BRAINLAB

BUZZ - DIGITAL OR WHITEPAPER

Modern operating rooms (ORs) are equipped with a variety of technical systems. Ever-increasing pre-operative diagnostic data, and safety and documentation requirements of OR procedures, have significantly raised the amount and complexity of information and devices used in the OR. Furthermore, the implementation of device integration in the OR is undergoing a radical change towards a modern and future-proof IP-networked infrastructure. The new Buzz system by Brainlab is based on a computer- and IP-based architecture, which meets also complex customer requirements and combines a workflow-oriented user concept with a state-of-the-art user interface.

What is important for the user in the OR?

Users need to both access medically relevant data (e.g. pre-operative computer-aided tomography image data) and control the OR infrastructure. In order to increase their efficiency, and because they will be used by a variety of users, the complexity of the underlying integration systems must be reduced to an intuitive, uniform interface using clear and intuitive operational controls to streamline the OR workflow.

Ideally everything in the OR will occur in the context of the patient being treated, with patient information automatically stored in a computer system so that multiple, recurring steps can be semi-automated throughout the OR process. Surgeons or care personnel must be able to access the following information and functions during a procedure:

- Data from the hospital information system (HIS): patient metadata, planned interventions etc.
- Access to and presentation of radiological image data from the radiological image archive system (PACS).
- Intelligent software algorithms providing support for information analysis and enriching raw data.
- Central control of signals and displays of live video data (endoscope, microscope, navigation etc) on all screens in the OR.
- Situation-dependent control of OR infrastructure (light, audio etc).
- Use of communication resources (streaming, video-conferencing, telephony).
- Tools for documenting procedures (video recordings, screenshots) and archiving records.

The challenge is to intelligently combine both the medical needs of the OR, which are sometimes subject to strict national regulation; and additional infrastructure functions, which are often adjusted to particular individual customer requirements, into an easy-to-use, uniform interface.

To address this challenge, Brainlab has developed the Buzz system, which has been fully optimised for user-centric integration in the clinical workflow. Independent of the individually connected systems and the functionality they provide, the user always interacts with the same user interface. Interaction occurs always in the context of the patient being treated using a large multi-touch screen with a home button, with e.g. DICOM image data and clinical applications readily accessible. Additionally, the number of multi-touch access points throughout the OR can be adjusted to meet individual customer requirements.

Table 1 gives a top-level overview about three typical Buzz configurations and their feature characteristics: Buzz on-wall, Buzz in-wall and Buzz with advanced Audio/Video-(A/V)-functionalities.

What exactly is Buzz?

Buzz is a medical product that has been specially designed and developed by Brainlab for information processing and control in the OR. The focus of the system is a 42-inch touch screen, which serves as a central control point in the OR

	Video Inputs for 2x SDI, 2x DVI, Svideo, Composite, VGA	Connection of additional 3 Full HD displays	full HD Streaming, Recording (2 channels)	OR Portal	DICOM Image Viewing	Video routing	Integration of OR PC	Integration of Navigation system	Universal device connection panel within OR	Standard quality IP-based Video Conferencing	high-quality A/V conferencing, telephony	InWall installation	integrated iPod dock, speaker	Installation in MR Environment	Several device connection panels distributed in the OR	Device Control (lights, table control etc.)
Buzz on-wall	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✗	✗	✗
Buzz in-wall	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✗
Buzz with advanced A/V-functionalities*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓

Table 1: Overview on three three Buzz configurations and their characteristics in terms of top-level features. Please note that also the overall budget needs increase significantly from Buzz on-wall to Buzz in-wall due to additional transfer line and infrastructure requirements, as well as again to Buzz with advanced A/V-functionalities due to extensive additional hardware needs.

** Note: Realization by Brainlab with local partner companies; availability and exact varies differs depending on sales region.*

featuring a state-of-the-art, intuitive graphical user interface.
The user interface supports both multi-touch gestures and "drag & drop" functionalities, allowing simple and rapid access to relevant information in the OR. All available information, e.g. image data, video images and patient files, are accessible using the standardised user interface.
An essential component of the system is its interactive DICOM image viewer (Illustration 1), which has been specially developed for the needs of surgeons in the OR.

Illustration 1: Brainlab Buzz with interactive DICOM image viewer. The illustration shows a display from a computerised tomography scanner: a series of single layers on the left, and on the right the 3D visualisation of the data calculated "in real time" on the Buzz system. Objects can be highlighted for further planning of the procedure. In this example an object (a tumour in red) has already been defined and displayed in a 3D view.

Intelligent software algorithms are used to generate additional information from the raw medical image data. For example, it is possible, to calculate "live" 3D renderings with highlighted objects (Illustration 1) or merge different image datasets such as CT & MRI (Illustration 2). Thus, static raw image data is enriched with details and dynamic views become available, which can provide important additional insight for treating the specific patient.

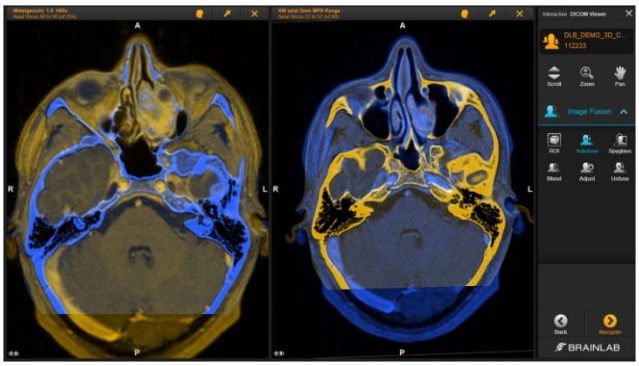

Illustration 2: Automatic Image Fusion: when different diagnostic image datasets are available, MRI and CT in this case, the images can be merged using an automated intelligent software algorithm. This allows the surgeon an enriched view of anatomical details.

Buzz also allows IP-based communication with additional devices in the OR. In the operating theatre, bi-directional communication with a hospital PC can be set up to allow control of the Buzz system not only from wall-mounted touch screens but from the hospital PC as well. In the same way, the screen content of the hospital PC can be made visible on the large Buzz touch screens so that information is available to the entire OR team. Furthermore, supporting OR infrastructure such as lights and cameras can be controlled using the standardised web interface.
Brainlab navigation systems occupy a special position in the integration solution, as they can be integrated seamlessly, creating an extremely comprehensive solution especially for neurosurgery and orthopaedics procedures: Constant data exchange between the Buzz and Brainlab navigation platforms makes all current patient data seamlessly available on both systems.
Another important requirement of today's ORs is the documentation of the surgical procedure. Buzz allows the capture and storage of digital screenshots and video recordings, which can then be easily accessed via a web browser from any PC outside the OR. Here, the security of vital patient data is guaranteed, as all data stored on Buzz systems is compliant with strict HIPAA requirements.
Buzz also offers the necessary flexibility when it comes to installation. While newly built ORs often prefer in-wall mounted components for hygiene considerations, Buzz is also available as an on-wall system allowing easy upgrades of existing ORs. The on-wall version contains an audio package featuring an iPod dock and loudspeakers – and offers a particularly attractive price/performance ratio since no expensive construction is required.

Illustration 3: Brainlab Buzz on-wall system: This Buzz version is designed for simple OR integration with low installation costs. In contrast to the in-wall version, it also includes an iPod dock and loudspeakers.

Exemplary configurations

The following pages describe three exemplary Buzz configurations: (i) Buzz on-wall, (ii) Buzz in-wall and (iii) Buzz with advanced A/V-functionalities*. It is important to note that these 3 options might not accommodate all customers, therefore the systems can be customized to meet exact customer requirements. While Buzz on-wall works well in retrofitting existing ORs and offers the best price/performance ratio, a Buzz in-wall solution provides hygiene advantages with its flush mounting finishes. Alternatively, Buzz with advanced A/V-functionalities* may be the solution of choice for teaching hospitals with high-end conferencing requirements between the OR and student auditoriums.
The following pages summarize top-level architecture and mandatory articles, as well as technical wiring diagrams and connectivity options for three exemplary configurations.

*Note: Realization by Brainlab with local A/V-partner companies (such as e.g. Crestron and their system builders in Europe); availability and exact offering varies depending on sales region.

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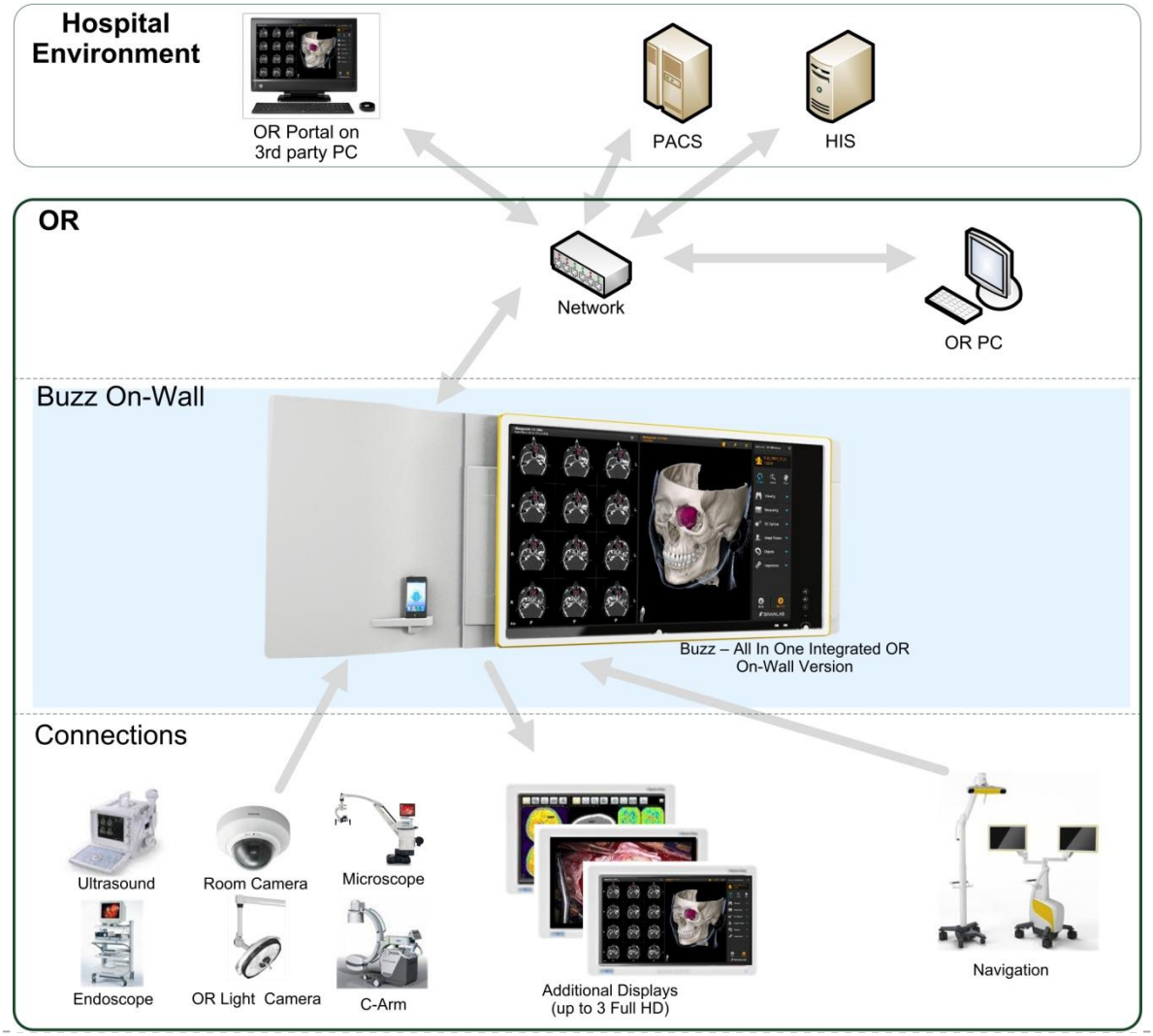
Buzz on-wall (1/3): Architecture and articles



	BUZZ ON WALL PACKAGE ✓	
HW OPTIONS	VIDEO INPUTS 2 CHANNELS UP TO FULL HD ✓	
		VIDEO EXTENSION UNIT INCL TRANSFER LINES
SW OPTIONS	STREAMING AND RECORDING: 1x HD	STREAMING AND RECORDING: 2x HD OR 1x FULL HD
	AUTOMATIC IMAGE FUSION	ADVANCED 3D VISUALIZATION
	TOUCH BASED SURGICAL PLANNING	TRAUMACAD TOUCH SOFTWARE
	INTEGRATION OF OR PC INTO BUZZ DIGITAL OR	REMOTE CONTROL OF BUZZ FROM TABLET INSIDE OR
	INTEGRATION OF OR COMPATIBLE 3rd PARTY SW	
3rd PARTY OPTIONS	DATA DISPLAY 26”	DATA SCREEN 42”
		DATA SCREEN 55”
iORS SERVICES	BUZZ STANDARD INSTALLATION	SERVICE PACKAGE
		SYSTEM INSPECTION

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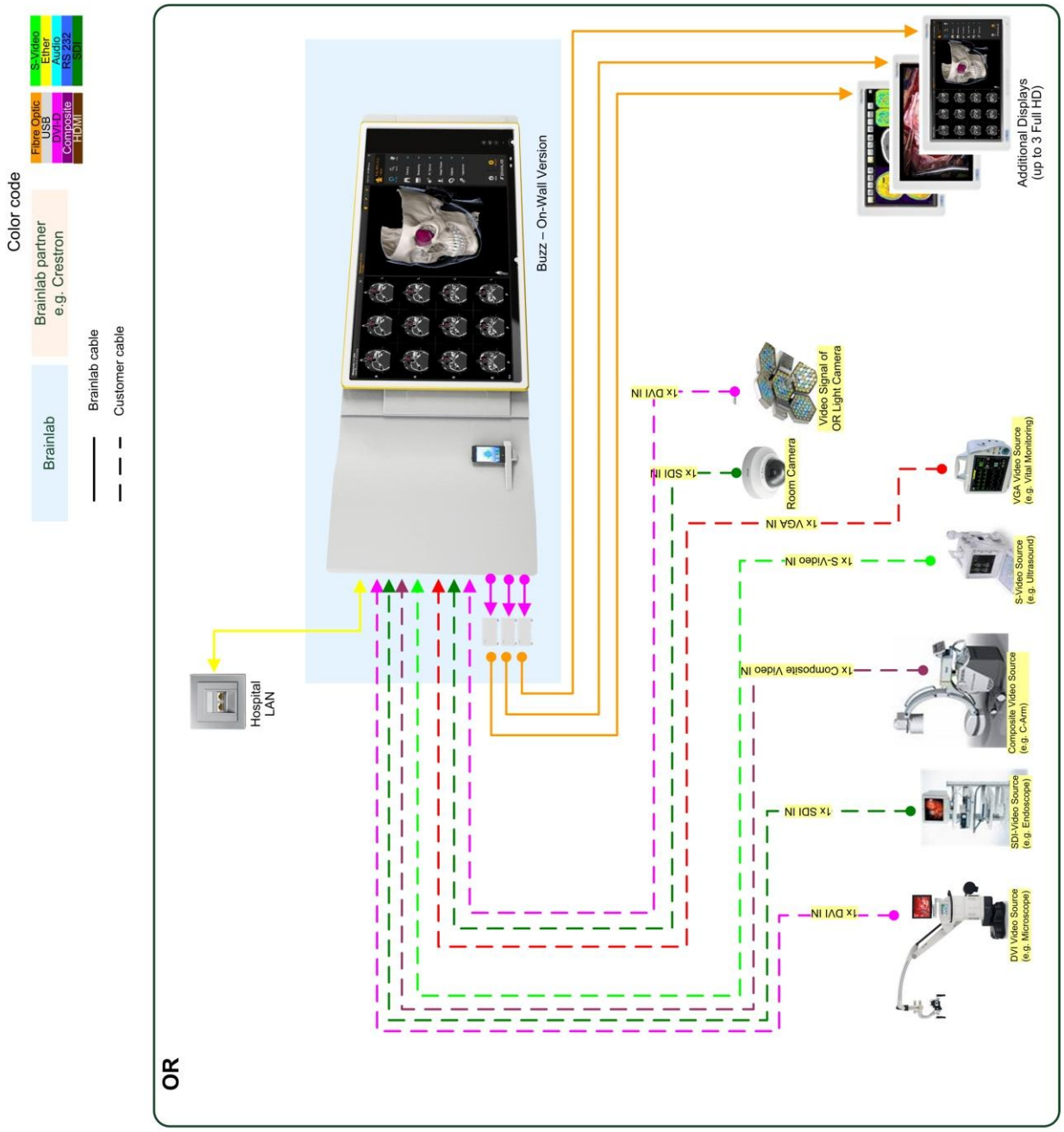
Buzz on-wall (2/3): Technical wiring diagram

Wiring diagram in one OR



Signal interfaces

Buzz Connection Panel

Front or Back Side	Group Assignment	Connector Name	Connected Device
Front	Audio	Aux In	x
Front	Audio	Aux Out	x
Front	Audio	Micro	x
Front	Network	Navigation	x
Front	Network	Hospital Network	Hospital Network
Front	Imaging Input 1	Composite In	C-Arm
Front	Imaging Input 1	S-Video In	Ultrasound
Front	Imaging Input 1	SDI In	Endoscope
Front	Imaging Input 1	DVI In	Microscope
Front	Imaging Input 2	RGB/VGA In	Vital Monitoring
Front	Imaging Input 2	SDI In	Room Camera
Front	Imaging Input 2	DVI In	OR Light Camera
Front	Displays	Display 2 Out	3rd party display
Front	Displays	Display 3 Out	3rd party display
Front	Displays	Display 4 Out	3rd party display
Front	Data	USB 3.0 (upper)	x
Front	Data	USB 3.0 (lower)	x
Front	Data	Sariel	x
Front	Power	DC Out 5V 2A (1)	x
Front	Power	DC Out 5V 2A (2)	x
Front	Power	DC Out 5V 2A (3)	x
Front	Power	DC Out 5V 2A (4)	x
Front	Power	DC Out 5V 2A (5)	x
Front	Mains Power	110-240V @ 50-60Hz	power
Front	Pot. Equi.	Pot. Equi.	Pot. Equi.

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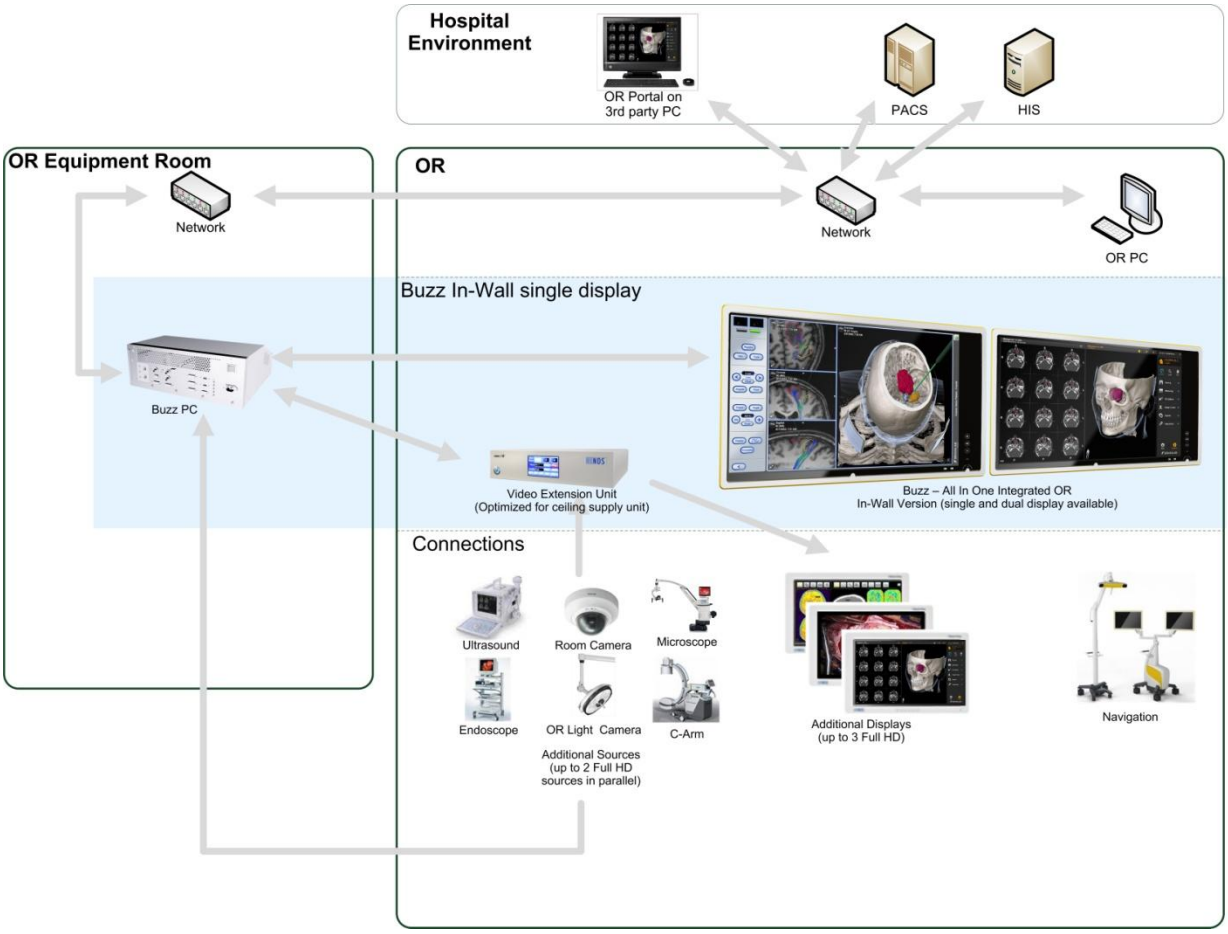
Buzz in-wall (1/3): Architecture and articles



Advantages:

- PC can be placed outside OR
- Clean installation within OR

Limitations:

- Video conferencing
- No room control or telephony integration

		BUZZ IN WALL PACKAGE ✓	
HW OPTIONS	VIDEO INPUTS 2 CHANNELS UP TO FULL HD ✓	SECONDARY IN-WALL TOUCH DISPLAY	
		VIDEO EXTENSION UNIT INCL TRANSFER LINES ✓	
SW OPTIONS	STREAMING AND RECORDING: 1x HD	STREAMING AND RECORDING: 2x HD OR 1x FULL HD	
	AUTOMATIC IMAGE FUSION	ADVANCED 3D VISUALIZATION	
	TOUCH BASED SURGICAL PLANNING	TRAUMACAD TOUCH SOFTWARE	
	INTEGRATION OF OR PC INTO BUZZ DIGITAL OR	REMOTE CONTROL OF BUZZ FROM TABLET INSIDE OR	
	INTEGRATION OF OR COMPATIBLE 3rd PARTY SW		
3rd PARTY OPTIONS	DATA DISPLAY 26”	DATA SCREEN 42”	DATA SCREEN 55”
iORS SERVICES	PLANNING & IMPLEMENTATION	SERVICE PACKAGE	SYSTEM INSPECTION

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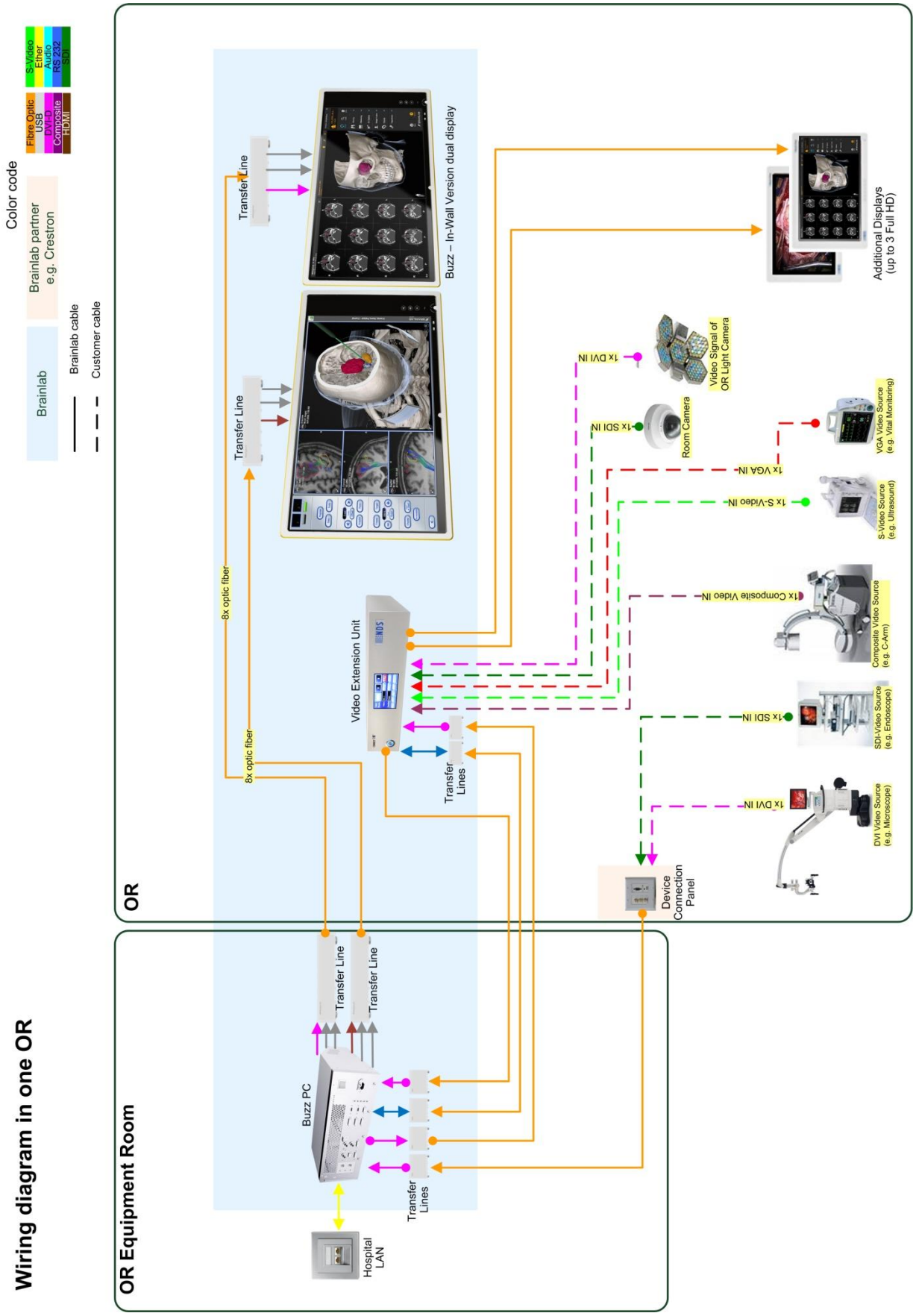
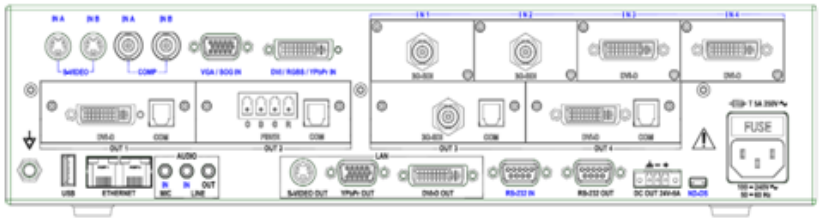
Buzz in-wall (2/3): Technical wiring diagram



Buzz Connection Panel

Front or Back Side	Group Assignment	Connector Name	Connected Device
Front	Audio	Aux In	x
Front	Audio	Aux Out	x
Front	Audio	Micro	x
Front	Network	Navigation	x
Front	Network	Hospital Network	Hospital Network
Front	Imaging Input 1	Composite In	x
Front	Imaging Input 1	S-Video In	x
Front	Imaging Input 1	SDI In	x
Front	Imaging Input 1	DVI In	Transfer line Video Extension Unit
Front	Imaging Input 2	RGB/VGA In	x
Front	Imaging Input 2	SDI In	x
Front	Imaging Input 2	DVI In	Transfer Line Device Connection Panel
Front	Displays	Display 2 Out	Transfer Line Buzz Touch Display 2
Front	Displays	Display 3 Out	Transfer Line Video Extension Unit
Front	Displays	Display 4 Out	x
Front	Data	USB 3.0 (upper)	x
Front	Data	USB 3.0 (lower)	x
Front	Data	Serial	Transfer Line Video Extension Unit
Front	Power	DC Out 5V 2A (1)	Transfer line Video Extension Unit
Front	Power	DC Out 5V 2A (2)	Transfer line Video Extension Unit
Front	Power	DC Out 5V 2A (3)	Transfer line Video Extension Unit
Front	Power	DC Out 5V 2A (4)	Transfer line Device Connecction Panel
Front	Power	DC Out 5V 2A (5)	x
Front	Mains Power	110-240V @ 50-60Hz	power
Front	Pot. Equi.	Pot. Equi.	Pot. Equi.

Video Extension Unit Connection Panel



Front or Back Side	Group Assignment	Connector Name	Connected Device
Back	S-Video	IN A	Ultrasound
Back	S-Video	IN B	x
Back	COMP	IN A	C-Arm
Back	COMP	IN B	x
Back	VGA / SOG IN	VGA / SOG IN	Vital Monitoring
Back	DVI / RGBS / YPbPr IN	DVI / RGBS / YPbPr IN	x
Back	IN 1	DVI-D (1)	Buzz Video Connection
Back	IN 2	DVI-D (2)	OR Light Camera
Back	IN 3	3G-SDI (1)	Room Camera
Back	IN 4	3G-SDI (2)	x
Back	OUT 1	Fiber RGBO / COM	Buzz Video Connection
Back	OUT 2	Fiber RGBO / COM	26" LCD #1
Back	OUT 3	Fiber RGBO / COM	26" LCD #2
Back	OUT 4 (clone of OUT 3)	3G-SDI / COM	x
Back	USB	USB	x
Back	ETHERNET	LAN 1	x
Back	ETHERNET	LAN 2	x
Back	AUDIO	IN MIC	x
Back	AUDIO	IN LINE	x
Back	AUDIO	OUT LINE	x
Back	LAN	S-VIDEO-OUT	x
Back	LAN	YPhPr OUT	x
Back	LAN	DVI-D OUT	x
Back	RS-232-IN	RS-232-IN	Buzz Control Signal
Back	RS-232-OUT	RS-232-OUT	Buzz Control Signal
Back	DC OUT 24V-5A	DC OUT 24V-5A	x
Back	ND-OS	ND-OS	x
Back	100-240Vac @50-60Hz	100-240Vac @50-60Hz	power

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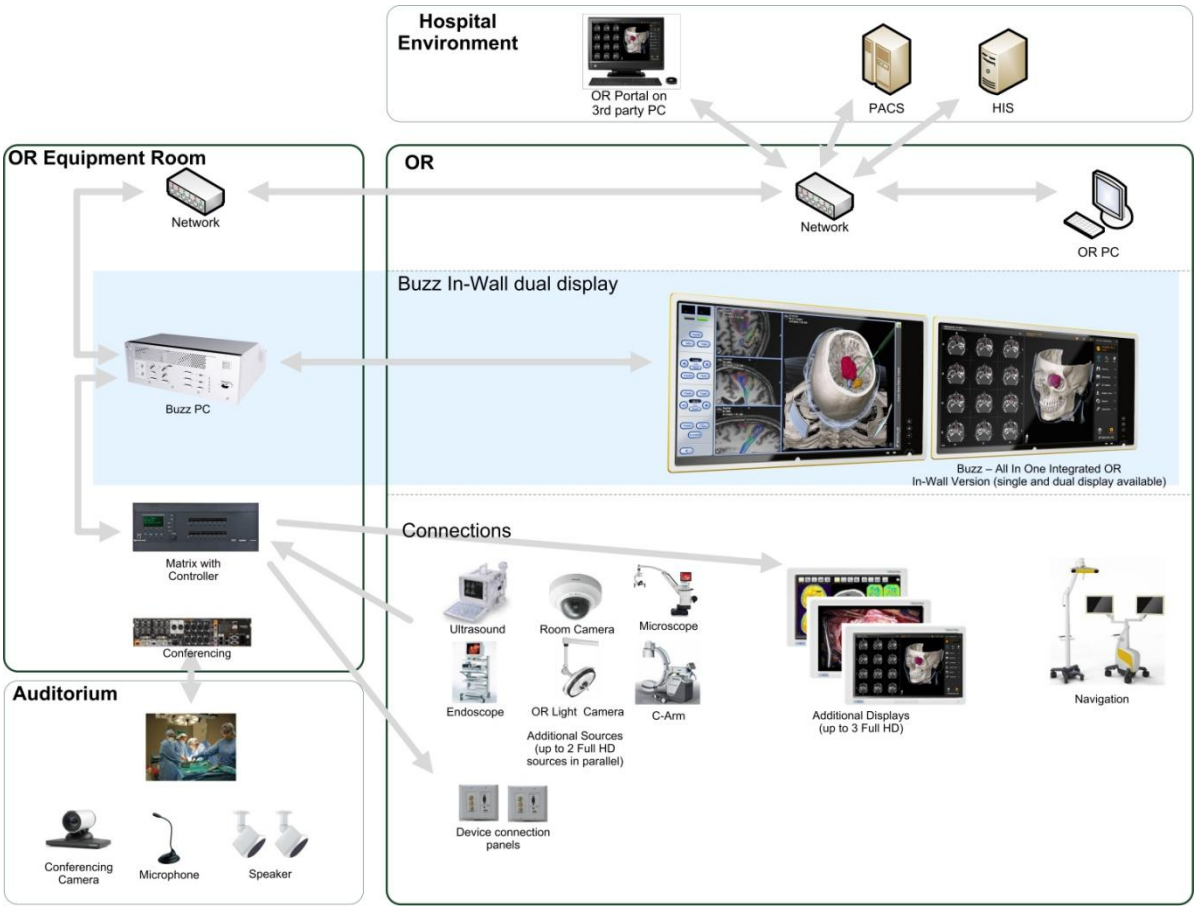
Buzz with adv. A/V (1/3): Architecture and articles

(Crestron example for a 3rd party A/V-system)



Advantages:

- 3rd party hardware connection
- Integration of infrastructure hardware (telephony)
- Room Control available
- High quality video conferencing

Limitations:

- Complex installation
- Rack required
- Integration hardware is 3rd party hardware

		BUZZ IN WALL PACKAGE ✓	
	VIDEO INPUTS 2 CHANNELS UP TO FULL HD ✓	SECONDARY IN-WALL TOUCH DISPLAY ✓	
		VIDEO EXTENSION UNIT INCL TRANSFER LINES	
SW OPTIONS	STREAMING AND RECORDING: 1x HD	STREAMING AND RECORDING: 2x HD OR 1x FULL HD	
	AUTOMATIC IMAGE FUSION	ADVANCED 3D VISUALIZATION	
	TOUCH BASED SURGICAL PLANNING	TRAUMACAD TOUCH SOFTWARE	
	INTEGRATION OF OR PC INTO BUZZ DIGITAL OR	REMOTE CONTROL OF BUZZ FROM TABLET INSIDE OR	
	INTEGRATION OF OR COMPATIBLE 3rd PARTY SW		
3rd PARTY OPTIONS	DATA DISPLAY 26”	DATA SCREEN 42”	DATA SCREEN 55”
iORS SERVICES	PLANNING & IMPLEMENTATION	SERVICE PACKAGE	SYSTEM INSPECTION
	HIGH QUALITY VIDEO CONFERENCING ✓	HIGH QUALITY AUDIO SYSTEM ✓	TELEPHONY INTEGRATION

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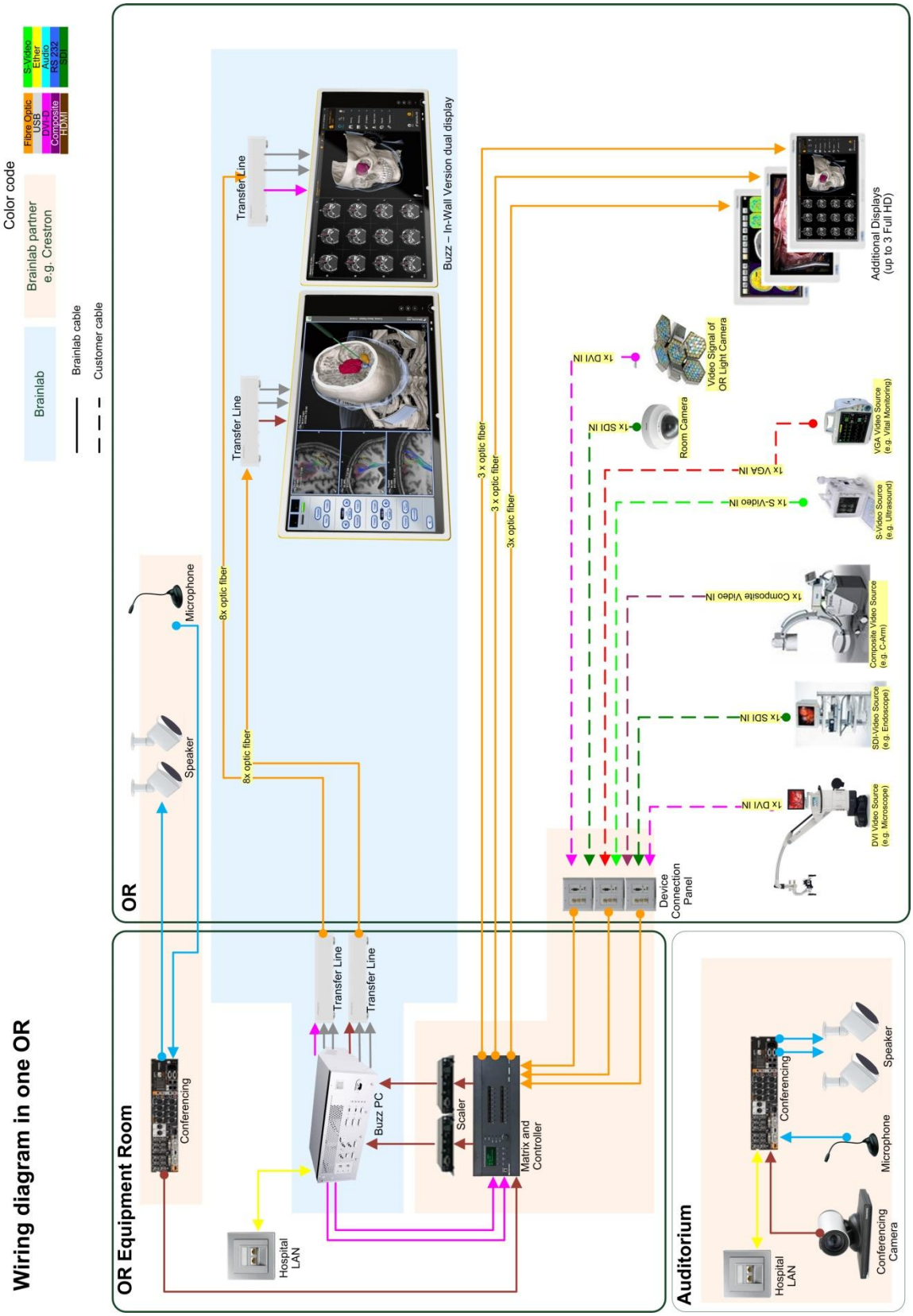
Buzz with adv. A/V (2/3): Techn. wiring diagram
(Crestron example for a 3rd party A/V-system)



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Buzz with adv. A/V (3/3): Connectivity options

(Crestron example for a 3rd party A/V-system)

Buzz Connection Panel

Front or Back Side	Group Assignment	Connector Name	Connected Device
Front	Audio	Aux In	x
Front	Audio	Aux Out	x
Front	Audio	Micro	x
Front	Network	Navigation	x
Front	Network	Hospital Network	Hospital Network
Front	Imaging Input 1	Composite In	x
Front	Imaging Input 1	S-Video In	x
Front	Imaging Input 1	SDI In	x
Front	Imaging Input 1	DVI In	Scaler Matrix Out
Front	Imaging Input 2	RGB/VGA In	x
Front	Imaging Input 2	SDI In	x
Front	Imaging Input 2	DVI In	Scaler Matrix Out
Front	Displays	Display 2 Out	
Front	Displays	Display 3 Out	Video Matrix In
Front	Displays	Display 4 Out	Video Matrix In
Front	Data	USB 3.0 (upper)	x
Front	Data	USB 3.0 (lower)	x
Front	Data	Serial	x
Front	Power	DC Out 5V 2A (1)	x
Front	Power	DC Out 5V 2A (2)	x
Front	Power	DC Out 5V 2A (3)	x
Front	Power	DC Out 5V 2A (4)	x
Front	Power	DC Out 5V 2A (5)	x
Front	Mains Power	110-240V @ 50-60Hz	power
Front	Pot. Equi.	Pot. Equi.	Pot. Equi.

Crestron Matrix DM-MD8X8

Front or Back Side	Group Assignment	Connector Name	Connected Device
Back	Video In 1	IN 1	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 2	IN 2	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 3	IN 3	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 4	IN 4	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 5	IN 5	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 6	IN 6	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 7	IN 7	Device Connection Panel (SDI, DVI, Composite, VGA, S-Video etc.)
Back	Video In 8	IN 8	Conferencing
Back	Video Out 1	OUT 1	Scaler Buzz 1
Back	Video Out 2	OUT 2	Scaler Buzz 2
Back	Video Out 3	OUT 3	Transfer Line addtl. 26" Display 1
Back	Video Out 4	OUT 4	Transfer Line addtl. 26" Display 2
Back	Video Out 5	OUT 5	Transfer Line addtl. 26" Display 3
Back	Video Out 6	OUT 6	x
Back	Video Out 7	OUT 7	x
Back	Video Out 8	OUT 8	Conferencing
Back	ETHERNET	LAN	LAN to Controller
Back	100-240Vac @50-60Hz	100-240Vac @50-60Hz	power