

The VP20 has a variety of video and graphics inputs. The VP20 can simultaneously display video from up to 4 input ports: Ports 1-3 support any one of the DVI/RGB/Composite/SOG inputs, and Port #4 supports any 1 of a variety of input mezzanine boards. Automatic mode detection on each input port. Up to 4 windows can be placed in the output active area. Via VP20 configuration utility, each window is assigned to an input, with window size, location, input area-of-interest, and rotation determined by the detected mode. One or more windows may be assigned to the foreground for optional keying operations. The dual LVDS output supports up to 165 MPixels/sec for panels up to WUXGA or 1080P. Single link DVI output for other output devices. Expansion output port for Westar output accessories.

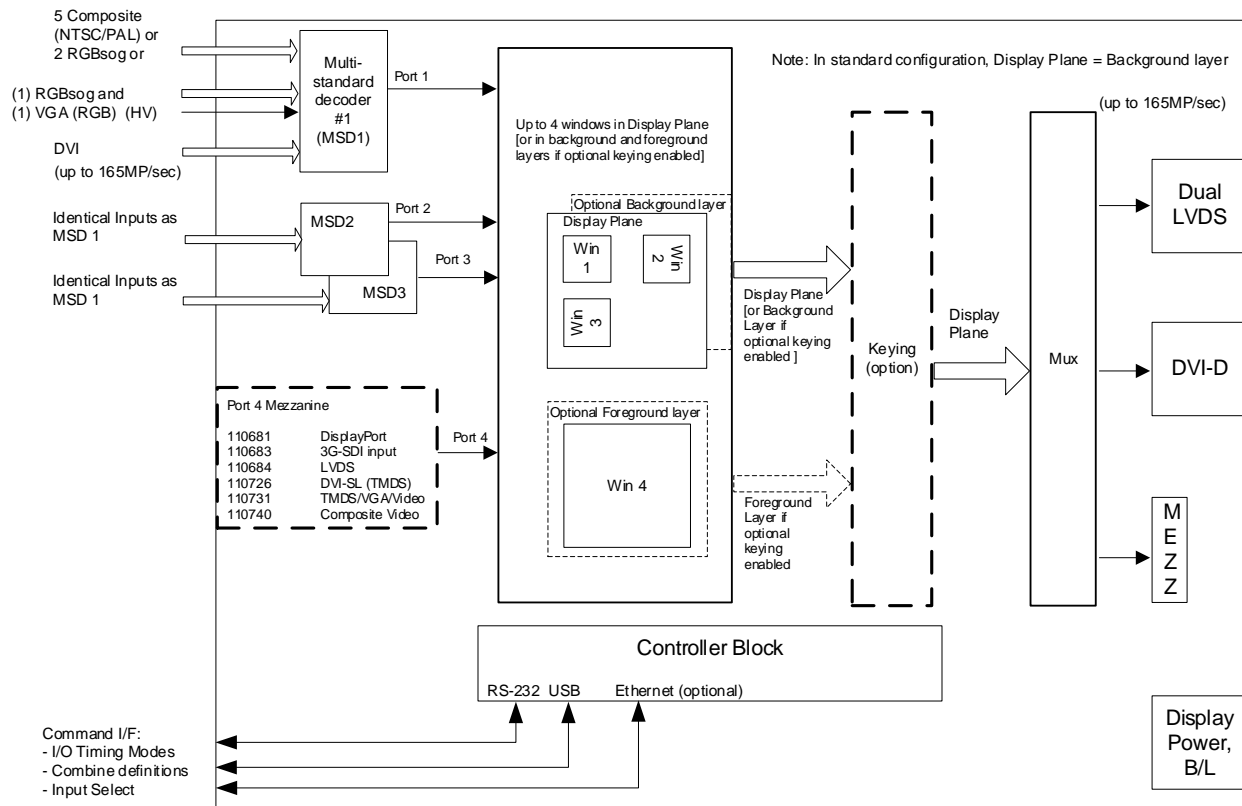


Figure 1 VP20 Block Diagram

## VP20 LCD Controller

The VP20 LCD Controller (see Figure 1 above) is ideal for applications requiring simultaneous display of 2 or more inputs. Video inputs from (4) ports can be viewed simultaneously:

- (3) Ports support video that can be DVI, VGA, Composite, or RS170/RS343 sync-on-green (RGBsog), STANAG 3350 inputs
- (1) Port supports an optional input from Westar's input mezzanine portfolio.

Up to 4 windows can be placed within the display plane (output active area). With optional keying, windows may be placed in either the foreground (key) layer or the background layer. Outputs include dual LVDS and Single Link DVI. An expansion port supports Westar output adapter portfolio.

## VP20 Highlights

The VP20 includes many advanced features, including:

- Input resolutions up to WUXGA (DVI/HDMI, DisplayPort, and analog RGB)
- Up to 3G resolutions auto-detected on optional SDI Port 4
- Ports 1-3 support NTSC/PAL composite, STANAG, and Computer (DVI / RGB) formats,
- Up to 4 windows assigned to any of 4 input ports
- Window size, location, input area-of-interest, flip, and rotation (90/180/270) defined per detected input mode,
- LVDS and DVI outputs (up to 165 MPixel). Optional mezzanine for other outputs.
- Tactical commands for real-time window adjustments
- RS-232 or USB program interface. (Ethernet optional)

### User Programmable Video Input Modes

To support multiple input types and resolutions per input port and multiple windows in an embedded application, the VP20 offers a comprehensive approach for automatic detection, conversion, and windowing of multiple video formats. Each input port can have multiple, prioritized video input modes associated with it. A mode consists of the input type (DVI, VGA, DisplayPort, CVBS, etc) and video timing. Each input port has a mode selection subsystem to scan for defined modes per a specific input type and sub-channel (such as VGA1), or sub-channel 1 of multiple input types (Auto mode). Windows are linked to a specific input port. Each window can have either mode-independent or mode-dependent size, location, input area-of-interest, rotation and other parameters.

At power up, each port's mode selection subsystem initiates a scan. Once a mode is matched (either exactly or within pre-defined limits), that video input is displayed in any associated window(s) per the mode's window parameters (input area-of-interest, window size, window location, rotation, flip, etc).

The mode selection subsystem continually monitors each port. If the port's currently selected video mode is lost, then a pre-programmed flat-field color can be placed in an associated window(s) with a text message, (or the window can be removed altogether) and a new scan is initiated. Even in the presence of valid video, a new scan can be initiated via remote command or discrete input.

Input Ports 1-3 can detect modes from one or more of the following inputs:

- RGB (SOG or HV or Composite Sync),
- DVI (HDMI),
- up to 5 NTSC/PAL composite inputs,
- RS170/RS343, STANAG 3350

If the customer purchases an optional input mezzanine for Port 4, the corresponding input types can be auto-detected.

### VP20 Configuration Application

The VP20 is configured via a PC application.

VP20 Configure Application supports the setup of:

- Output timing/electrical parameters and synchronization method,
- All inputs, including a prioritized list of all applicable video input modes that can be automatically detected for each input port,
- Up to 4 windows with mode dependent and mode independent parameters such as size, location, and input area-of-interest for each detected mode per window
- Sequences for display initialization, loss of video, and video detection.

All parameters are stored in non-volatile memory for automatic operation upon power up. The VP20 Configure application output is a .txt file composed of VP20 commands. This file can be downloaded to the VP20 or saved on a PC. Commands are defined in the VP20 Command Line Description document. The application runs on Windows 10 and 11.

The VP20 supports:

### Video Conversion and Synchronization

- Digitization of computer-generated analog RGB video sources with separate syncs or sync-on-green, non-interlaced and interlaced,
- Digitization and de-interlacing of consumer video formats, including NTSC and PAL Composite
- Support for custom video formats and specialty formats such as RS-343, RS-170, and STANAG,
- decoding of DVI (TMDS)
- De-coding of DisplayPort or 3G-SDI (with appropriate mezzanine),
- Incoming video gain and offset adjustments,
- Per window YUV and RGB color space adjustments,
- Free-running output or genlocked to an input port. If video is lost from the associated genlock input port, then timing converts to free-running until a new input is detected for that port. Note: Genlocked output provides the lowest possible latency.

### Scaling, Windowing, and Area-of-Interest

- Unlimited, independent horizontal and vertical scaling,
- Up to 4 windows with programmable size and position,
- Image can be reversed left to right and flipped top to bottom,
- Image can be rotated 90, 180, or 270 degrees.

### Video Combining up to WUXGA and 1080P

The VP20 offers robust windowing for display resolutions with pixel clock frequencies  $\leq 165$  MPixels/sec (eg 1080P and WUGA @ 60Hz). Up to 4 windows may be sized and placed anywhere in the output active area. Window techniques include PIP, side-by-side, and other window configurations.

### Programmable

- In addition to the initial configuration programmed at power up, commands may be sent dynamically to the VP20. Dynamic adjustments include brightness and contrast,
- (2) RS-232 interface and (1) USB interface are standard,
- Optional Ethernet interface assembly is available.

### Video Output Interfaces

- Supports most single and dual LVDS panels,
- Supports various LVDS pixel mappings, including multiple MSBit/LSSBit arrangements, and 3/4/5 channels (pairs) per link,
- Single link TMDS output for up to 1920x1200 displays,
- Expansion output port (up to WUXGA) that is compatible with Westar output mezzanines.

### Tactical Commands

“Tactical” commands allow real-time update of a window’s source, that source’s area-of-interest, window size, location, rotation, and color adjustments. These commands are particularly useful for tactical displays requiring dynamic windowing. Tactical commands are defined in the VP20 Command Line Description. Please contact the factory for more information.

### Special features

- One EDID prom per port (for either DVI or VGA type input), programmable via VP20 Configuration Utility,
- Backlight Power/Enable/PWM/Sync features,
- Video Contrast and Backlight PWM controllable via discrete input (pushbutton), rotary encoder, analog input, or command.
- Discrete I/O interfaces. A discrete input can trigger a VP20 action, such as a mode switch. Discrete outputs are typically used for parameter selection on a display, such as scan direction.

### Ports 1-3 Video Input Selections

Ports 1-3 accept both TMDS (SL-DVI) and analog video.

Possible analog video configurations include:

- 1x RGBHV input and 4x NTSC/PAL composite (CVBS) inputs
- 5x NTSC/PAL CVBS inputs
- 1x RGBHV input and 1xRGBsog input

Figure 3 below shows possible Port 1-3 configurations. The number after the designation defines the sub-channel. For example, R1 is the Red component of RGB sub-channel #1. Automatic mode detection is possible among the Orange sub-channels, and the TMDS input.

VP20 pin	VGA (RGB)	Composite (CVBS)
J17/J78/J82 pin 1	R1	
J17/J78/J82 pin 3	G1	CVBS5
J17/J78/J82 pin 5	B1	
J17/J78/J82 pin 7	VS1	
J17/J78/J82 pin 9	HS1	
J24/J79/J83 pin 3	R2	CVBS4
J24/J79/J83 pin 1	G2	CVBS3
J24/J79/J83 pin 7	B2	CVBS2
J24/J79/J83 pin 5		CVBS1

Figure 3 Port 1-3 Analog Video Input Possibilities

### Video Combining (Standard)

- PIP is performed by assigning windows in a layer.
- Programmable alphas in a layer support z-order priority and alpha blending per window overlap area.

### Keying (Standard)

- Alpha blending between foreground and background is standard on the VP20. This is also known as “area keying”.
- Keying requires both the foreground and background layer of equal resolution (typically 1080P), to form a display plane.
- A rectangular key area is defined in the active area.
- With standard “area keying”, programmable foreground and background alpha values are defined for outside the key area and inside the key area.
- An output pixel in the display plane is computed as:

$$\text{Output pixel} = (\text{Foreground alpha} * \text{foreground pixel}) + (\text{Background alpha} * \text{background pixel})$$

### Keying (Optional)

- Optional keying (:Key) supports calculations on foreground pixels that are “inside” the key area. These calculations may be based on RGB, Luma, or HSV values. Foreground and background alpha values are applied based on the key calculation result (Key = True or Key = False)

### Gamma Adjustments

The VP20 supports overall panel gamma correction to account for the characteristics of a particular panel. The VP20 supports mode dependent reverse gamma correction to reverse prior gamma correction on a particular input video source.

The VP20 gamma LUTs are 1024 element tables (curves) used to re-shape 10bit video luminance profile. Individual R, G and B LUT's are supported. The panel gamma LUT is typically profiled to the inverse characteristic of the panel. The reverse gamma LUT is typically used to reverse a prior gamma profile adjustment on a particular input video source.

The LUT's default to “bypassed” mode. For applications that require gamma adjustments the tables can be incorporated into the downloadable configuration file using the VP20 Configuration application. A spreadsheet is available from Westar that supports creation of the .csv files that are compatible with the VP20 Configuration application.

LUT table entries are constructed as follows:

- Panel Gamma (10.2) correction values are 12bit with 10bits integer and two bits fractional (0000-0fff).
- Reverse Gamma (10.5) correction values are 15bit with 10bits integer and 5bits fractional (range 0000-7fff).

### Dithering

The VP20 supports dithering 8 bits into 6 bits (for 6 bit panels) and 10 bits into 8 bits (for 8 bit panels).

### Test Pattern / Messaging

- Test Patterns include: flood fields, color wedges, checkerboards, and color wedges; each highly programmable
- Test pattern overlay capabilities include: outline, lines, and pixel.
- Up to 8 on-screen messages using built-in 8x10 pixel character generator based on ASCII character set. Each message has:
  - up to 64 characters
  - 1x, 2x, 4x, 8x character size multiplier
  - programmable location in x and y

Figure 4 below shows the high level specifications for VP20. Figure 5 lists the VP20 connectors.

Physical Dimensions	5.75" x 4.5" x 0.8"
Temperature Range	Operating: 0°C to +70°C (additional data available) Storage: -40°C to +100°C
Video Inputs	Ports 1-3 RGB (up to WUXGA resolutions @ 60Hz), DVI (up to 165 MHz) NTSC/PAL (composite), RS170/RS343 sync-on-green (RGBsog), STANAG 3350 Optional Port 4: Supports multiple mezzanine boards for various video types
Video Outputs	Single, Dual LVDS up to WUXGA DVI (TMDS) up to WUXGA Expansion port for other outputs
Input Power	+12 VDC, tbd Watts
Control Interface	(2) RS-232, USB, Ethernet (via optional Ethernet interface assembly) Maintenance RS-232 interface fixed at 115kbps for Configuration Application User RS-232 interface has programmable baud rate
Support Documentation, Applications	VP20 Configuration Utility and Manual, VP20 Command Line Description, VP20 Installation Manual

Figure 4 VP20 Specifications

VP20 CONNECTOR SUMMARY			
Connector	Description	Connector	Description
J1	USB Interface	J28	Factory Use Only
J2	Backlight Pull-up Enable	J29	Factory Use Only
J3	Ethernet Module Interface	J32	LVDS Out Dual Pixel
J4	Factory Use Only	J33	LVDS Out Single Pixel
J5	Factory Use Only	J34	Port 1 TMDS EDID
J6	RS-232 Interface	J36	Analog to Digital Converter Input
J7	LED Output	J37	TMDS Video Output
J8	Inverter Power Select	J76	Output Mezzanine Control
J9	Panel Power Select	J77	Output Mezzanine Data
J10	Inverter Interface	J78	Port 2 VGA Video Input
J13	Power Input	J79	Port 2 Composite Video Input
J17	Port 1 VGA Video Input	J80	Port 2 TMDS EDID
J18	Discrete I/O Interface	J81	Port 2 TMDS Video Input
J24	Port 1 Composite Video Input	J82	Port 3 VGA Video Input
J25	Port 1 TMDS #1 Video Input	J83	Port 3 Composite Video Input
J26	Port 4 Input Mezzanine Control	J84	Port 3 TMDS EDID
J27	Port 4 Input Mezzanine Data	J85	Port 3 TMDS Video Input

Figure 5 VP20 Connector Definitions

### VP20 Operation

Typically, the VP20 operates as follows:

1. Upon power up, the VP20 configures itself based on its internal BIOS. The BIOS includes various input mode definitions per input port, windowing definitions, and an output mode (timing, electrical format, video combining definition, etc.)

For each input port, if a valid video mode is detected on an input port, the VP20 drives windows associated with that input port per the mode definition.

### Ordering Configuration

VP20                      standard VP20  
 VP20 /Key                VP20 with optional foreground keying

Optional Ethernet is available via a cable assembly with built-in Ethernet port.

### Contact Us

Call us for additional product info and pricing.

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