference input signal when troubleshooting luminance or R, G, B amplifier problems within a display device using an oscilloscope.

Window1, Window2

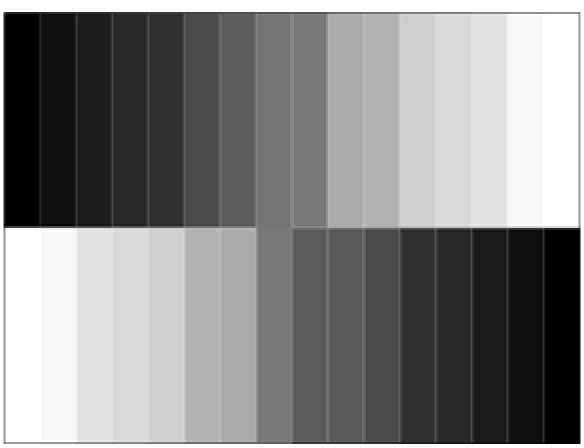
Pattern Description:
The Window1 and Window2 patterns are a centered white window on a black background. Luminance levels of Window1 and Window2 are independently adjustable from 100 IRE to 0 IRE in 1 IRE steps. Each window pattern includes pluge level bars at +4% and –4% to the left of the white window.

Pattern Usage:
Use the white window to measure chromaticity of a display device. This pattern is preferable to using a full field white raster since the window pattern more closely duplicates the average picture level (APL) of typical program material and doesn't unnaturally stress display circuits. When adjusting grayscale tracking, one window can be set for low luminance and the other window set for high luminance to quickly switch between adjusting cutoff controls (low luminance) and drive controls (high luminance).

SplitGray

Pattern Description:

The SplitGray pattern consists of an upper and lower section. The top and bottom section contains bars that vary in level from black to white in 17 steps. The top section progresses from black to white in 17 steps from left to right on a display. The bottom section progresses from white to black in 17 steps from left to right on a display. Since the progression from black to white is opposite on the top and bottom, they provide a mirror image grayscale level meeting in the middle at 50%.



Pattern Usage:

Use the SplitGray pattern to visually analyze the grayscale tracking performance of a display. The pattern provides 15 individual steps of gray. Poor performance is seen when a primary color tint (red, green, or blue) is observed within the black, gray or white bars of the pattern. Tinting is often prevalent at the bright or dark end of the pattern.

This pattern is also useful for adjusting grayscale tracking by eye, when a color analyzer is not available. Adjust the display cutoff/bias controls for a neutral dark gray tone at the dark end of the pattern. Adjust the display drive/gain controls for a neutral bright gray tone at the bright end of the pattern.

Applications

A multi-media monitor displays video signals from many different sources. The video signal may originate from an antenna, cable system set-top-box, satellite receiver, ATSC receiver/ decoder, VCR, DVD player, digital video recorder (DVR), video game or computer. The Sencore VP403 substitutes for all these signal sources providing a test signal for all testing, alignment or troubleshooting applications.

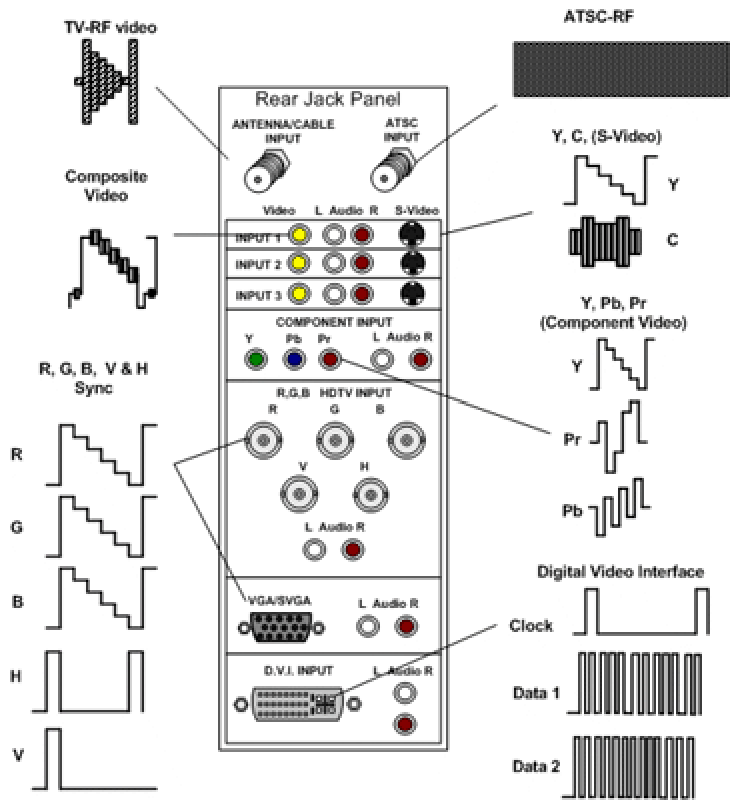
The Application section of this manual shows how to use the VP403 to substitute for a variety of signal interface formats that exist in today's multi-media video environment.

Display Inputs

Video signals may be interfaced to a multi-media display using several different video signal types including:

1) TV-RF Video,
2) Composite Video,
3) Y/C video or S-Video,
4) Component Video (YPbPr),
5) RGB video (RGBHV),
6) Digital Video Interface (DVI),
7) ATSC – RF 8VSB.

A multi-media display contains input signal jacks to accept these various signal types and processing circuits to decode and display the video signal.



Testing Display Inputs with the VideoPro

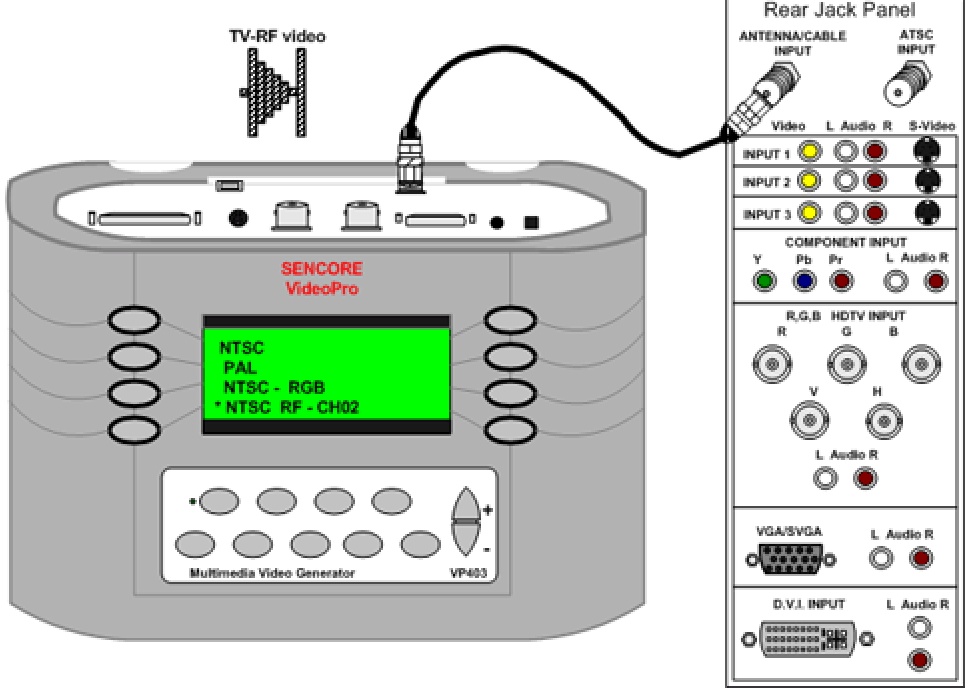
A multi-media generator, such as the Sencore VideoPro can be used to apply a test signal to the inputs of a video display, video signal processor, modulator and other standard video equipment. This section describes the connections and setup when using the Sencore VideoPro for testing various display inputs.

NTSC RF to Antenna Input

Standard NTSC video signals are carried on RF carriers that are transmitted by broadcasters or carried on cable television systems. TV receivers accept these RF-video signals, tune to the user selected channel and process them for display. An NTSC RF generator produces one or more TV-RF carriers for testing a display's antenna input and associated receive circuitry.

To test the antenna input on a display, connect the RF test cable (39G189) from the RF output jack of the generator to the antenna input on the display. Select the NTSC/PAL selection in the Signal Type menu. Select one of the NTSC – RF – CH selections in the Format menu for the desired RF channel. You may choose RF channel, 2, 3, 4, or 6. Select the Antenna Input from the receiver/monitors input menu. Select the receivers channel number to agree with the RF channel selected on the generator. The receiver/ monitor should decode the TV-RF NTSC signal and display the video test pattern.

NTSC TV-RF Output to Antenna/Cable Input

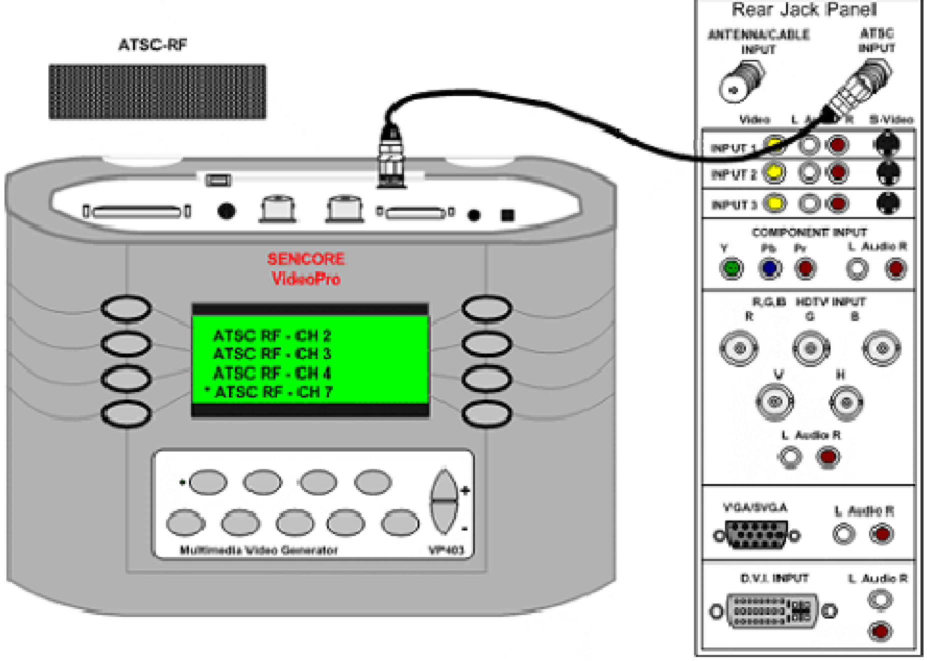


ATSC HDTV RF to Antenna Input

HDTV signals are broadcast on RF carriers modulated with an 8 level vestigial sideband system (8VSB) developed by Zenith and selected by the ATSC (Advanced Television System Committee). An HDTV integrated receiver/decoder (IRD) accepts the RF-8VSB input signal and decodes it into a component YPbPr or RGB analog output or DVI output for interface to a HDTV ready monitor. Many larger projection TVs now include an ATSC tuner along with digital decoding circuits to receive off-air 8VSB HDTV digital signals. An ATSC 8VSB TV-RF generator supplies one or more TV-RF carriers containing test signals to test the ATSC tuner/decoder circuits.

To test the ATSC input of an HDTV receiver/monitor, connect the RF test cable (39G189) between the ATSC output of the generator and the ATSC input of the receiver. Select the HDTV/SDTV – RF – 8VSB Signal Type in the Signal Type menu. Choose a resolution format from the Format menu. The upper- most display menu of HDTV/SDTV formats lists the most popular resolutions used, and are compatible with most HD ready displays. After choosing a format, an additional menu appears. Select one of the ATSC RF – CH –XX selections that are displayed. You may choose RF channels 2-4, 7-10, or 30-32. Select the ATSC input from the receiver/monitors input menu. Select a channel number that agrees with the generator channel selection. If you choose channel 30, 31 or 32 on the display, be sure the receiver is set for broadcast channels and not cable channels. The receiver/monitor should decode the ATSC HDTV signal and display the video test pattern.

ATSC HDTV-RF Output to ATSC Input



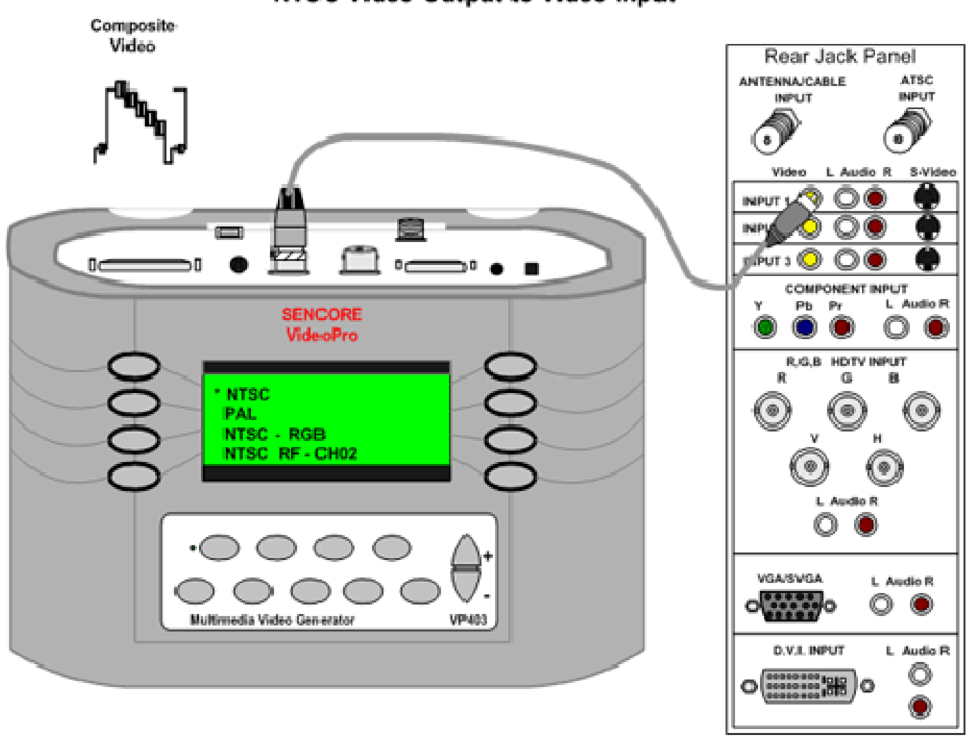
Composite Video (NTSC) to Video Input

A common interface used for NTSC video is a single wire composite video signal. A composite video signal contains a luminance signal, encoded color sub-carrier signal and analog composite sync signal (ACS). A test generator supplies an NTSC composite video signal with test patterns for testing equipment with a composite video input.

To test the video input, connect the BNC video test lead (39G232) from the generator's Composite Output to the Video input of the display. Since the display likely uses an RCA phono connector, you will need to connect a BNC to RCA phono adapter (26G1255) to the display end of the BNC cable.

To output a composite video signal from the generator, select the NTSC/PAL selection in the Signal Type menu. Select the NTSC selection in the Format menu. Select the Video input from the receiver/monitors input menu screen. The receiver/monitor should process the composite video signal and display the video test pattern

NTSC Video Output to Video Input

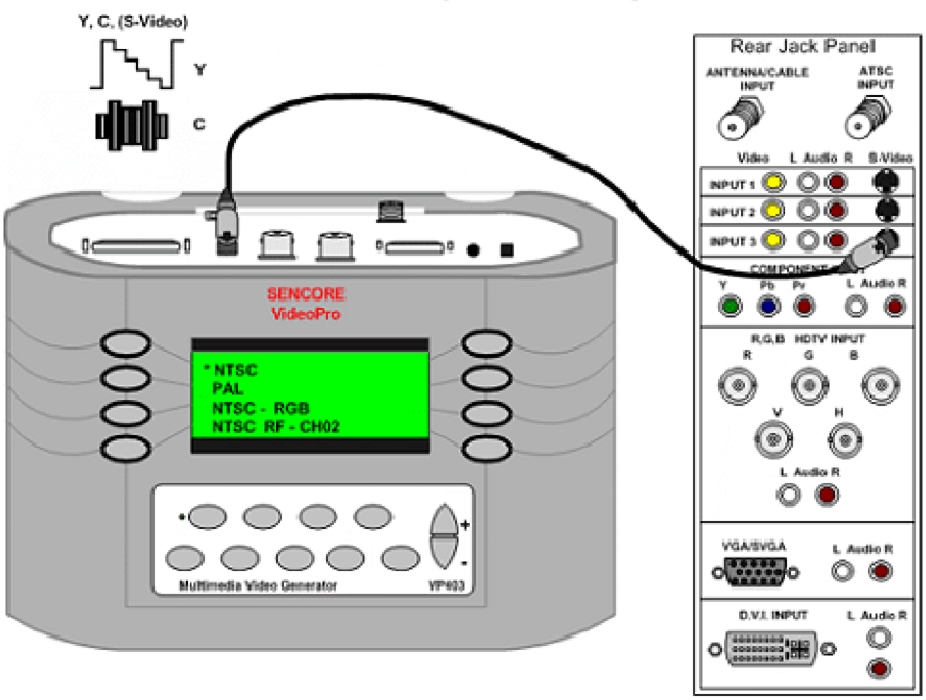


S-Video (NTSC) to S-Video Input

A two wire video interface consisting of a separate luminance signal and a color sub-carrier signal is commonly used to interface NTSC video. This interface is called "S-Video" describing the super video performance achieved using this interface compared to composite video. S-video provides slightly higher bandwidth and reduces display artifacts attributed to separating the luminance and color information of the composite video signal. S-Video originated with the introduction of Super VHS, Super Beta, and other high performance VCR formats. An S-video generator can be used to substitute a signal into an S-video input for testing and aligning video equipment.

To test the S-Video input, connect the S-video Cable (39G270) from the S-Video Output jack of the generator to the S-video input jack of the display. To output an S-video signal from the generator, select the NTSC/PAL selection in the Signal Type menu. Select the NTSC selection in the Format menu. Select the S-video input from the receiver/monitors input menu screen. *Note:* Some displays automatically sense the presence of a signal to the S-video input when the same display input has a composite video input jack. The receiver/monitor should process the composite video signal and display the video test pattern. Select the desired test pattern from the Pattern menu.

NTSC S-Video Output to S-Video Input



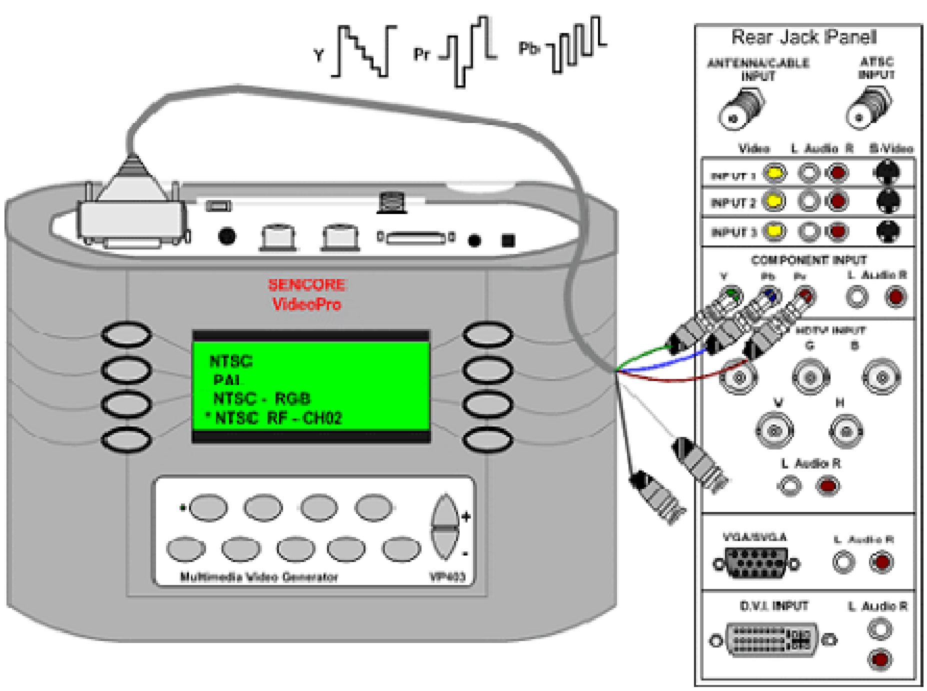
Component YPbPr to Component HDTV Input

Most HD ready display monitors have inputs that accept a component video signal. A component video signal has (3) signals including luminance (Y), a scaled red color difference signal (Pr), and a scaled blue color difference signal (Pb). Analog composite sync is included on the Y signal. The component video signal provides a high bandwidth interface using only 3 separate signals nicely supporting the resolution bandwidth required by HDTV/SDTV signals. A component video interface has become the most popular method of interfacing analog signals from a satellite, terrestrial, or cable HDTV receiver to a display. An HDTV/SDTV component video generator may be used to substitute for HDTV component video signal sources when aligning or troubleshooting HDTV/SDTV video equipment.

To test the component video input (YPbPr), connect the DVI to BNC test lead cable (39G1059) from the generators DVI output to the display's Y, Pr, and Pb inputs. You will likely need to use the BNC to RCA adapters (26G1255) to connect to the phono plugs commonly used as display inputs.

Select the HDTV/SDTV –YPbPr signal type from the generator menu. Select a resolution format from the Format menu. Use 480i29 for testing SDTV and 1080i29 for testing the HDTV display operation. Select the component video input from the receiver/monitors input menu screen. The receiver/monitor should process the component video signal and display the video test pattern. Select the desired test pattern from the generator's Pattern menu.

Component Video (Y, Pr,Pb) Hookup



RGB to RGB HDTV Input

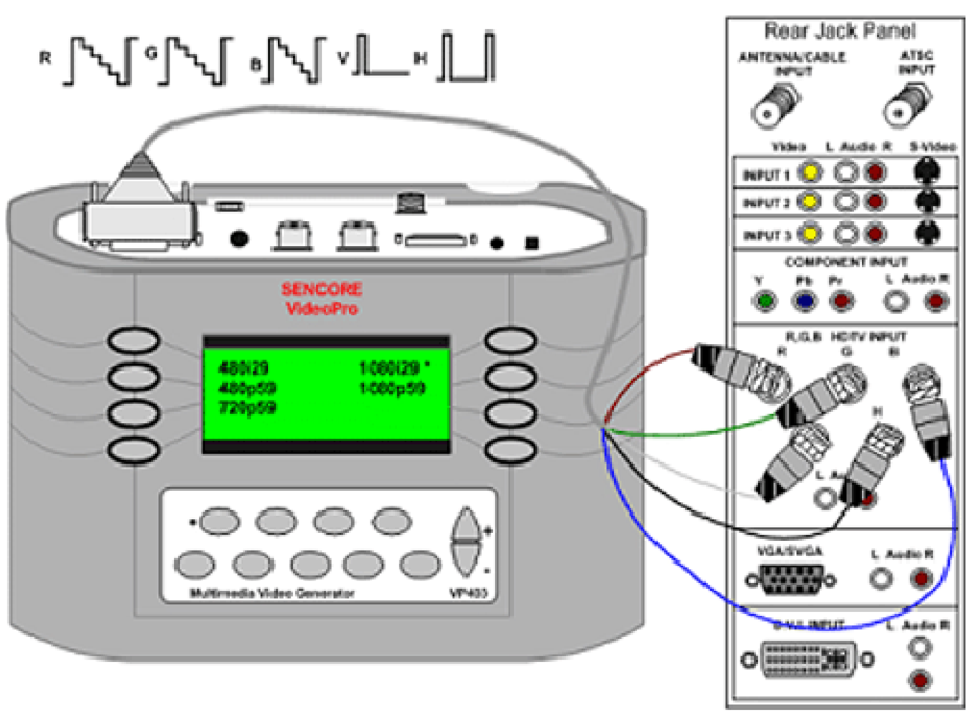
An HDTV/SDTV video signal may be interfaced between a receiver/decoder and a display using an RGB signal. This interface may use all 5 wires (R,G,B,H,V), 4 wires (R,G,B, Composite Sync) or 3 wires (R,G & composite Sync, B). The number of BNC connectors on the display input indicates the variation that is being used.

The VideoPro can be used to supply any of these RGB signal input variations. In the Gating menu, select DSS when a 5 wire system is used. This is the default setting when using the VideoPro. Select DCS when a 4 wire RGB system with composite sync is being used. Select ACS when analog sync is being added to the green signal wire in a 3 wire RGB interface.

To supply an HDTV signal from the VideoPro to the RGB display inputs, connect the DVI to BNC connector cable (39G1059) from the generator's DVI Output to the RGB inputs of the display. The red, green and blue colored cables are the R, G, B signals respectively. The black cable is the horizontal signal (DSS) or the composite sync (DCS).

To output the proper signal from the VideoPro, select the HDTV/SDTV- RGB signal type from the Signal Type menu. Select the resolution format (Ex 1080i29) from the Format menu. Select the HDTV-RGB input on the display/monitor's input menu screen. The video pattern from the generator should be visible on the display screen.

Analog RGBVH Output to RGBVH Input

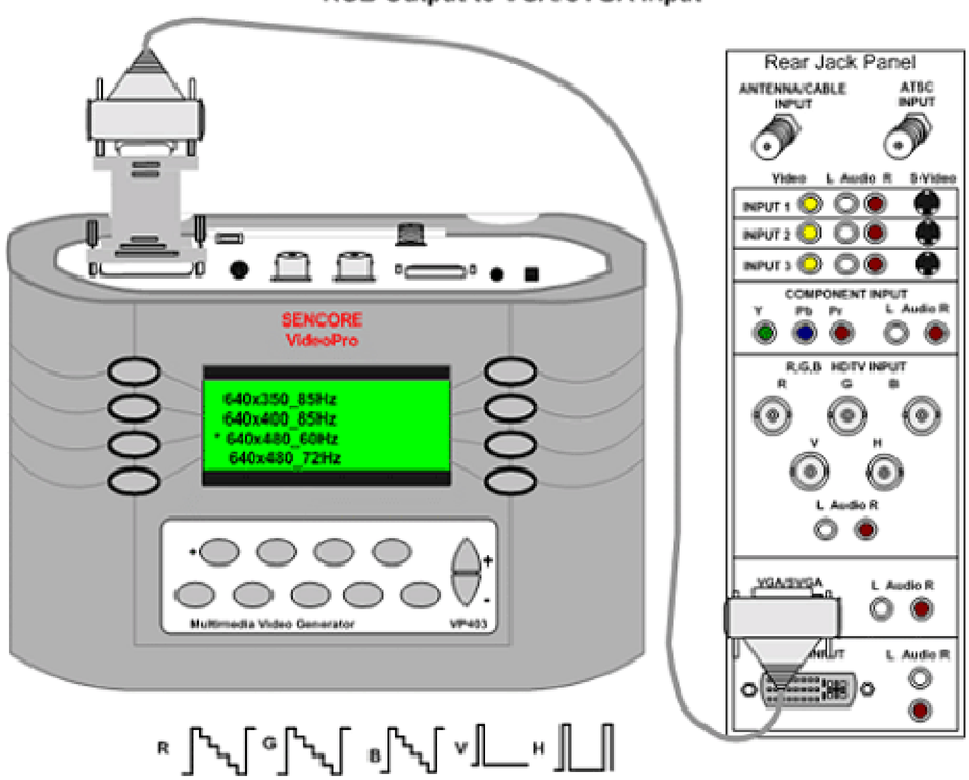


RGB to VGA/SVGA Input

The most common method of interfacing high bandwidth signals from a computer source to a monitor is with an analog RGB signal interface. A five signal or wire system interfaces the red video, green video, blue video, vertical sync and horizontal sync signals from the source to the monitor. Indus-try standard VESA (Video Electronic Standard Association) and Apple/Mac picture resolutions are used. These resolution formats are stated as picture elements (pixels) or lines such as 640x480_60Hz. This indicates 640 horizontal pixels of picture resolution and 480 vertical pixels of resolution (480 scan lines) with a picture refresh frequency of 60 Hz.

To test the VGA/SVGA/VESA inputs of a display using a standard 15 pin HD connector, connect the DVI/VGA Adapter (39G1061) to the DVI output of the VideoPro. Use a standard VGA cable connected from the display input to the output of the adapter (Sencore optional cable 39G798). Select the VESA/Mac – RGB signal type from the Signal Type menu. Select a resolution format from the Format menu that the display is capable of displaying. ***Note:*** *Most displays are cable of VGA (640x480_60Hz) and SVGA (800x600_60Hz*). Select the appropriate input on the display and note the display screen. The video pattern of the VideoPro should be displayed. You can use the Gating menu of the VideoPro to gate on/off each separate red, green and blue output.

RGB Output to VGA/SVGA Input



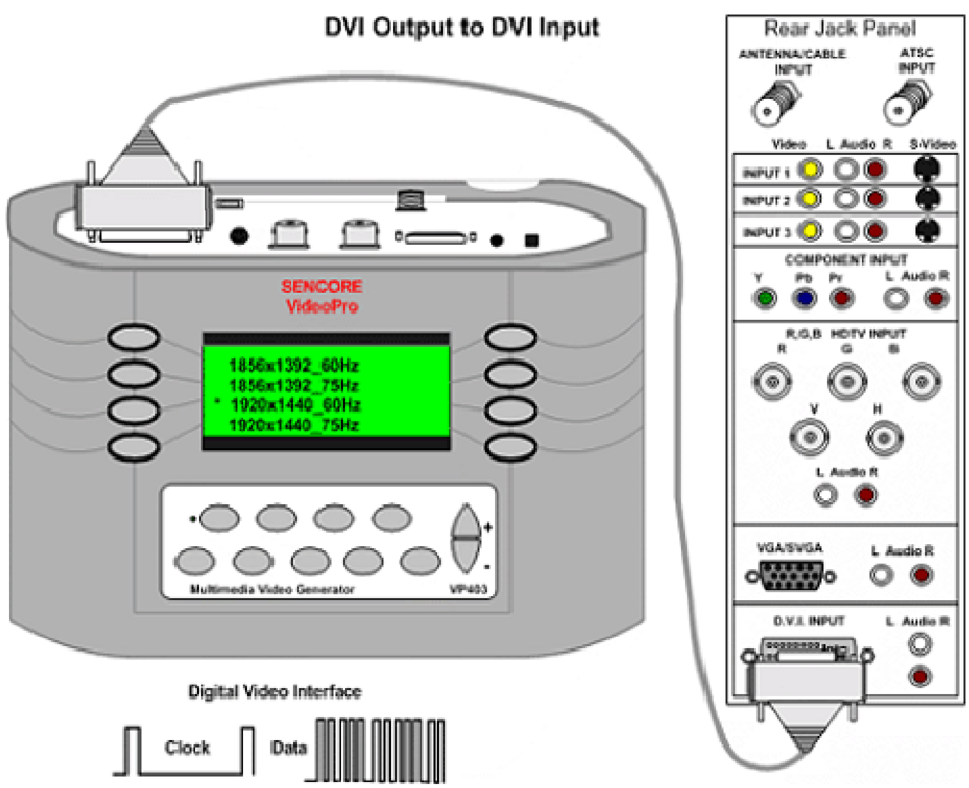
DVI to DVI Input

A digital signal interface is available to move signals from a source to a display. The video signal is digitized into several data streams and clocked to the display. The display's circuitry decodes the input data to produce the original video. A DVI signal generator produces the DVI data and clock signals comprised of video test patterns for testing the DVI inputs.

To test the DVI inputs of a display, connect the DVI test lead (39G1060) between the generator and the DVI inputs of the monitor. Select either the HDTV/SDTV –DVI or VESA/Mac – DVI selections in the Signal Type menu. Use the HDTV/SDTV–DVI when testing HDTV/SDTV monitors. Use the VESA/Mac – DVI signal type when testing computer monitors, data projectors and multi-media projectors.

Note: Many multi-media displays are capable of receiving and decoding both HDTV/SDTV and VESA/Mac signal formats.

Select a signal format from the Format menu that provides a signal resolution within the range of the display. Select the DVI Input from the monitor's input menu. The monitor should decode the DVI signal and display the video test pattern.



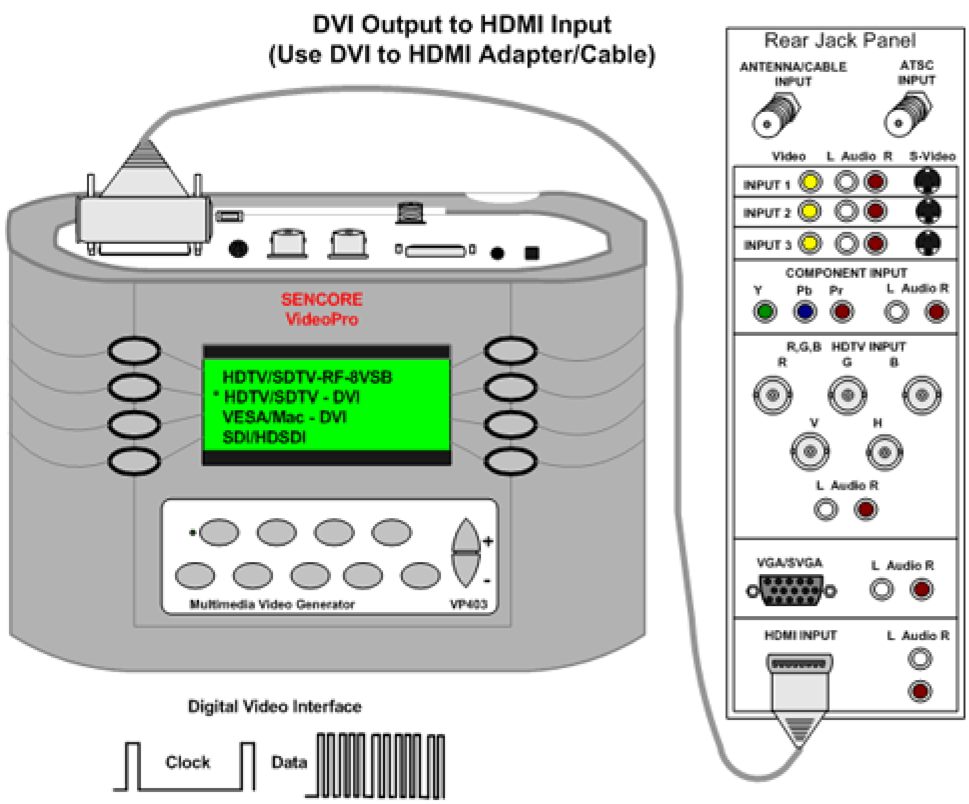
Testing HDMI Inputs – DVI to HDMI Inputs

Some displays contain an HDMI input. The HDMI signal interface is, in most regards, the same as DVI, but utilizes a different connector. The VideoPro DVI output and DVI video test signal may be used to test a display's HDMI input. All HDMI inputs and decoding circuits are backwards compatible with DVI test signals.

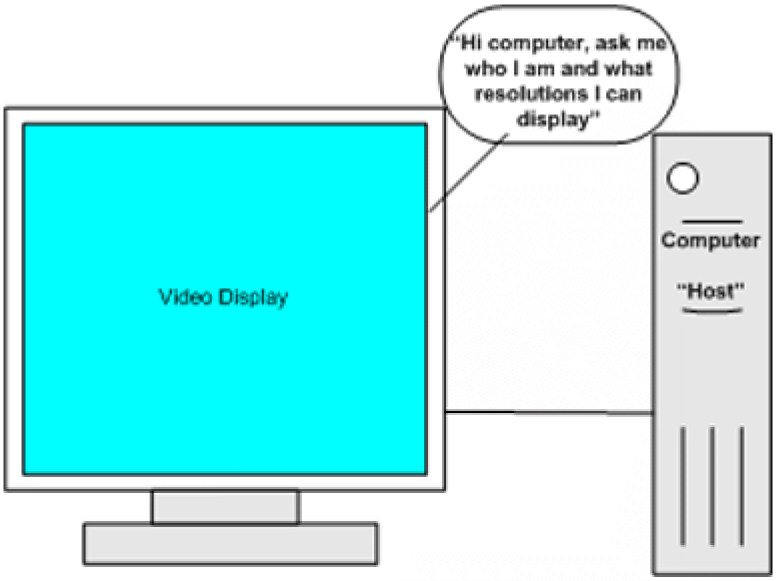
To input a signal to the display's HDMI input requires an adapter cable. An optional adapter cable is available from Sencore. The DVI to HDMI adapter cable is Sencore part number DH1000. Connect the DH1000, or an equivalent adapter cable, from the DVI output jack of the VideoPro to the HDMI input of the display.

Select either the HDTV/SDTV – DVI or VESA/Mac – DVI selections in the Signal Type menu. Use the HDTV/SDTV–DVI when testing HDTV/SDTV monitors. Use the VESA/Mac – DVI signal type when testing computer monitors, data projectors and multi-media projectors. *Note: Many multi-media displays are capable of receiving and decoding both HDTV/SDTV and VESA/Mac signal formats.*

Select a signal format from the Format menu that provides a signal resolution within the range of the display. Select the HDMI Input from the monitor's input menu. The monitor should decode the DVI signal and display the video test pattern.



Display Data Channel (DDC)

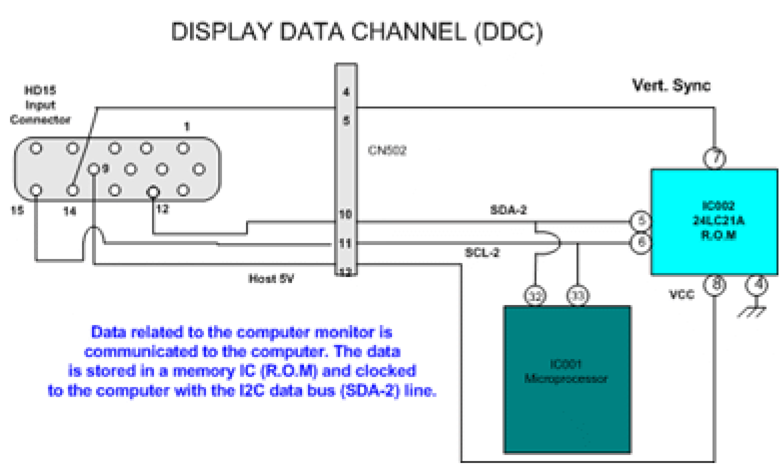


Many displays talk to the computer through a Display Data Channel in the monitor's signal cable.

Display Data Channel (DDC) is a communications channel between a signal source and a display. DDC was originally developed to enable a computer to learn what resolution formats a display that was connected to its video output was capable of displaying. This was in support of Plug & Play protocols developed through the Video Electronic Standard Association (VESA). Once the computer learned what formats the monitor could display, it automatically selected the highest resolution format for optimum performance. DDC was originally specified for use with standard VGA 15 pin HD connectors. Since its definition, all newer connection plugs, including DVI and EVC, have specified pins for DDC compatibility. DDC is no longer confined to computers and computer monitors as other display devices and signal sources are integrating DDC capabilities.

DDC uses an I2C communications bus between the computer or host device. This bus uses two lines including a serial clock (SCL) line and a serial data (SDA) line. Communication over these lines can be either uni-directional or bi-directional. Several revisions of DDC protocols have evolved. DDC1 is uni-directional from the display to the host, display data is sent continuously, clocked by vertical sync. DDC2B, DDC2B+ and DDC2AB are bi-directional, with the host initiating a request for data and the display then transferring the data. DDC2B involves a simple command by the host followed by reading data (EDID information) from the I2C slave memory IC. DDC2B is used by the VideoPro 400 series generators.

Extended Display Identification Data (EDID) defines the data and orientation of the data over the DDC channel. The data can include manufacturing and model information, but more importantly, resolution information regarding the compatible formats that display can properly display. When the EDID data is decoded, a host device can determine which of the standard VESA formats, along with other formats, are compatible with the display. The VideoPro 400 series reads the EDID data and lists the formats that can be produced by the generator. These formats can be selected and output to the display in the DDC Step sub-

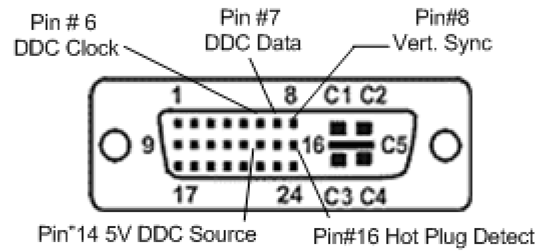


Data related to the computer monitor is communicated to the computer. The data is stored in a memory IC (R.O.M) and clocked to the computer with the I2C data bus (SDA-2) line.

menu within the Learn Formats function of the VideoPro.

The DVI connector is DDC compatible. DVI connector pin 6 is the DDC clock line and pin 7 is the DDC data line. Pin 8 supplies an analog vertical sync signal. Pin 14 of the DVI connector is available for use by the host to supply 5V to the display's DDC circuits. The display has the option to use this supply to keep the DDC capable circuits active while powered off. Pin 16 is a detection pin used to sense when a display is plugged into the DVI jack. When the host detects over 2.4V or logic high on pin 16, it can begin a DDC test as part of the plug and play setup. The Sencore VideoPro generator does not employ a host detection feature. DDC is implemented by pressing the Learn Formats pushbutton.

DVI Connector - DCC Compatible



APPENDIX A

Sencore VideoPro Pixel Resolution

Format	Format pixel clk	VideoPro pixel clk	min pixel resolution
VESA	-	-	-
640x350_85Hz	31,500	31,500	1
640x400_85Hz	31,500	31,500	1
640x480_60Hz	25,175	25,175	1
640x480_72Hz	31,500	31,500	1
640x480_75Hz	31,500	31,500	1
640x480_85Hz	36,000	36,000	1
720x400_85Hz	35,500	35,500	1
800x600_56Hz	36,000	36,000	1
800x600_60Hz	40,000	40,000	1
800x600_72Hz	50,000	50,000	1
800x600_75Hz	49,500	49,500	1
800x600_85Hz	56,250	56,250	1
1024x768_42Hz	44,899	44,899	1
1024x768_60Hz	65,000	65,000	1
1024x768_70Hz	75,000	75,000	1
1024x768_75Hz	78,750	78,750	1
1024x768_85Hz	94,500	94,500	1
1152x864_75Hz	108,000	108,000	1
1280x960_60Hz	108,000	108,000	1
1280x960_85Hz	148,500	148,500	1
1280x1024_60Hz	108,000	108,000	1
1280x1024_75Hz	135,000	135,000	1
1280x1024_85Hz	157,500	78,750	2
1600x1200_60Hz	162,000	81,000	2
1600x1200_65Hz	175,500	87,750	2
1600x1200_70Hz	189,000	94,500	2
1600x1200_75Hz	202,500	101,250	2
1600x1200_85Hz	229,500	114,750	2
1792x1344_60Hz	204,750	102,375	2
1792x1344_75Hz	261,000	130,500	2
1856x1392_60Hz	218,250	109,125	2
1856x1392_75Hz	288,000	144,000	2
1920x1440_60Hz	234,000	117,000	2
1920x1440_75Hz	297,000	148,500	2
Mac			
640x480_67Hz	30,240	30,240	1
832x624_75Hz	55,000	55,000	1
1024x765_75Hz	80,000	80,000	1
1152x870_75Hz	100,000	100,000	1
NTSC/PAL			
NTSC	14,318	14,318	1
NTSC_Y	14,318	14,318	1
PAL	17,750	17,750	1
PAL_Y	17,750	17,750	1
RS170Y	14,318	14,318	1
NTSC_RGB	14,318	14,318	1
PAL_RGB	14,318	14,318	1

Format	Format pixel clk	VideoPro pixel clk	min pixel resolution
ATSC			
480i29	13,500	13,500	1
480i30	13,513	13,513	1
480p59	27,000	27,000	1
480p60	27,027	27,027	1
720p59	74,175	74,175	1
720p60	74,250	74,250	1
1080i25	74,250	74,250	1
1080i29	74,175	74,175	1
1080i30	74,250	74,250	1
1080p50	148,500	148,500	1
1080p59	148,351	148,351	1
1080p60	148,500	148,500	1
1080p24	74,250	74,250	1
1080p24sF	74,250	74,250	1
CUSTOM			
848x480_60Hz	33,749	33,749	1
1024x576_60Hz	47,249	47,249	1
1280x720_60Hz	76,591	76,591	1
1360x768_60Hz	85,499	85,499	1
1365x1024_60Hz	119,999	119,999	1
1365x1024_75Hz	144,000	144,000	1
1440x960_72Hz	129,024	129,024	1
960p59	107,999	107,999	1

HDTV/SDTV DVI
480i29
480p59
720p59
1080i29
480i29LH
480i29SH
480i30
480p59LH
480p60
540p59
720p60
1080s23
1080s24
1080s25
1080i30
1080p23

SDI
487i29
576i25
HDSDI
720P@50, 59, 60
1080i@25, 29, 30
1080p@25, 29, 30
1080x@23, 24

DVI VESA/Mac
640x480_60
640x480_75
640x480_85
720x400_85
800x600_60
800x600_72
800x600_75
800x600_85
1024x768_60
1024x768_70
1280x768_60
1280x768_75
1280x768_85
1280x1024_60
640x480_67
832x624_75
848x480_60
852x480_60

Appendix B – Calibrating TV User Controls

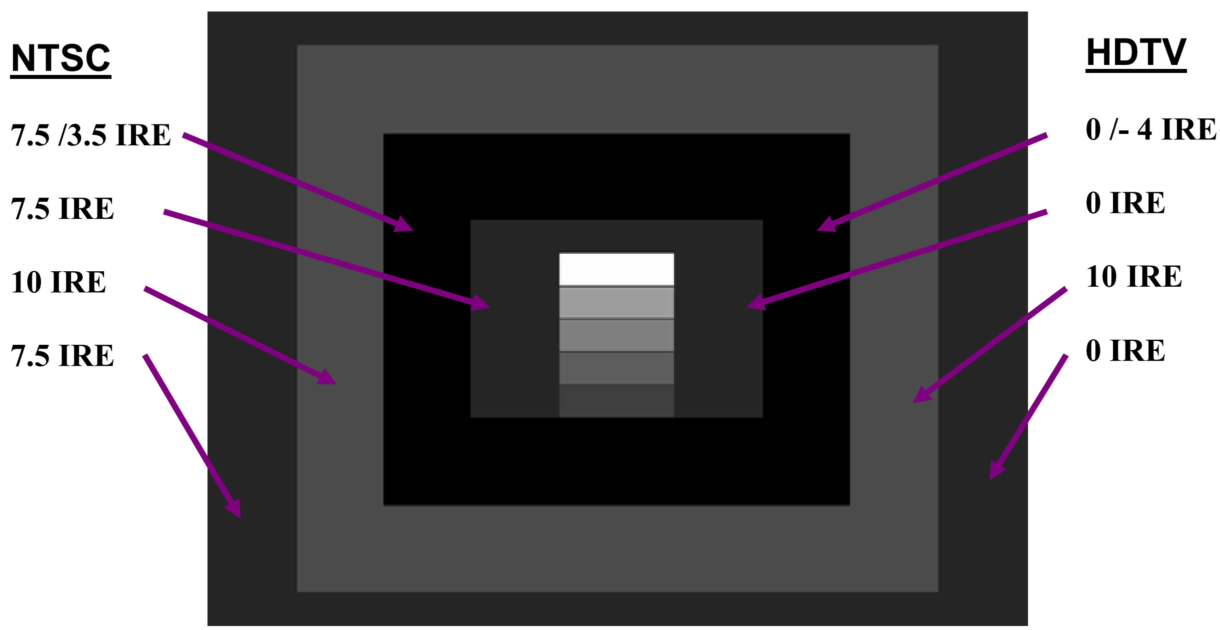
The improved quality of today's large screen TVs presents a challenge to the installation technician. Even the slightest mis-adjustment of the TV user controls can cause the picture quality to be significantly less than it could be. This section describes how to properly adjust the five major user controls, using the Sencore VP400 Family Multimedia RF-Video Generators, which provide the patterns needed for user control calibration, as well as for white balance calibration and picture geometry adjustment. The important TV user controls are (commonly used label listed first; more accurate technical term in parentheses):

1. **Brightness (Black Level)**
2. **Contrast/Picture (White Level)**
3. **Sharpness**
4. **Tint (Chroma Hue)**
5. **Color (Chroma Saturation)**

Brightness Control

The brightness control adjusts the light level of the darkest portions of a picture - that's why this control is more accurately called the black level control. When the black level is set too dark, the subtle dark gray details of a scene are lost to black. When the black level is set too bright, the darkest grays and deep blacks in the picture are all a lighter gray, which effectively lowers the contrast ratio of the display, reducing picture quality.

The VideoPro Series Pluge pattern, shown below, provides a unique black level alignment signal that was designed for easily adjusting the brightness control for proper black level.



Note: The environment surrounding a TV affects the proper setting of the user controls. Room lighting should be adjusted to the preferred level for movie viewing before the TV is calibrated.

When the Pluge pattern is selected with the NTSC format, the VideoPro automatically displays an NTSC pluge pattern with a 7.5 IRE black setup level. When an HDTV format is selected, the VideoPro displays an HDTV pluge pattern, without black setup.

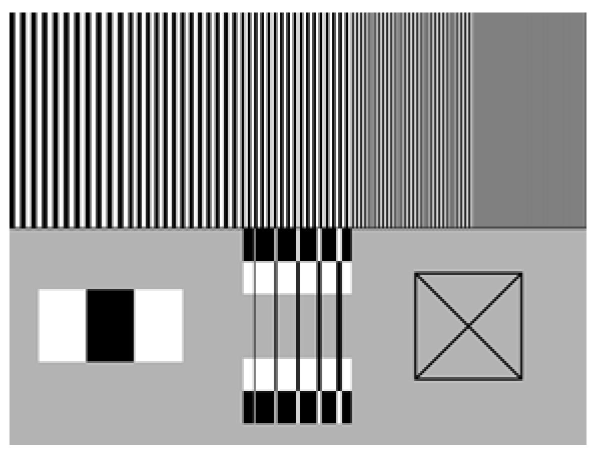
To adjust the brightness control on an NTSC or HDTV display device with the Pluge pattern, watch the second box from the inside, which is alternating between black and blacker-than-black (7.5 IRE and 3.5 IRE in NTSC, 0 IRE and –4 IRE in non-NTSC formats). Adjust the brightness control until the black and blacker-than-black levels appear the same and no flashing can be seen. The outer 10 IRE box should still be slightly visible. The same method is used for HDTV, although the pattern IRE levels are different.

If the brightness level of the outer two rectangular zones does not remain constant as the second zone from the center alternates between black and blacker than black, the display has less than perfect DC restoration. This can be seen especially well with the brightness (black level) control adjusted to a slightly higher than normal setting. In this case, you will need to decide, based on the primary use of the display, whether the black level should be adjusted on a pattern with low APL or high APL. If the display will usually be viewed in a darkened room, adjust the brightness control with a low APL pattern, such as the Pluge pattern. If the display will usually be viewed in a bright room, adjust the brightness control with the pluge levels in a medium or high APL pattern, such as the SMPTE Bar pattern or one of the Window patterns set to a high IRE level.

Sharpness Control

The sharpness control is designed to enhance the fine detail in a picture, independent of picture content. It was originally introduced in color TVs with notch filter luma/chroma separation that removed high frequency detail in the black and white portion of the picture. The sharpness control was designed to put some of that detail back into the picture. Most modern TVs now use a comb filter, which doesn't lose the high frequency luminance detail. If a comb filter is used, there is no longer a real need for the sharpness control. If the sharpness control is improperly adjusted, it will either add picture distortion or reduce picture resolution.

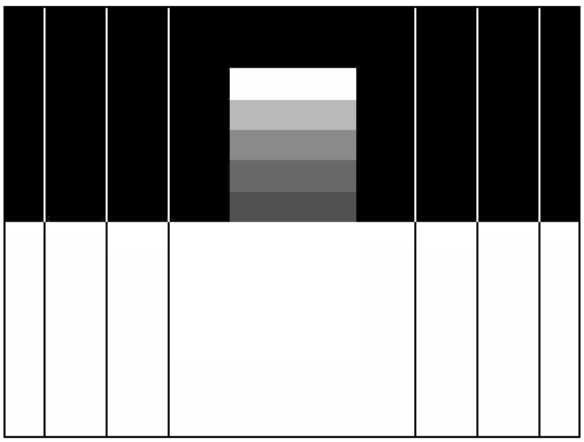
The VideoPro Sharpness pattern is designed for adjusting the sharpness control. To calibrate the sharpness control, watch the left and right edges of the needle pulse lines. If the sharpness is set too high, a faint duplicate line will be seen beside the original line. This ghosting affect is unwanted picture distortion.



Do not adjust the sharpness control low enough to lose resolution or brightness in the multiburst bars. Adjust the sharpness control to achieve the best balance between ghosting and poor resolution.

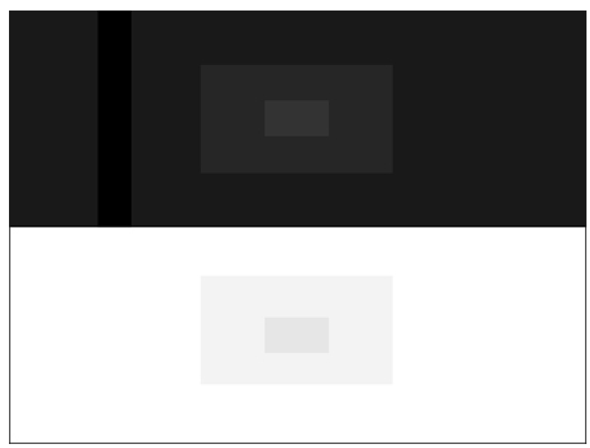
Contrast Control

The contrast control is sometimes labeled the picture control, or is more accurately called the white level control. This control adjusts the light level of the white or high luminance portions of a scene. If the contrast control is set too low, the image is dim, the whites become dull and the image loses its luster. For this reason, many displays are adjusted from the factory with the contrast control set to maximum. If the contrast control is set too high on a CRT type display, though, the power supply may be overdriven and raster distortion may occur. Also, too much contrast may cause pixel blooming. Blooming occurs when the screen pixels are lighted so brightly that light spreads to the adjacent pixel, defocusing the white image.



The VideoPro Needle Pulse pattern works very well for adjusting the contrast control for maximum light level while minimizing raster distortion or blooming. Adjust the contrast control until the top white bar is the same width as the four gray bars under it. This will ensure that no pixel blooming is occurring. Also, observe the needle pulses (vertical lines in the picture) as you adjust the contrast control. These lines should be straight. If the contrast is set too high, the display's power supply may cause the needle pulses to bend. This line bending creates unwanted picture distortion.

For non-CRT displays, use the HiLoTrk pattern to set the contrast control. Start with the contrast low enough so that you can distinguish both the 95% and 97.5% boxes within the white bottom portion of the pattern. Increase the contrast control to just below the point where the brightest gray box starts to fade into the white background.



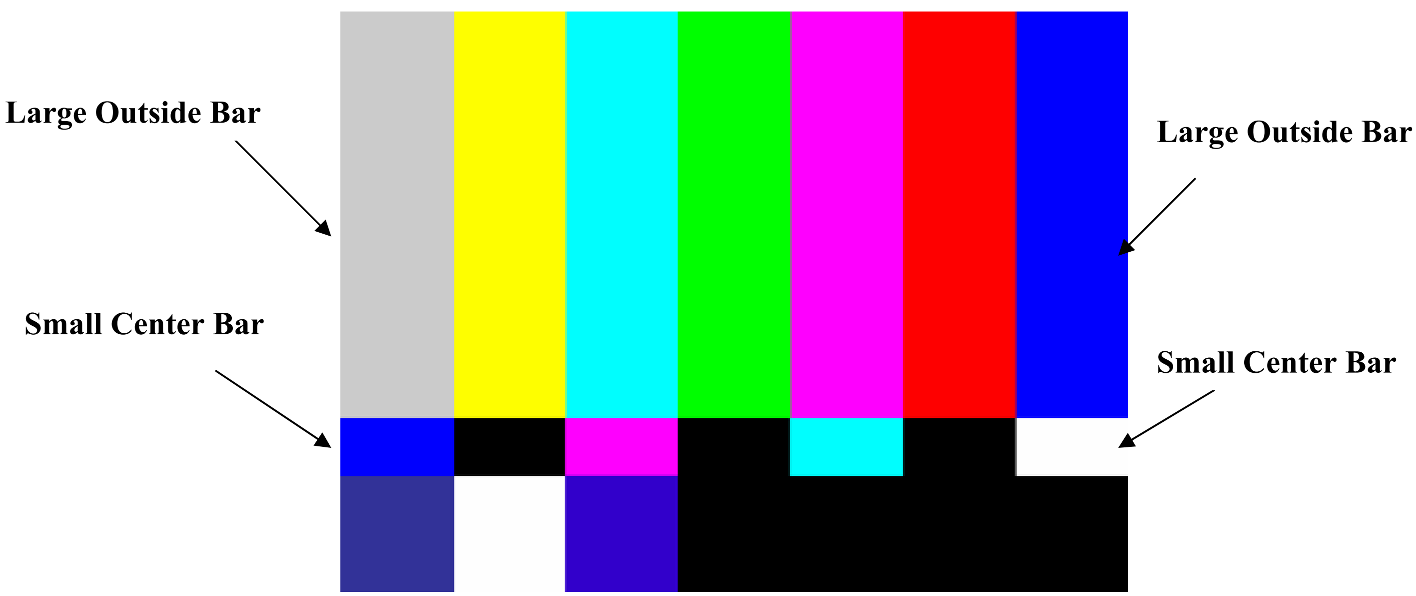
Brightness should be rechecked after the contrast control is adjusted because the two controls may have some interaction.

Color and Tint Controls

The color and tint user controls should be adjusted last. These two controls should be adjusted using the SMPTE color bar pattern. The easiest and most accurate method of adjusting the tint and color controls is to view the SMPTE color bar pattern through a blue filter.

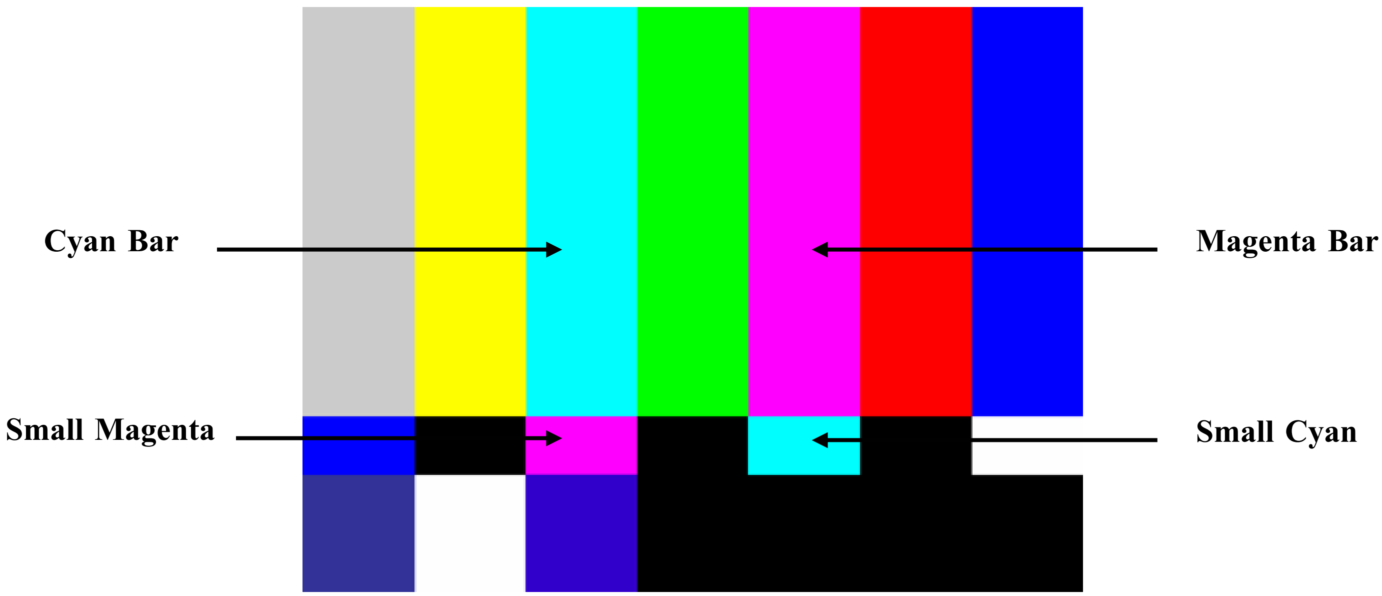
Color Control

Adjust the color control by comparing the intensity of the large top outside blue and white bars with the intensity of the small bars below them. Adjust the color control to make these bars appear the same light level, as viewed through a blue filter. To double-check the color control adjustment, remove the blue filter and look at the yellow and red bars. These bars should appear very colorful without any signs of blooming into the adjacent bars.



Tint Control

Adjust the tint control by comparing the intensity of the cyan and magenta color bars through a blue filter. Compare the light level of the large top cyan and magenta bars with the small bars directly below each of them. Adjust the tint control to make these bars appear the same light level, as viewed through a blue filter. To double-check the adjustment, remove the blue filter and observe the yellow and cyan bars. If the tint is set too red, the cyan bar will look green and the yellow bar will look orange. If the tint is set too green, the cyan bar will look blue and the yellow bar will look green.



Remember that the user controls should be calibrated with the room lighting adjusted to the preferred level for movie viewing. These controls should also be the final adjustments that are made to the TV. If the TV white balance is calibrated, these five user controls will need to be re-calibrated.

Appendix C – Video Display White Balance Adjustment

Following is a general white balance (grayscale, color temperature) video display adjustment procedure that will produce a properly adjusted display in most cases. If a service manual is available for the display, however, use the manufacturer's adjustment procedure.

White Balance Adjustment

1. In your color analyzer's setup utility, select the white reference or CIE chromaticity coordinates to which the display is to be adjusted.

   Note: Most displays should be adjusted to the CIE D65 daylight standard (x = 0.313, y = 0.329) for best color accuracy with standard program material.

2. Adjust the brightness control to make blacks just black (use the Pluge pattern, or use the pluge bars in the Window pattern) and adjust the contrast control for maximum brightness without blooming or raster distortion (use the Needle pattern).

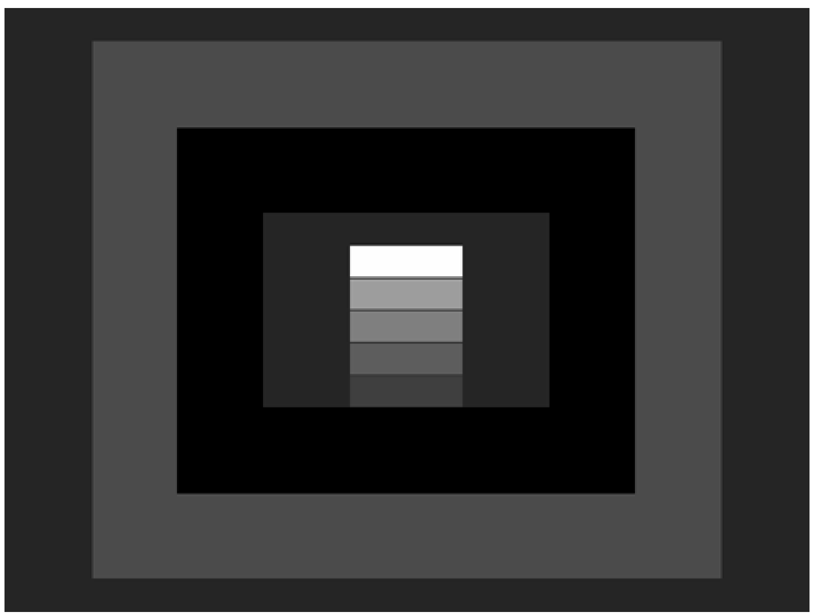


Fig. 1 – VideoPro Pluge pattern

3. Select the VideoPro Window1 pattern and adjust the pattern level for a low IRE level to produce approximately 1-2 Ft-Lamberts of luminance in the center of the white window, as measured with the color analyzer.

4. Leaving the cutoff control for the initially strongest color (as viewed on the dim CRT) at its original or preset level, adjust the other two cutoff controls to obtain color balance at the desired white reference.

   Note: The ColorPro Delta RGB display indicates which is the strongest and weakest color.

5. Select the VideoPro Window2 pattern and adjust the pattern level for 80-100 IRE. Most direct-view displays will track well up to 100 IRE, whereas many projection displays produce a better compromise tracking when adjusted at a lower IRE level.

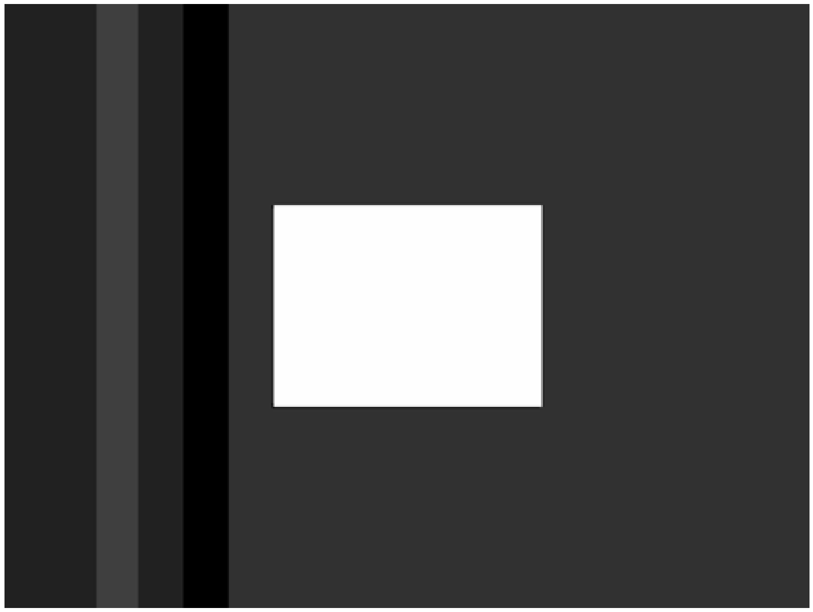


Fig. 2 – VideoPro 100 IRE Window pattern

6. Adjust the drive/gain controls to obtain color balance at high brightness.
   Note: *If only two drive controls are available, select the missing color as your reference color in the ColorPro Delta RGB display window.*

7. Re-select the Window1 pattern, readjust the pattern IRE level to produce approximately 1-2 footlamberts of luminance, and recheck/readjust the cutoff controls for the desired chromaticity coordinates.

8. Repeat steps 5-7 until the display's color temperature remains relatively constant (tracks) over the full range of white window IRE levels.

Final User Control Adjustment

When the white balance adjustment is complete, perform a final adjustment of the display's user controls (brightness, contrast, sharpness, color, and hue), as outlined in Appendix A.

Appendix D: Playing the VP403C Video Clips and Picture Images on an ATSC Display

The VP403C "VideoPro" outputs two moving video test signals on an ATSC-RF test signal. The motion video test clips feature colorful hot-air balloons or beautiful nature scenes from Hawaii. The moving test signals highlight the performance of HD-ready displays after installation, calibration or servicing. The clips are also excellent for testing and identifying artifacts related to digital signal processing. The video clips are accompanied with a stereo audio signal.

To play a VP403C video clip on an HDTV display, follow these few simple steps. Each step is described in detail in this appendix.

1. **Connect the VP403C to the ATSC Receiver**
2. **Select VP403C Signal Type & ATSC Channel** Press the Signal Type button, wait, and then select the ATSC channel.
3. **Select Signal Format** (720p = Hawaii Scenes, 1080i = Colorful Hot Air Balloons)
4. **Select VP403C "Video 1" Pattern**
5. **Set up ATSC Receiver** (vhf/uhf) **– Perform Channel Search** (SCAN)
6. **Select ATSC Channel** on the receiver

1. Connect the VP403C to ATSC Receiver

The VP403C is a multimedia generator with multiple output signal types. It provides NTSC-RF, NTSC and PAL composite video, NTSC and PAL S-video, SDTV/HDTV YPbPr component video, SDTV/HDTV and VESA/MAC RGB, SDTV/HDTV and VESA/MAC DVI, and SDTV/HDTV ATSC-RF test signal types.

The moving video test clips are available through the ATSC-RF output signal type. Connect the RF test cable (Sencore Part #39G189) between the ATSC-RF output of the generator and the ATSC input of the receiver. The receiver may call this an RF input or an antenna input.

Note: Check with the owner's manual to be sure the receiver has a built-in ATSC digital tuner. If it claims to include a digital cable or QAM tuner it also receives ATSC. Some ATSC receivers or set-top-boxes (STB) may have more than one RF connector input. Check with the operations manual to be sure the input you select is capable of tuning to off-air TV channel signals.

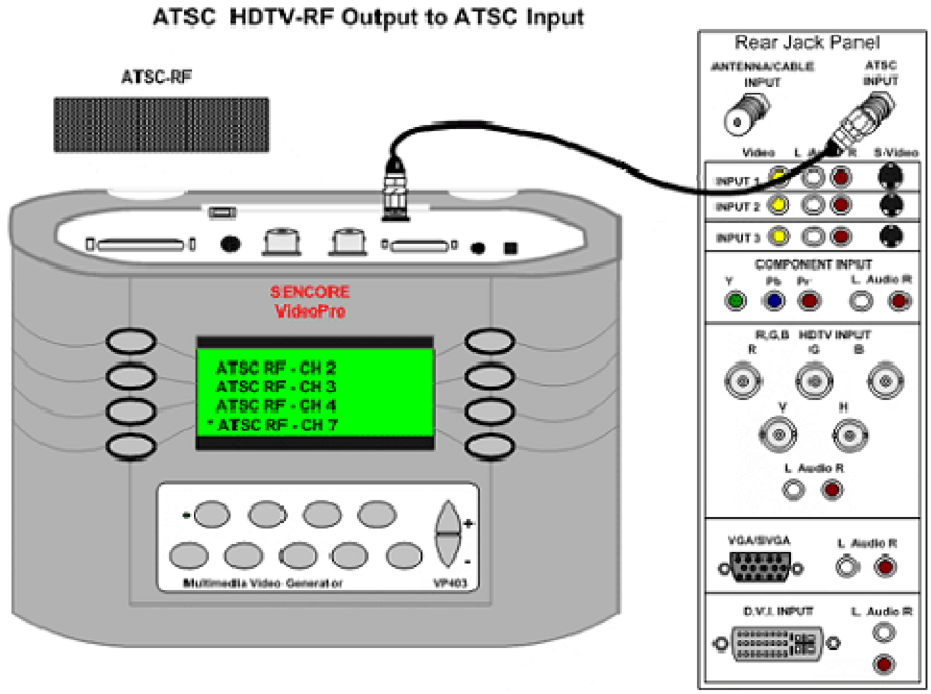


Figure 1. Connect the RF test cable (39G189) between the ATSC output of the generator and the ATSC input of the receiver.

2. Select Signal Type & ATSC Channel

The moving video test clips are designed for output by the VP403C in the SDTV/HDTV RF ATSC signal type. To select this signal on the VP403C press the "SIGNAL TYPE" pushbutton. Push the "-" side of the large scroll-down button to increment to the second menu. Press the button beside the display listing the SDTV/HDTV RF ATSC signal type.

Upon choosing this signal type, an ATSC RF channel menu appears. You may choose any RF channel in the following ranges 2-4, 7-10, or 30-32. Use the scroll down pushbuttons to view the menu pages providing these channel choices. Press the button beside the display for the desired ATSC RF channel. After the channel selection the FORMAT menu(s) appear.

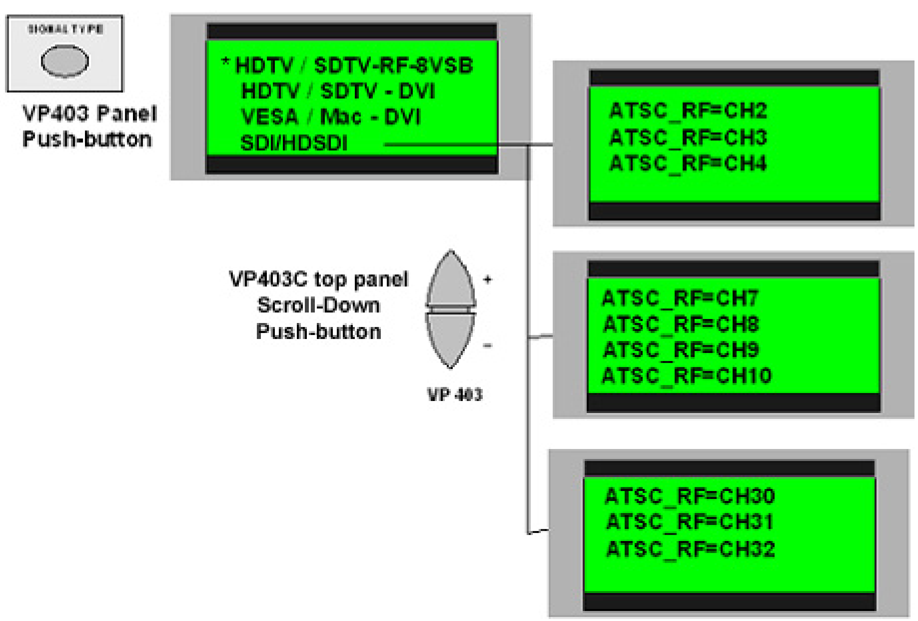


Figure 2. Select the signal type (HDTV/SDTV-RF-8VSB) by pressing the button beside this display selection. An ATSC RF channel menu appears. Press the button beside the display for the desired RF channel.

3. Select Signal Format

The "FORMAT" selections within the menu's of the VP403C provide varying signal resolution output formats to meet today's video display testing needs. Displays accept NTSC on RF channels, composite video or S-video inputs. HD-ready displays accept an RF channel, component (YPrPb) and/or an RGB input with resolution formats for HDTV including 480i, 480p, 720p and 1080i.

Upon selection of an ATSC-RF channel (Step 2), the format menu automatically appears on the VP403C. This is the same menu that appears when the "FORMAT" pushbutton is pressed. *Note: The first or upper- most display menu of the HDTV/SDTV formats lists the most popular resolutions used, and are compatible with most HD ready displays.*
The moving video clips are available in the 720P59 or 1080i29 format. Push the button located beside the display screen for one of these formats. The 720P59 format provides the Hot Air balloon clip and the 1080i29 format provides the Hawaii nature scene clip.

1080i29 = Hawaii Nature Scenes
720P59 = Colorful Hot Air Balloons

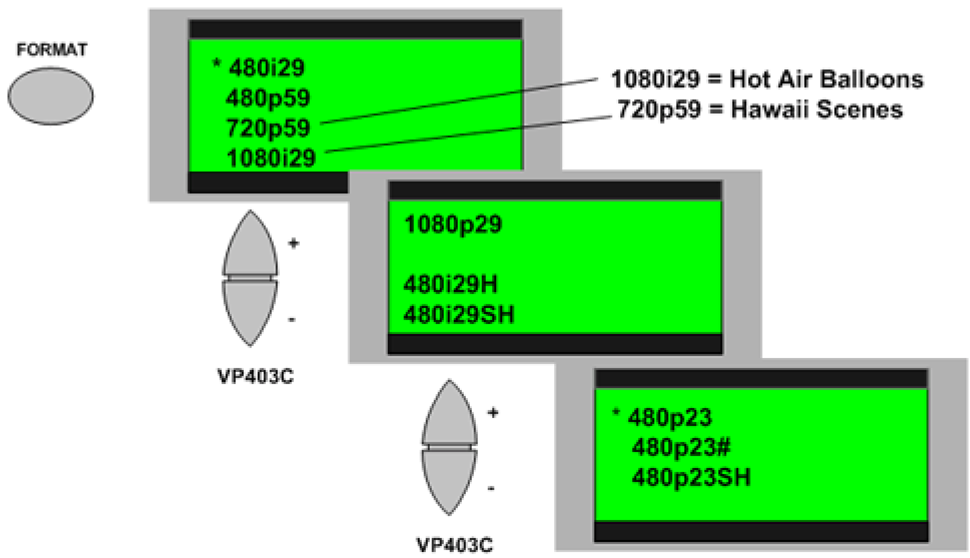


Figure 3. Select the resolution format either 720P59 or 1080i29 by pressing the pushbutton beside the display screen.

4. Select Video 1 Test Clip

To select the video test clip for operation at 720p or 1080i you must push the "Pattern" pushbutton on the VP403C. Push the "-" scroll down button on the VP403C to increment to the last of the 4 pattern menu screens. Press the pushbutton beside the display indicating "Video 1" selection.

Note: If you do not see a "Video 1" selection in the Pattern menu you need to return to the Signal Type menu to be sure you have selected the ATSC –RF type and the FORMAT menu to be sure you selected 720p59 or 1080i29. If its still not there you have a VP403C model which does not include video clips.

In addition to the video clips, the VP403C contains many innovative video test patterns. The analyzing and alignment test patterns include: Pluge, Decoder Adjust, Linearity, Over-scan, HiLoTrk, and selectable IRE level Window patterns, plus a host of other standard video patterns. This wide selection of patterns helps you with any testing, professional calibration, or show & tell demonstration.

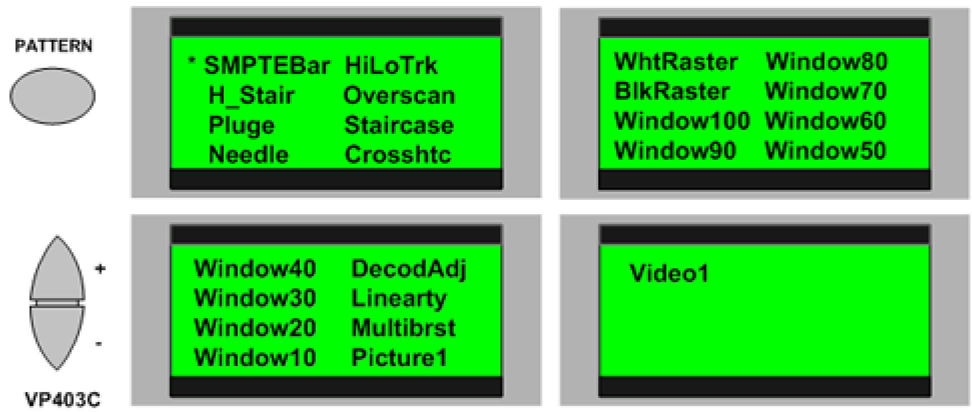


Figure 4. Push the "-" scroll down button on the VP403C to select the last menu. Press the pushbutton beside the display indicating "Video 1" selection.

5. Setup ATSC Receiver – Perform Channel Search (SCAN)

An important part of getting the VP403C to play the moving video on the receiver or through a STB is to configure the receiver. This requires going into the setup menu and making several key selections. It further requires performing a channel tuning search to find and configure the receiver to display the digital channel.

First, go into the receiver's signal input menu(s) and find the setup menu for specifying the input RF or antenna inputs. You must select the input in which you have the generator connected. Secondly, setup the receiver to receive over-the-air digital ATSC signals. Choose the menu selection which specifies reception for broadcast TV, over-the-air, antenna, or VHF/UHF. These are all terms used to describe TV signals transmitted to your receiver by local broadcasters.

With the VP403C connected and configured as in steps 1-4, perform a channel tuning search on the receiver so it can find and configure the receiver to the ATSC channel of the generator. ***Note: You must have the VP03C connected and outputting an ATSC-RF channel (Steps 1- 4).***

A tuning search may not be necessary if the receiver is already setup to receive an ATSC signal on the same VHF/UHF ATSC-RF channel selected on the generator. Remote entry of that ATSC-RF channel number or virtual channel ID # may provide direct access. (Example VP403C ATSC-RF Channel 3: Enter 3.1 or 3.10 or 1.2)

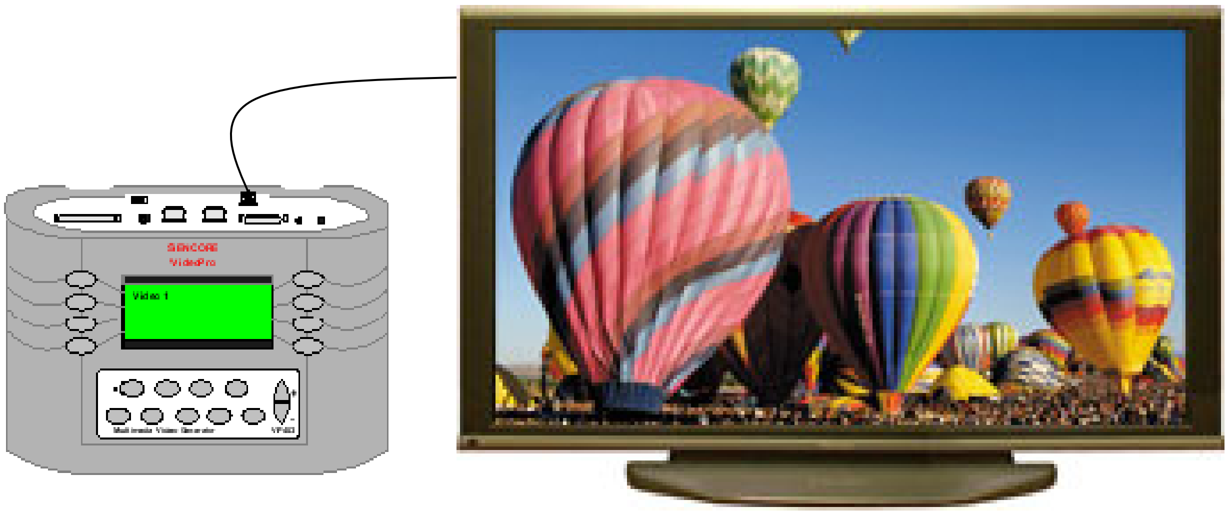


Figure 5. Setup the display for off-air broadcast tuning on the RF input in which the VP403C is connected. Perform a channel search with the generator setup as in steps 1-4.

6. Select the ATSC Channel on the Receiver

Once you have completed the channel search, exit the setup menu of the display. Check menu settings on the receiver to be sure you have selected the proper input if the receiver has more than one RF input.

Note: Navigate the menus to be sure the proper "antenna 1" or "antenna 2" choice is selected for RF channel viewing if the display has more than one RF input connector.

Exit the menu and increment up or down in channel numbers if necessary until the receiver indicates the VP403C's channel ID number and you see the video clip on the display screen. A slight delay is normal as the display tunes, locks and decodes the digital signal.

The virtual channel ID number imbedded in the ATSC digital signal of the VP403C on each RF channel is 1-2. The receiver may display this number and not the number of the selected ATSC-RF channel you selected on the VP403C.

7. Selecting ATSC-RF Photo Image Test Signals (480i, 480p, 720p, 1080i)

Another first for the VP403C is the addition of photo (still) images to the selection of video test patterns for the ATSC-RF output. The photo images are available for output in the resolutions of 480i, 480p, 720p and 1080i. The images feature a close-up view of a young lady with a multi-color hairpiece and an outdoor scene of a young couple with backpacks. The images provide an excellent reference for gauging display facial color tone and picture clarity at the various resolutions.

Still picture test images of young girl and backpacking couple.

Figure 6. Photo (still) images are part of the video pattern selections on the VP403C's ATSC-RF signal type.

8. To View the ATSC-RF PICTURE Image on a Display

1. Follow the same steps as previously outlined in this document to produce a video test clip on an ATSC display. This insures proper connection, generator configuration and receiver tuning

2. Push VP403C FORMAT pushbutton and select the 480i29, 480p59, 720p59, or 1080i29 format selection.
   480i29 = 4:3 ratio, Beautiful girl photo
   480p59 = 4:3 ratio, Beautiful girl photo
   720p59 = 16:9 ratio, Back-packing couple
   1080i29 = 16:9 ratio, Back-packing couple

3. Push VP403C PATTERN pushbutton. Press Scroll "-" key to locate the pattern menu screen which lists the "Picture 1" pattern menu selection.

4. Press the pushbutton beside the display's "Picture 1" selection.

Appendix E: Applying SDI/HDSDI Signals (SH VideoPro Option)

Serial Digital Interface (SDI) and High Definition Serial Digital Interface (HDSDI) are serial digital interface signals. These signals originated as a means to interface uncompressed, unencrypted digitized video between devices in the television production and broadcast environments. In recent years, SDI and HDSDI are beginning to branch out into other applications and more and more displays are being designed with SDI and HDSDI inputs.

Figure 1. Serial Digital Interface video signals are found in TV production & broadcast, signage, cinema, rental & staging, and increasingly more and more applications.

Serial Digital Interface Signal

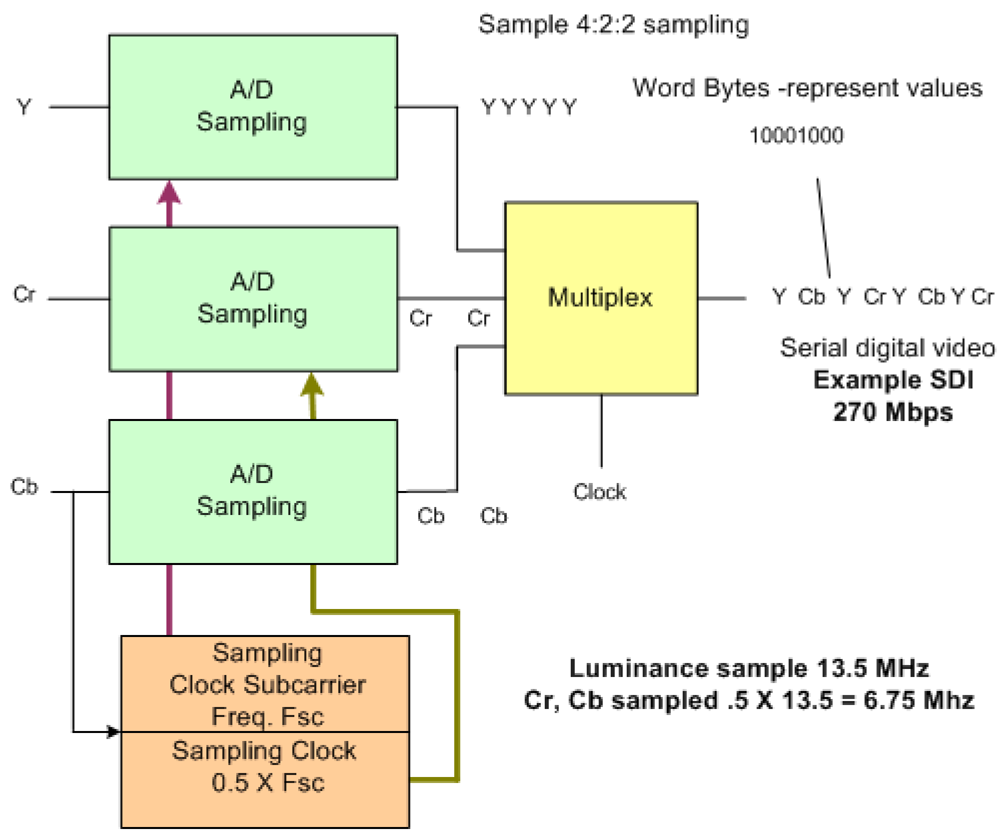
A serial digital video signal is produced using the video's Y, Cr, and Cb component voltages representing the luminance and color picture information. These individual component voltages are input to ADC (analog-to-digital converters).The converters take samples, snapshots in time, of the voltage levels occurring on the Y, Cr and Cb inputs. The snapshot voltages are quantified into 10 bit digital values representing levels from black to white (luminance) and color levels (Cr, Cb).

The clock sampling rates for the conversion is chosen to be multiples of the color sub-carrier frequency. For example, the SDI 525i system samples the luminance at 13.5 MHz and the Cb and Cr at ½ this rate or 6.75MHz. Therefore, for every 4 luminance samples there are two Cb and Cr samples. This is stated as a 4:2:2 digital sampling ratio.

Imagine a picture frame feeding the Y, Cr, Cb ADC sequentially video line by line. The resulting output of each ADC is sequential 10 bit digital words (digital samples) representing Y, Cr and Cb for the entire picture frame. These digital values are multiplexed together so they can exist on a single cable and then be separated by the receiver. The output of the time division multiplexer is multiplexed data words Y, Cr, Y, Cb, etc.

Synchronizing bits are added to the digital multiplexed signal and encoding is applied. Synchronizing bits and encoding enables the serial digital receiver to properly detect the beginning of the picture frame and horizontal blanking times to recover the Y, Cr and Cb components.

Figure 2. Serial digital video consist of a series of multiplexed bits (bit stream) consisting of Y, Cb, and Cr digitized values representing the video.



The VideoPro SDI/HDSDI Connection (Electrical Interface)

Serial digital interface standards specify the use of coaxial cables with BNC connectors. The nominal transmission line impedance is 75 ohm. The specified signal amplitude at the source is 800 mV (±10%) peak-to-peak although far lower voltages may be measured at the receiver, due to attenuation. The interface signal carries a synchronizing signal sequence within the digital signal and is self clocking which permits a receiver to lock and recover the video

The VideoPro VP403SH provides SDI or HDSDI through a rear panel BNC connector. The SDI/HDSDI output is enabled when the signal type is chosen within the menu selections. A short BNC cable is provided for connection to SDI/HDSDI inputs.

Figure 3. The SDI/HDSDI output of the Sencore VideoPro provides standard SDI or HDSDI signals through a standard BNC interface connection.

SDI/HDSDI Video Resolution Formats

An SDI/HDSDI signal can be one of several different resolutions. The SDI format may be divided into either a 525 (720x486) @ 59.94i or a 625 (720x576) @ 50i signal resolution. These are commonly called NTSC and PAL serial digital signals. Both resolutions employ 10 bit data and a data clock rate of 270 Mb/s.

The HDSDI signal offers multiple resolutions in 720 or 1080 formats. The 720p signal format is available at frame rates of 60, 59.94 or 50 Hz. The 1080 signal format is available in interlaced, segmented or progressive scan formats at applicable frame rates of 30, 29.97, 25, 24, or 23.98 Hz. HDSDI employs 10 bit data and a data rate of 1.485 Gb/s.

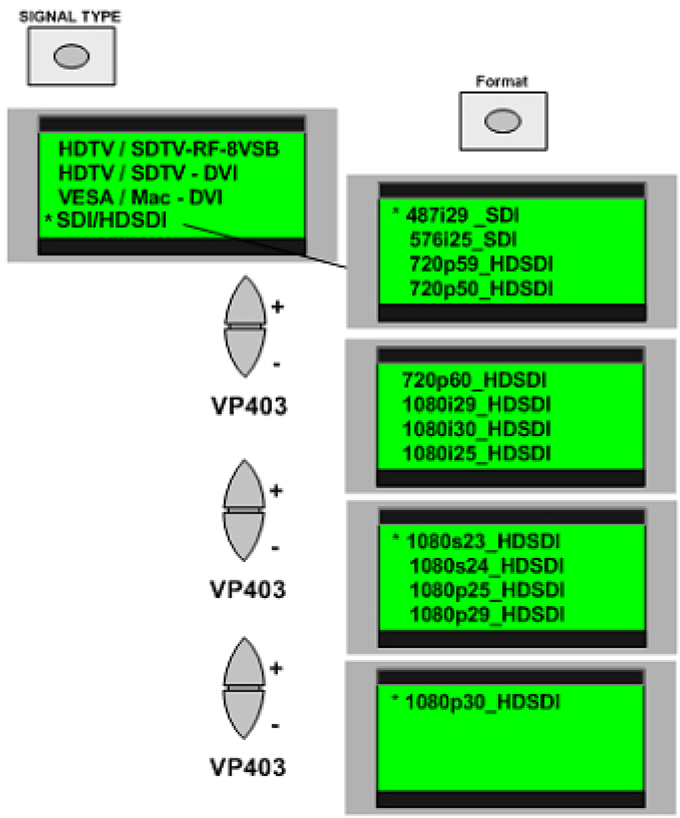


Figure 4. The SD/HDSDI output of the VideoPro offers two SDI output signal formats and multiple HDSDI 720 or 1080i formats.

To output an SDI or HDSDI signal from the 'SH' VideoPro:

1. Connect a BNC cable to the VideoPro SDI/HDSDI output and to the SDI/HDSDI input of the device to be tested. (BNC to BNC cable – Sencore #39G232)

2. Power the VideoPro ON. Push the "SIGNAL TYPE" pushbutton. Push the large '-' scroll down pushbutton to increment to the second signal type menu. Press the pushbutton beside the display choice "HD/SDI". Note: A format menu appears.

3. Select the desired SDI or HDSDI signal format. Pushing the '-' scroll down button moves down to additional menus or formats. Pushing the '+' scroll up pushbutton moves upwards through the menus. To choose a format and press the pushbutton beside the display listing of the desired format.

4. Select a video test pattern by pushing the PATTERN pushbutton and again pressing the pushbutton beside the display indicating the desired pattern. Use the '-' and '+' scroll down pushbuttons to see additional menus. *Note: Many menus have listings on each side of the display.*

NOTES