- *Port 1 is configured as DisplayPort or HDMI, supporting resolutions up to 4K.*
- *2 additional ports provide a myriad of inputs based on various mezzanine types (sold separately)*
- *All 3 ports can be viewed simultaneously within an output resolution of 4K or less*
- *Up to 4 windows supported. Each window can be mapped to any input port.*
- *Each port has a mode handler that detects input mode and sets window size, location, input area-of-interest, and rotation.*
- *VP18E can display Foreground, Background, or an alpha blend of the 2 planes defined in 4 different rectangular key areas.*
- *With optional keying (VP18E :Key), RGB, Luma, and HSV keying techniques are supported.*
- *Outputs up to 4K. VP18E standard output is DP or HDMI. Quad LVDS or V-by-One HS is supported via available output mezzanine.*

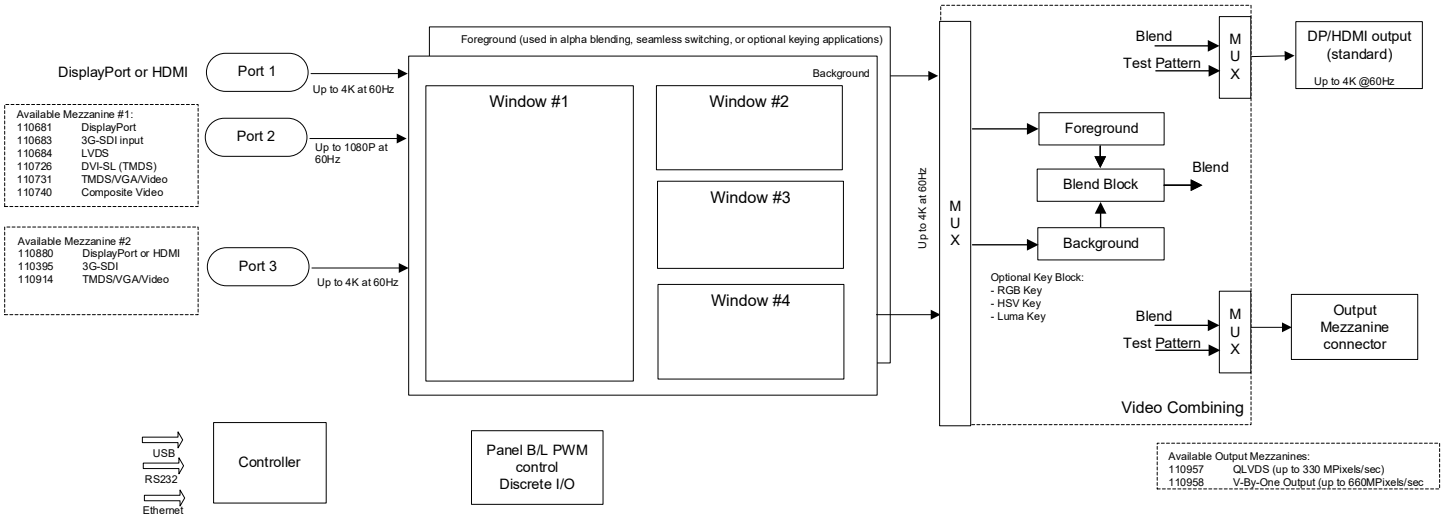

Figure 1 VP18E Block Diagram

VP18E LCD Controller

The VP18E LCD Controller (see Figure 1 above) is ideal for applications requiring simultaneous viewing of up to (3) inputs in up to 4 windows. The windows may be placed in the foreground or background. The foreground layer is used for alpha blending, fast seamless switching, or optionally for keying (/Key option). The standard output is DP or HDMI. Quad LVDS or V-by-One output mezzanines are available.

VP18E Highlights

The VP18E includes many advanced features, including:

- Port 1 supports an HDMI or DisplayPort input at up to 4K.
- Up to (2) input mezzanines (sold separately) support additional inputs per Tables 1 and 2.
- Each of 4 programmable windows may be assigned to any input and placed in the foreground or background plane.
- Window size, location, input area-of-interest, flip, and rotation (90/180/270) may all be defined the per detected input mode,
- Output pixel rates up to 600 MPixel/sec
- Dynamic commands for real-time window adjustments
- RS-232, USB or Ethernet programming interface.

Port 2 input mezzanines (up to 1080P) are shown in Table 1 below.

P/N	Description
110681	DisplayPort
110683	3G-SDI
110684	LVDS
110726	DVI-SL (HDMI-compatible)
110731	TMDS/VGA/Video
110740	Composite Video

Table 1: Port 2 input mezzanines

Port 3 input mezzanines are shown in Table 2 below.

P/N	Description
110895	3G-SDI Input Board (up to 1080P)
110880	DP or HDMI (up to 4K)
110914	TMDS/VGA/Video (up to 1080P)

Table 2: Port 3 input mezzanines

Available output mezzanines are shown in Table 3 below.

P/N	Description
110957	QLVDS (up to 330 MPixels/sec)
110958	V-By-One Output (up to 660MPixels/sec

Table 3: Output mezzanines

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User Programmable Video Input Modes

To support multiple input types and resolutions per input port and multiple windows in an embedded application, the VP18E 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 and video timing. Windows are linked to a specific input port. Each window can have either port-dependent or mode-dependent output size and location, rotate, flip, border color, and other parameters. Input area-of-interest is always mode dependent.

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 Port 1 can detect multiple DisplayPort (or HDMI depending on configuration) resolutions. Input Ports 2 and 3 can detect modes based on the mezzanine type.

Port 2 1080P Mezzanine

Per Figure 1, Port 2 accepts one of many available mezzanine types. These mezzanines are compatible with other Westar LCD controllers, including VP14, VP17, and VP20. The maximum pixel rate into this port is 165 MPixels/sec (up to 1080P or WUXGA).

Port 3 4K Mezzanine

Per Figure 1, Port 3 accepts one of several available mezzanine types. The maximum pixel rate into this port is 600 MPixels/sec (up to 4K/60Hz).

VP18E Configuration Application

The VP18E is configured via the VP18E Configure Application. It 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 port dependent or mode dependent 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 VP18E Configure application output is a text file with a .cfg extension. The file consists of VP18E commands. This file can be downloaded to the VP18E or saved on a PC. Commands are defined in the VP18E Command Line Description document. The application runs on Windows.

Video Conversion and Synchronization

- Decoding of DisplayPort and HDMI digital inputs, with other interfaces supported via available input mezzanine cards.
- Free-running output or genlocked to input port 1 or 2. If video is lost from the associated genlocked 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 can be placed in the scaler plane,
- 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 4K

The VP18E offers robust windowing for display resolutions with pixel clock frequencies <= 600 MPixels/sec (4K @ 60Hz). Up to 4 windows may be sized and placed in the output active area, per Figure 1. 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 VP18E.
- (2) RS-232 interfaces, (1) USB interface and (1) Ethernet interface are available.

Video Output Interfaces

- Supports DP and HDMI displays.
- QLVDS and V-by-One HS panels are supported by available output mezzanines.

Dynamic Commands

"Dynamic" commands allow real-time update of a window's source, input area-of-interest, window size, location, rotation, and color adjustments. These commands are particularly useful for specialty displays requiring dynamic windowing. Dynamic commands are defined in the VP18E Command Line Description. Please contact the factory for more information.

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Special features

- EDID proms on Port 1 are programmable via VP18E Configuration Utility,
- Backlight Enable/PWM 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 VP18E action, such as a change in Window layout or an on-screen message. Discrete outputs are typically used for parameter selection on a display, such as scan direction.

Video Combining (Standard)

- PIP is performed by assigning windows in the background or foreground plane.
- Programmable alphas in a plane support z-order priority or alpha blending per window overlap area.

Alpha Blend between Planes (Standard)

- Alpha blends can be performed between the foreground and background plane within 1 of 4 rectangular key areas. Each key area is defined in the active area.
- Programmable foreground and background alpha values are defined inside each key area and outside the key area.
- An output pixel in the display plane is computed as:

*Output pixel = (Foreground alpha * foreground pixel) + (Background alpha * background pixel)*

Keying (Optional)

Optional keying (:Key) supports calculations on foreground plane pixels that are “inside” a 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).

Test Pattern / Messaging

- Test Patterns include: color flat fields, color wedges, and checkerboards; 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

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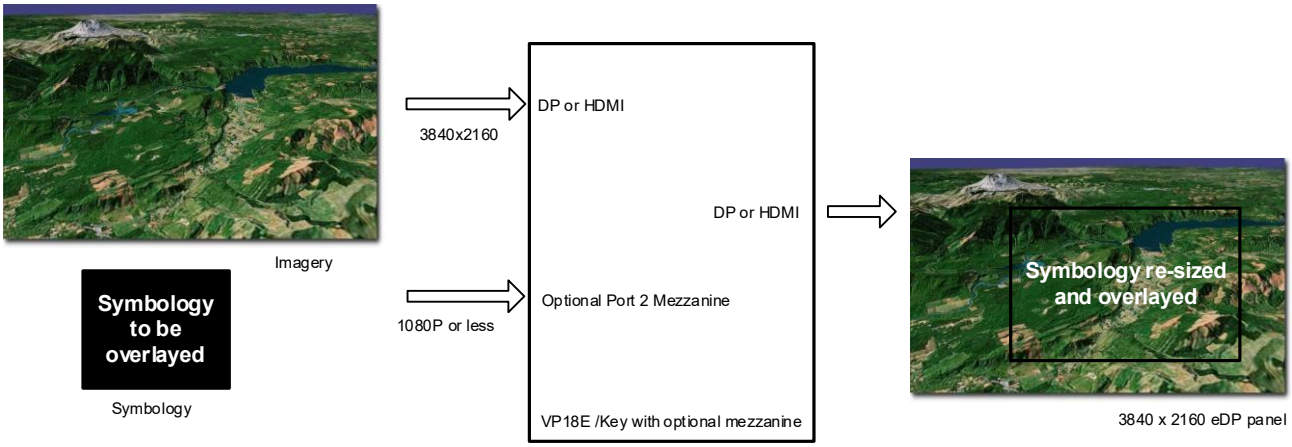
VP18E Applications

Application #1

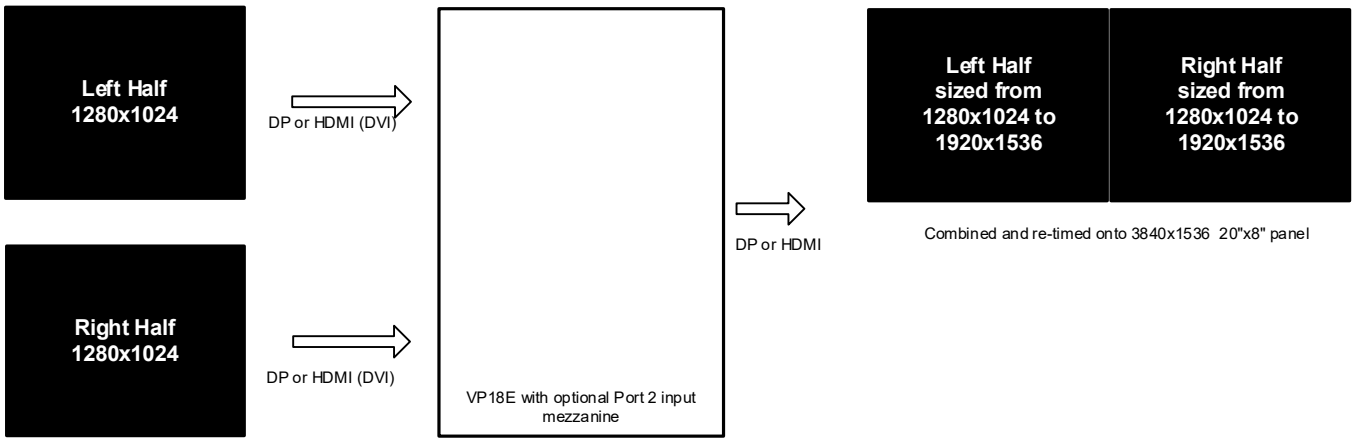


In Application #1, a VP18E /Key with a 1080P type input mezzanine card on Port 2 is used to combine symbology with underlying imagery. An RGB (or HSV or Luma) key has 3 sets of programmable foreground and background alpha values as follows:

- outside the key area,
- inside the key area, when Key= TRUE, and
- inside the key area, when Key = FALSE

The keying results in the symbology placed atop the imagery, with programmable transparency.

Application #2



In Application #2, a VP18E with a 1080P type input mezzanine card on Port 2 is used to combine (2) separate feeds (left half, right half) into one image for a 3840x1536 cut panel. The panel is driven with standard 3840x2160 timing.

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Table 4 below shows the high-level specifications for VP18. Figure 2 is a picture of the VP18E LCD Controller without mezzanine cards. Figure 3 is a picture of the VP18E with 110880 and 110681 mezzanine cards installed. Table 5 lists the VP18E connectors. Figure 4 shows the connector locations.

Physical Dimensions	240mm x 148.5mm
Temperature Range	Operating: 0°C to +70°C (additional data available) Storage: -40°C to +100°C
Video Inputs	Port 1: DisplayPort or HDMI up to 4K/60Hz Other inputs via available mezzanines (see Tables 1 and 2)
Video Outputs	DP up to 4K (60Hz) Output Mezzanine supports an output mezzanine from the following available types: QLVDS up to 2560x1600 (60Hz) (via output adapter) V-by-One HS up to 4K (60Hz) (via output adapter)
Input Power	Scenario #1: Input Voltage +12 VDC, 2.17 Amps (26.0W) 4K DP output 4K DP input #1 on Port 1 >> kept 1:1 XGA SL-DVI input on Port 2 (110726 Mezzanine) >> kept 1:1 window 1080P DP input #2 on Port 3 (110880 Mezzanine) >> kept 1:1 window Scenario #2: Input Voltage +12 VDC, 2.42 Amps (29.0W) 4K DP output 4K DP input #1 on Port 1 >> kept 1:1 1080P SL-DVI input on Port 2 (110726 Mezzanine) >> kept 1:1 window and overlaid 4K DP input #2 on Port 3 (110880 Mezzanine) >> kept 1:1 and alpha combined with #1
Control	(2) RS-232, USB, Ethernet Maintenance RS-232 interface fixed at 115kbps for Configuration Application User RS-232 interface has programmable baud rate
Support Documentation, Applications	VP18E Configuration Utility and Manual, VP18E Command Line Description, VP18E Installation Manual

Table 4 VP18E Specifications

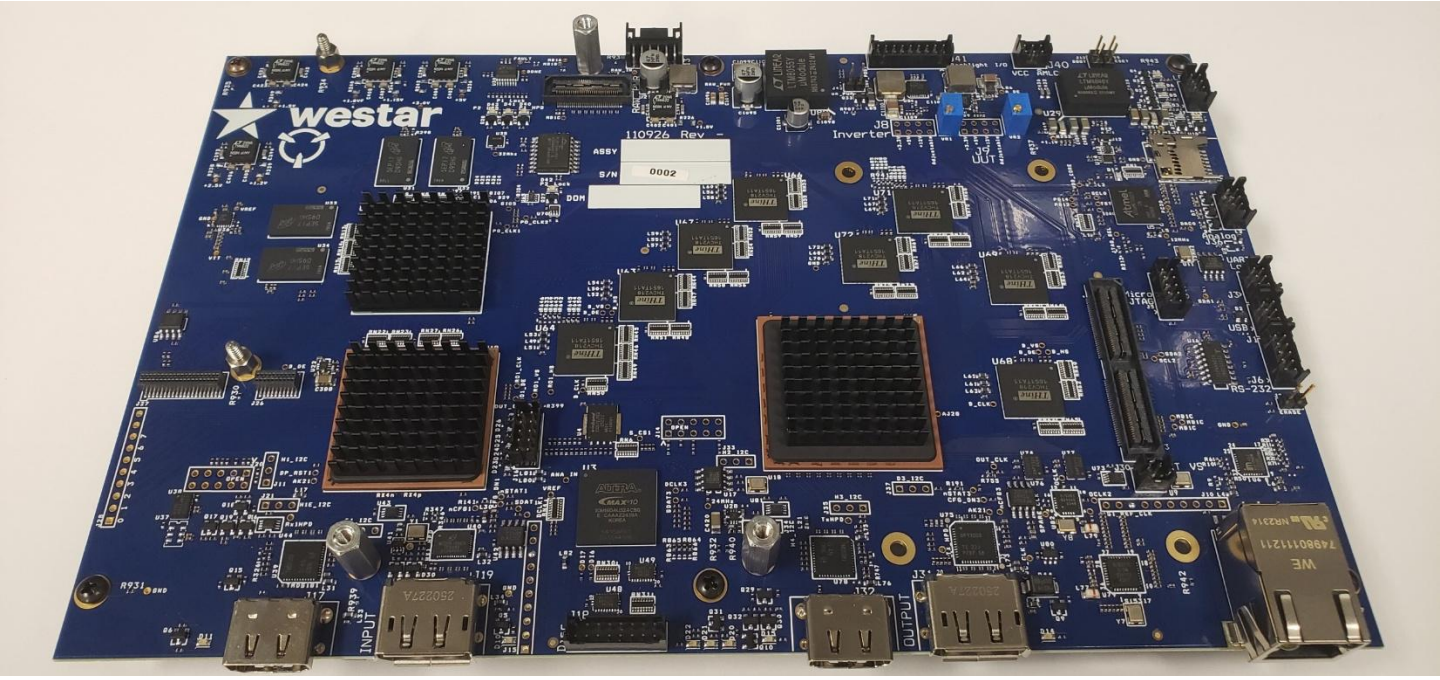

Figure 2: VP18E LCD Controller (without mezzanine cards)

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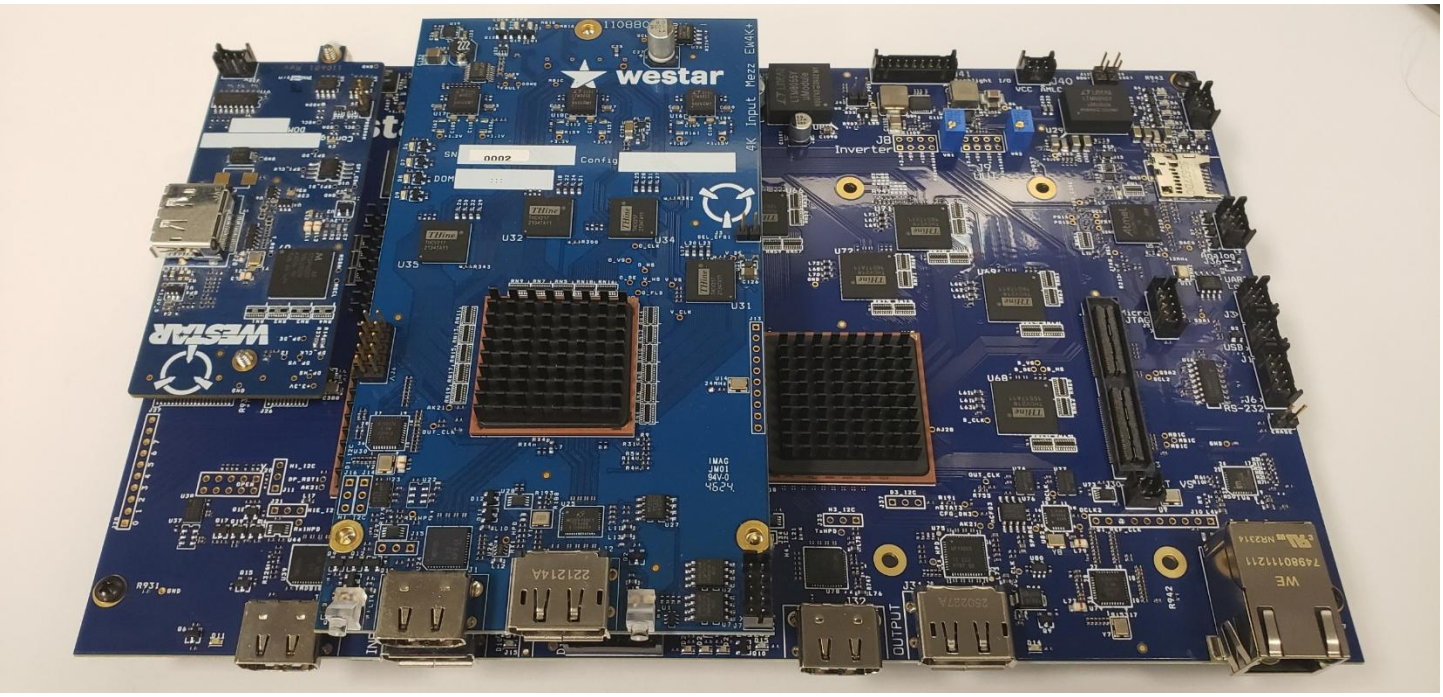

Figure 3: VP18E LCD Controller (with 110726 and 110681 mezzanine cards)

VP18E CONNECTOR SUMMARY				
Connector	Description		Connector	Description
J1	USB Interface		J21	Factory Use Only
J2	Factory Use Only		J22	Factory Use Only
J3	Spare UART Interface		J26	1080p Input Mezzanine Board
J4	Ethernet Interface		J27	1080p Input Mezzanine Board
J5	Factory Use Only		J28	Factory Use Only
J6	RS-232 Interface		J29	Factory Use Only
J7	LED Output		J30	Factory Use Only
J8	Backlight Power Select		J31	DisplayPort Output
J9	Panel Power Select		J32	HDMI Output
J10	Factory Use Only		J33	Factory Use Only
J11	Factory Use Only		J34	Factory Use Only
J12	Factory Use Only		J35	Factory Use Only
J13	Input Power		J36	Analog Signal Input
J14	Factory Use Only		J37	Factory Use Only
J15	Factory Use Only		J40	Panel Power Output
J16	Factory Use Only		J41	Backlight Interface
J17	HDMI Video Input		J42	Backlight On/Off Pull-Up Enable
J18	Discrete Input/Output		P1	4K Input Mezzanine Board Interface
J19	DisplayPort Video Input		P3	Output Mezzanine Board Interface
J20	Factory Use Only			

Table 5 VP18E Connector Definitions

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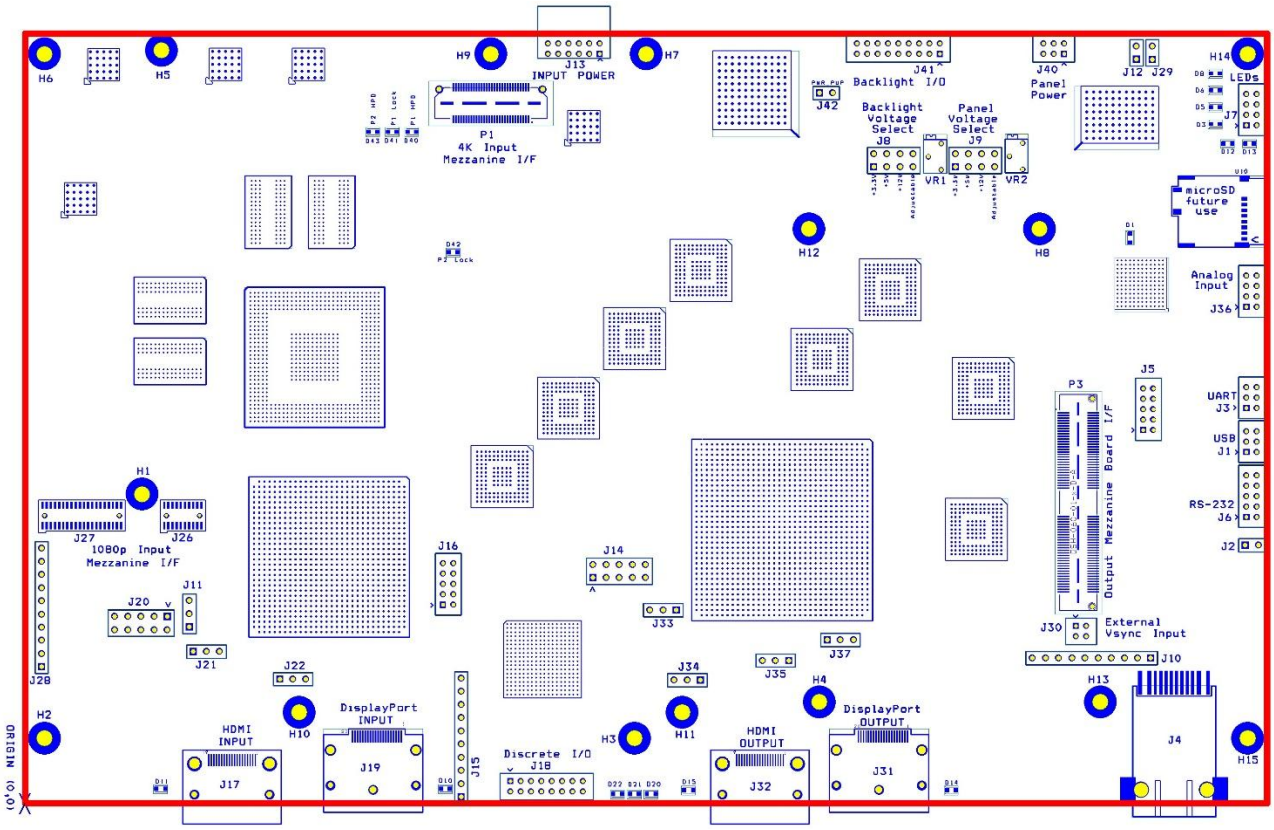

Figure 4 VP18E connector locations

VP18E Operation

Typically, the VP18E operates as follows:

1. Upon power up, the VP18E 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 VP18E drives windows associated with that input port per the mode definition.

Ordering Configuration

VP18E	VP18E with DisplayPort/HDMI I/O
VP18E /Key	VP18E with optional keying

Available input and output mezzanines are purchased separately.

Contact Us

Call us for additional product info and pricing.

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