

XT245, XT1145, XT2145

The BrightSign XT245, XT1145, and XT2145 media players can be used to decode images, audio, and video for digital-signage and kiosk applications. These players dramatically increase HTML performance, with full support for OpenGL. They also support multi-headed output and other applications. In addition to driving audio/video devices, these players can be controlled with various networked and built-in interfaces. These models include a Real Time Clock (RTC) with a supercapacitor that backs up the clock settings when it is power cycled.

Interfaces

XT245



Front	Back
WiFi antenna connector (1 of 2)	MicroSD card slot
Audio out (combo, 3.5mm)	HDMI® out
IR in/out (3.5 mm)	Service button (SVC)
GPIO	Reset button (Reset)
4 Status LEDs, also visible on the top case	PoE+Gigabit Ethernet
12V@3A locking power connector	
WiFi antenna connector (2 of 2)	

XT1145



Front

WiFi antenna connector (1 of 2)

Audio out (combo, 3.5mm)

IR in/out (3.5 mm)

Serial (3.5 mm)

GPIO

4 Status LEDs, also visible on the top case

12V@3A locking power connector

WiFi antenna connector (2 of 2)

Back

MicroSD card slot

HDMI in

HDMI out

USB-A 2.0 port

USB-C port

Service button (SVC)

Reset button (Reset)

PoE+Gigabit Ethernet

XT2145



Front	Back
WiFi antenna connector (1 of 2)	MicroSD card slot
Audio out (combo, 3.5 mm)	HDMI in
IR in/out (3.5 mm)	HDMI out (2 outputs)
Serial (3.5 mm)	USB-A 2.0 port
GPIO	USB-C port
4 Status LEDs, also visible on the top case	Service button (SVC)
12V@3A locking power connector	Reset button (Reset)
WiFi antenna connector (2 of 2)	PoE+Gigbit Ethernet

XT5 Hardware Interfaces

This section describes the characteristics and operation of all connectors on the XT245, XT1145, and XT2145.

Ethernet / PoE

This connection is used to connect an ethernet cable for internet access and can be used for PoE. The XT245, XT1145, and XT2145 wired ethernet connection is capable of 10/100/1000 Mbps.

Power Connector

The power connector for the XT245, XT1145, and XT2145, which connects the power cord to the device, is rated for 12V 3A. It uses a locking connector to prevent inadvertent disconnections.

HDMI Input

The HDMI®-in connector is used to receive digital video and audio from HDMI-enabled source devices. This connector on all XT5 devices is capable of accepting a maximum video resolution of 4096×2160×60p. HDMI input is not available on the XT245.

The HDMI signaling has CEC functionality. The CEC channel is electrically coupled to the corresponding signal on the HDMI output, and the CEC commands will pass through the player even when it does not have power.

HDMI Output

The HDMI-out connector is used to send digital video and audio to HDMI-enabled sink devices. The XT245 and XT1145 have an HDMI output and the XT2145 has two HDMI outputs. The HDMI output is capable of HDMI 2.1, and one of the HDMI outputs on the XT2145 is HDMI 2.1.

CEC control and AVI are supported over each HDMI interface independently, and it can maintain the configured multiscreen layout if one of the HDMI outputs loses sync.

GPIO

The XT245, XT1145, and XT2145 have a 12-pin GPIO switch and an LED connector, which allows the player to control external LEDs or other devices requiring 24mA of current or less. The port can supply 3.3V@500mA to PWR pins and sink or source 24mA on each button pin. Auxiliary power is 1A.

The GPIO port is a standard design manufactured by Phoenix Contact, Wurth Electronics, and others. Pluggable GPIO terminal blocks can be inserted into the GPIO connector to make bare-wire contacts (see [here](#) for an example part). These terminal blocks can be purchased from the [BrightSign Store](#). If you wish to source your own terminal blocks, make sure to use 4-pin or 6-pin blocks (12-pin blocks are extremely difficult to remove from the GPIO port).

Connect the LED outputs to the LED ANODE and connect the LED CATHODE to the ground. If you want to connect another device, then the output is capable of sourcing or sinking up to 3.3V at 24mA, but there is a series resistor of 100Ω in each line.

The GPIO also allows for connecting of external contact closures to the ground. In order to connect a switch, connect one side of the switch to the switch input, and connect the other side to one of the ground pins on the GPIO connector.

If one BrightSign player is driving the inputs on another BrightSign player, then you can drive at most three inputs from one output. The following calculations explain this limitation:

The GPIO outputs have 100Ω series resistors; the GPIO inputs have 1K pullup resistors to 3.3V; and the input threshold is 2V high and .8V low. The high voltage is not problematic, but the low voltage can be if there are too many inputs connected to one output.

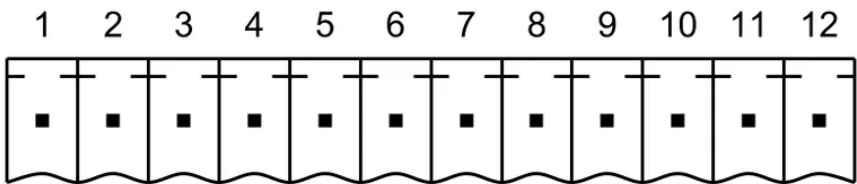
1 out driving 1 in	$V=3.3*100/(100+1,000)=0.3$
1 out driving 2 in	$V=3.3*100/(100+500)=0.55$
1 out driving 3 in	$V=3.3*100/(100+333.3)=0.76$
1 out driving 4 in	$V=3.3*100/(100+250)=.94$ (This is too high, so 1 output driving 3 inputs is the maximum)

GPIO Pinout

The following table illustrates the pinout of the GPIO on XT5 players:

Pin	Function	Pin	Function
1	GND	7	GND
2	3.3V	8	3.3V
3	BUTTON 0	9	BUTTON 4
4	BUTTON 1	10	BUTTON 5
5	BUTTON 2	11	BUTTON 6
6	BUTTON 3	12	BUTTON 7

The following schematic illustrates the pinout of the GPIO connector:



IR Input / Output

The IR blaster generates or receives a space-encoded NEC or Pronto Hex signal. The two transported bit values of the signal (0 and 1) are encoded using differing lengths of low-time IR pulses.

This 3.5mm IR in/out port has the following pinout:

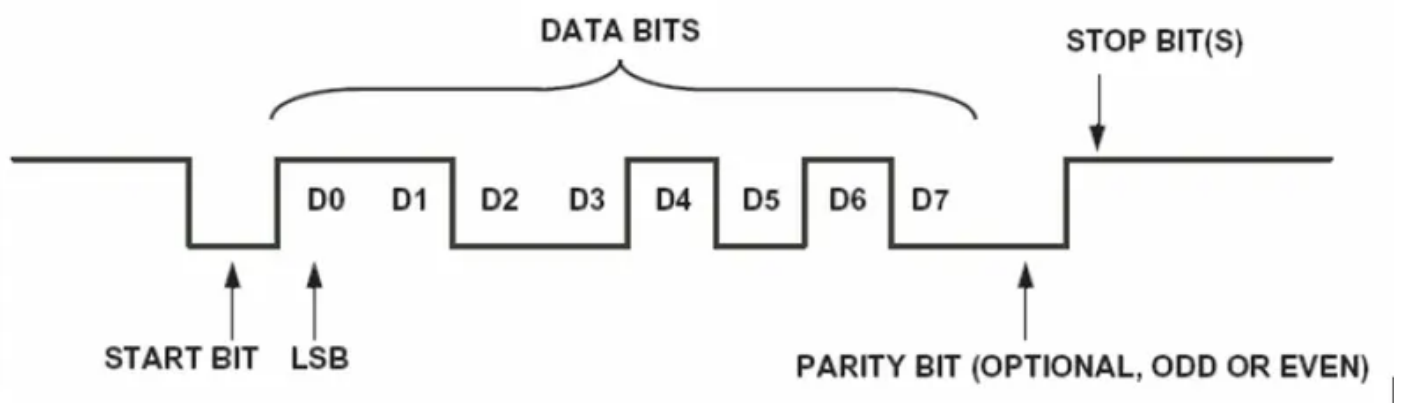
- **Tip:** 3.3V@50mA
- **Ring:** IR Input
- **Sleeve:** IR Output

The sleeve is used as a ground during input operations.

Serial

The XT5 contains an UART (asynchronous serial) interface. It is a 3.5mm (1/8") jack that connects a serial modem or other devices that use a serial connector, and it uses TTL for communication. The receiver will tolerate input voltages between -30V and +30V, with anything below 3V interpreted as a logical 1. The output signaling voltage output is +15V or -15V.

The default baud rate of the interface is 115200, with no parity, 8 data bits, and 1 stop bit. These settings can be configured in the software. The serial interface supports TX, RX, and ground only—RTS/CTS hardware flow control is not supported. The following diagram illustrates the behavior of the TX and RX signal:



This 3.5mm serial port has the following configuration (from the perspective of the player):

- **Tip:** Receive
- **Ring:** Transmit
- **Sleeve:** Ground

BrightSign players are DTE devices, so communication with another DTE device that uses a 3.5mm port would require a null-modem cable or converter that transposes the TX/RX signals. If the device communicating with the player is a DTE device with a DE9 serial port (performing asynchronous transmission), the serial cable should be wired as shown in the following diagram:



Audio Connector

The XT245, XT1145, and XT2145 have a combination analog/optical audio jack. To transmit a digital audio signal, use a TOSLINK optical audio cable with a 3.5mm connector. Analog and digital audio cannot be transmitted simultaneously. EAC3 and AC3 are also supported.

The full-scale voltage output of the analog audio is 2V RMS. The minimum load impedance is 32Ω.

The analog audio connector has the following pinout:

- **Tip:** Left audio
- **Ring:** Right audio
- **Sleeve:** Ground for audio signal

USB

The XT245 does not have a USB port.

The XT1145 and XT2145 have one USB-A 2.0 and one USB-C port to connect USB-compatible devices. The USB-C port supports both device and host mode, and BrightSign USB accessories (for example, the USB-C to GPIO Panda device).

WiFi & Antennas

The XT245, XT1145, and XT2145 models come equipped with an M.2 connector slot and two SMT-mounted SMA connectors. The M.2 slot supports M.2 PCIe cards for WiFi and Bluetooth connectivity (sold separately), while the SMA connectors facilitate the connection of external antennas.

SSD Interface

XT5 players will accept NVMe SSDs in M.2 2242 or 2280 (but not 2260) form factors of SX id type (single-sided form factor). Double-sided drives (DX id type)* will not fit because the back side of the SSD is essentially flush against the motherboard. For example, a 2280-S1 module will fit a BrightSign player but a 2280-D2 module would not.

NVMe drives with heat sinks are not compatible with our players.

*D4 drives may fit but have not been tested

XT5 Environmental & Power

Environmental

The XT245, XT1145, and XT2145 are designed for sustained ambient temperatures between -10°C and 50°C, with transients up to 70°C (at 90% maximum relative humidity, non-condensing). Operating the players above 50°C ambient for prolonged periods may reduce the operational life of the product and result in intermittent resetting of the device.

Exposing a cold player to warm air at high relative humidity may cause water to condense inside the player, leading to component failure. Damage due to such internal condensation is not covered by warranty. If a player is cold, allow several hours for it to acclimatize to ambient conditions before applying power.

Power

Power Adapter

The XT245, XT1145, and XT2145 are supplied with a 36W (12V3A) power adapter. The device will use approximately 12W (1A) of power when playing a 4096×2160×60p H.265 (HEVC) source file.

A power budget of 24W is available to be shared between peripherals connected to the player. The user should not connect any combination of peripherals that will exceed 24W draw. If more than 24W is drawn, the external power supply may shut down due to over-current conditions. The unit will not be damaged, but it may reboot or not operate properly until the overload is removed.

PoE Type 1

When the player is powered via Type 1 PoE, the total available power is reduced to 12W. This means that each USB port supplies 100mA of power (one unit load for USB 2.0). This is sufficient for low-power devices such as memory sticks and mice. High-power devices such as hard disks will not operate.

XT5 Theory of Operation

This section describes how specific components operate on the XT245, XT1145, and XT2145.

On-Board LEDs

The four on-board LEDs have the following indicators:

LED	Indication
Green power (Pwr)	Displays when the board is powered up and not in reset mode. Flashes during the firmware update process.
Green file-system activity (Bsy)	Flashes any time there is file-system activity (on any storage device)
Blue WiFi (WiFi icon)	Flashes when the board is being updated
Red status (Err)	Flashes a certain number of times to indicate which error is occurring. The flash codes are described below.
	2: Unspecified error
	3: Network recovery script is preparing to run on a device configured for network recovery.
	4: No upgrade file found
	5: Failed to load kernel module
	6: Board is not capable of running the current firmware version
	7: A piece of on-board hardware is not working correctly.
	8: Problem related to the storage device (either the USB drive or microSD card)
	9: Problem related to the registry/NAND
	10: The autorun script encountered a load/run error.
	11: WiFi-related error
	12: Unable to find a bootable image

On-Board Switch / SVC Button

The on-board switch is connected to the GPIO02, which is pulled low when the service (SVC) button is pressed. Conversely, a pull-up on the button normally sets the GPIO02 to be pulled high.

Reset Switch / GPIO Button

The on-board switch is connected to the reset circuit. Pressing down the reset button will send an initial signal to the system software and holding the reset button low for approximately four seconds will cause a hard reset.

microSD Slot

The XT245, XT1145, and XT2145 have one MicroSD slot, which supports transfer modes up to UHS-1 DDR50 (50Mbit/s). There is a 2TB limit on the storage capacity of microSD cards used with the player.

Wireless Module

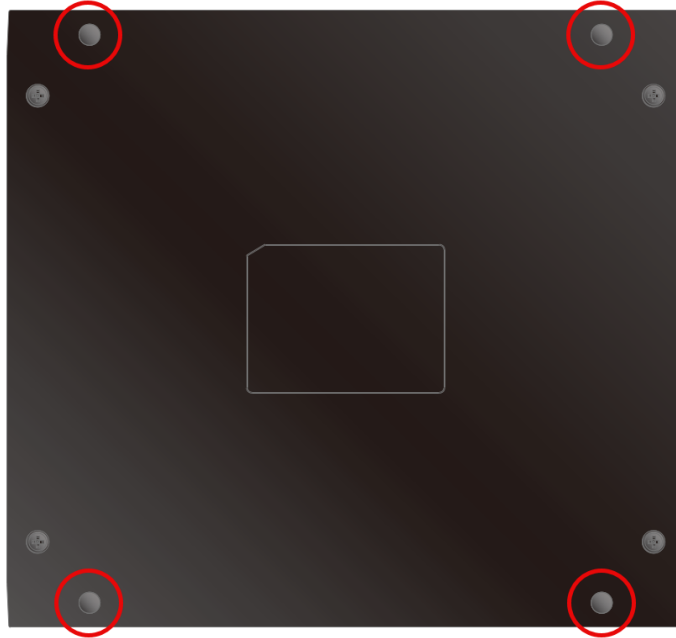
The XT245, XT1145, and XT2145 have a dual antenna connection. This allows users to install a compatible wireless module without disassembling the unit. This connection has a Bluetooth option.

XT5 Dimensions



XT5 Mounting

Players can be mounted using the player's four mounting holes. Note that the player may have rubber plugs inserted in the mounting holes which must be removed before mounting.



Remove the rubber plugs to access the mounting holes.

The mounting holes are compatible with the following screw sizes:

- Metric / ISO: M3.5 or M4
- US / Imperial: #6 or #8

Nails should not be used to mount the player.