SPACELABS HEALTHCARE
An OSI Systems Company

The Spacelabs 91496 Command Module is designed to provide a flexible selection of clinical measurements and compatibility with Spacelabs patient monitors. Choose the Command Module measurement offering based on your care unit needs or patient acuity. Durable and lightweight, Command Modules can easily be moved between monitors. With the optional Data Shuttle® feature, transfer up to 24-hours of patient demographics, physiological data, and applicable measurement settings between monitors without having to re-cable patients.

ECG

Available leads	
3-leadwire	I, II, or III
5-leadwire	I, II, III, aVR, aVL, aVF, V
10-leadwire	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
Measurement range	Adult/Pediatric/Neonate: 15 to 300 bpm
Resolution	1 bpm
ECG size	Adjustable from 0.5 to 10 mV/cm
Numeric update rate	Every 3 seconds or immediately at onset of alarm
Heart rate accuracy	±1% or 3 bpm (whichever is greater)
Frequency range	Monitoring: 0.5 to 40 Hz ±10% Extended: 0.05 to 150 Hz ±25%
Gain accuracy	±5%
Maximum input	±5 mV (±10%)
Sample rate	896 samples per second
Arrhythmia classifications	Atrial Fibrillation, Asystole, Couplet, Paroxysmal Supraventricular Tachycardia, Pause, Ventricular Ectopic, Ventricular Fibrillation, Ventricular Run

Diagnostic ECG reports	12-leads; standard or Cabrera format
Diagnostic sample rate	500 samples per second
QRS detection	
Leads	Performed on up to 2 leads simultaneously, default II and V, with auto lead switch in event of lead off
Amplitude	Adult/Pediatric: 0.2 to 5 mV Neonate: 0.15 to 5 mV
Duration	40 to 120 ms
Pacemaker detection	Indicator of pace pulse on waveform display (user selectable)
Amplitude	±2 to ±200 mV
Width	0.25 to 2 ms
Rise time	10% of width not to exceed 100 µsec

ST

Measurement range	±9 mm
Leads	Up to 12 leads
Resolution	0.08 mm
ST segment review	Up to nine 1-second ST segment sets for up to 12 leads

Defibrillator Sync Input

Input level	±1 V, hlo1
Input impedance	2,000 Ω minimum
Connector	hlo1 supports TT-253 plug, P/N 354171-001, for connection to external device
Input display	Defibrillator sync marker is displayed with the return signal for synchronization of defibrillators for cardioversion.

Analog Output

Signal selection	ECG1/ECG2, ECG1/RESP, ECG1/PRES1, PRES1/PRES2
Delay	<35 ms
Signal gain	ECG: X1,000 (±5%) Invasive pressure (ART, PRS, UA, UV): 10 mV/mmHg (±5%) Other pressure labels: 25 mV/mmHg (±5%) Respiration: 0.6 V/Ω ±20%
Dynamic range	ECG: ±5 mV (±10%) Invasive Pressure: -0.5 to 3.5 V Respiration: ±4 V minimum

ECG bandwidth	0 to 150 Hz
Pacemaker pulses	Not included
Connector	hlo2 supports TT-253 plug, P/N 354171-001, for connection to external device *Note:* *Spacelabs Healthcare does not provide interface cables to third party equipment. Cables constructed for use with 354171-001 must incorporate a ferrite bead with 200 Ω impedance at 100 MHz within 25mm (1-inch) of the plug for EMI compliance.*

Respiration

Measurement method	Impedance pneumography
Sensing leads	User selected: RA/LA (R/L); RL/LL (N/F), RL/LA (N/L), or RA/LL (R/F)
Detection sensitivity	Shallow: 0.1 Ω input source impedance Normal: 0.25 Ω (normal) at 500 Ω input source impedance
Measurement range	0 to 200 breaths per minute
Resolution	1 breath per minute
Accuracy	±5% or 1 breath per minute (whichever is greater)
Signal bandwidth	Adult/Pediatric: 0.12 to 3 Hz (±10%) Neonate: 0.15 to 3.5 Hz (±10%)
Numeric update rate	Every 3 seconds or immediately at onset of apnea alarm
Apnea detection	User selectable, 5 to 40 seconds; apnea alarm automatically enabled for Neonate patient type

Noninvasive Blood Pressure (NIBP)

Measurement method	Oscillometric, step-deflation method
Measurement operation	Automatic interval, manual
Interval times	User selectable: 1, 2, 2.5, 3, 4, 5, 10, 15, 20, 30 minutes; 1, 2, 4, 6, 8 hours
Measurement read time	<45 seconds, typical
Pulse measurement range	25 to 255 bpm
Measurement range (Systolic/Diastolic/Mean)	Adult/Pediatric 4: 30 to 260 mmHg (4 to 34.7 kPa) Pediatric 2/3: 30 to 190 mmHg (4 to 25.4 kPa) Neonate/Pediatric 1: 15 to 140 mmHg (2 kPa to 18.7 kPa)
Resolution	1 mmHg
Accuracy	Standard deviation ±7.3 mmHg Mean error ±4.5 mmHg Meets or exceeds ANSI/AAMI standard SP-10

Initial cuff inflation	Adult/Pediatric 4: 170 mmHg Pediatric 2/3: 130 mmHg Neonate/Pediatric 1: 115 mmHg
Maximum cuff inflation	Adult/Pediatric 2/3/4: 290 mmHg Neonate/Pediatric 1: 150 mmHg
Cuff deflation rate	Adult/Pediatric: <10 seconds from 260 to 15 mmHg (34.7 to 2 kPa) Neonate: <5 seconds from 150 to 5 mmHg (20 to 0.7 kPa)
Connector	Adult/Pediatric: female bayonet plastic or metal fitting compliant with IEC 80369-5, with single airway tube Neonate: male bayonet plastic or metal fitting complaint with IEC 80369-5, with single airway tube

Invasive Blood Pressure (IBP)

Transducer type	Strain-gauge, standardized to 5µV/V/mmHg ±1%
Transducer compatibility	Edwards, Utah, Abbott, BD, Argon, Braun
Measurement method	Resistive strain gauge transducer
Parameter labels	ART (Arterial Pressure), ART2 (Arterial Pressure 2), ART3 (Arterial Pressure 3), CVP (Central Venous Pressure), ICP (Intracranial Pressure), LAP (Left Atrial Pressure), PA (Pulmonary Artery), RAP (Right Atrial Pressure), UA (Umbilical Artery), UV (Umbilical Venous), Generic Pressure (PRS)
Measurement range	-50 to 300 mmHg (-6.7 to 40 kPa)
Accuracy	±2 mmHg (0.27 kPa) or 2% of reading (whichever is greater)
Signal bandwidth	0 to 40 Hz
Numeric update rate	Every 3 seconds

Cardiac Output (CO)

Measurement method	Thermodilution
Parameter	Cardiac output, blood temperature, injectate temperature
Measurement range	Cardiac output: 0.1 to 18 L/min Blood temperature: 17.2° to 43° C Injectate temperature: 0° to 28 °C
Cardiac output accuracy	±10%
Temperature accuracy	±0.2° C
Calculated values	Body Surface Area (BSA), Cardiac Index (CI), Stroke Volume (SV), Stroke Volume Index (SVI), Systemic Vascular Resistance (SVR), Pulmonary Vascular Resistance (PVR), Left Ventricular Stroke Work (LVSW), Right Ventricular Stroke Work (RVSW), Systemic Vascular Resistance Index (SVRI), Pulmonary Vascular Resistance Index (PVRI), Left Ventricular Stroke Work Index (LVSWI), Right Ventricular Stroke Work Index (RVSWI)

Spacelabs Pulse Oximetry (SpO_2)

Measurement method	Functional saturation (oxygen saturation of functional hemoglobins)
Display parameters	%SpO_2, %SpO_2D (second SpO_2 available with 91496-L), pulse rate
Measurement range	SpO_2: 30% to 100% Pulse rate: 30 to 249 bpm
Resolution	SpO_2: 1% Pulse rate: 1 bpm
SpO_2 accuracy (A_{rms}) of Spacelabs sensors	70% to 100% ±3% 0% to 69% unspecified Established accuracy is the root-mean-square of the error between measured values and reference values obtained from a laboratory hemoximeter during adult human blood studies. Assuming a normal distribution, A_{rms} encompasses 68% of the data population.
Numeric update rate	Every 3 seconds
Spacelabs sensors	P/N 015-0660-00: Finger sensor, Adult, Reusable P/N 015-0661-00: Y Multi-site sensor, Universal, Reusable P/N 015-0662-00: Foam sensor, Adult, SPU P/N 015-0664-00: Foam sensor, Pediatric, SPU P/N 015-0663-00: Vinyl sensor, Adult, SPU P/N 015-0665-00: Vinyl sensor, Pediatric, SPU P/N 015-0666-00: Cloth sensor, Infant, SPU P/N 015-0667-00: Cloth sensor, Neonate, SPU

Masimo SET Pulse Oximetry (SpO_2)

Measurement method	Functional saturation (oxygen saturation of functional hemoglobins)
Display parameters	%SpO_2, %SpO_2D (second SpO_2 available with 91496-L), pulse rate
Measurement range	SpO_2: 1% to 100% Pulse rate: 25 to 240 bpm
Resolution	SpO_2: 1% Pulse rate: 1 bpm
Numeric update rate	Every 3 seconds
Pulse accuracy	No motion: ±3% Motion: ±5% Low perfusion: ±3%

SpO_2 Accuracy (70% to 100%) of Masimo sensors	
LNCS DC-I, LNCS DC-IP, LNCS TF-I**, LNCS Adtx, LNCS Pdtx, LNCS Inf	No motion: ±2% Low perfusion†: ±2%
LNCS TC-I**	No motion: ±3.5% Low perfusion†: ±3.5%
LNCS Neo	No motion: <3 kg ±3%, >40 kg ±2% Low perfusion†: <3 kg ±3%, >40 kg ±2%
RD SET Adt*, RD SET Pdt*, RD SET Inf*, RD SET DCI-P*	No motion: ±2% Low perfusion†: ±2%
RD SET TC-I*	No motion: ±3.5% Low perfusion†: ±3.5%
RD SET Neo*	No motion: <3 kg ±3%, >40 kg ±2% Low perfusion†: <3 kg ±3%, >40 kg ±2%
LNOP DC-I*, LNOP DC-IP*, LNOP Adt*, LNOP Pdt*, LNOP Inf-L*	No motion: ±2% Low perfusion†: ±2%
LNOP YI	No motion: 1 to 3 kg ±3%, >3 kg ±2% Low perfusion†: 1 to 3 kg ±3%, >3 kg ±2%
LNOP Neo*, LNOP NeoPt*, LNOP NeoPt-L*, LNOP TC-I**	No motion: ±3.5% Low perfusion†: ±3.5%
LNOP Neo-L	No motion: <3 kg ±3%, >40 kg ±2% Low perfusion†: <3 kg ±3%, >40 kg ±2%

* *The accuracy specification under motion conditions is ±3%. Motion is defined as continuous rubbing and tapping motions at 2 to 4 Hz, at an amplitude of 1 to 2 cm, and continuous random frequency motion between 1 to 5 Hz, at an amplitude of 2 to 3 cm.*

** *These sensors were not validated under motion conditions.*

† *Pulse amplitude >0.2%; % transmission >5%*

Nellcor OxiMax Pulse Oximetry (SpO_2)

Measurement method	Functional saturation (oxygen saturation of functional hemoglobins)
Display parameters	%SpO_2, %SpO_2D (second SpO_2 available with 91496-L), pulse rate
Measurement range	SpO_2: 1% to 100% Pulse rate: 25 to 300 bpm
Resolution	SpO_2: 1% Pulse rate: 1 bpm
Numeric update rate	Every 3 seconds

SpO_2 Accuracy (70% to 100%) of Nellcor sensors	
MAX-A*, MAX-AL*, MAX-N*†, MAX-P*, MAX-I*, MAX-FAST	±2%
OxiCliq A, OxiCliq P, OxiCliq N (Adult)†, OxiCliq I	±2.5%
MAX-N*, D-YS (Infant to Adult), DS-100A, OXI-AN, OXI-P/I	±3%
MAX-R**, OxiCliq N (Neonate), D-YSE	±3.5%
D-YS (Neonate), OXI-A/N	±4%

* *The accuracy specification under motion conditions is ±3%.*

** *The accuracy specification has been determined between saturations of 80% and 100%.*

† *The MAX-N and the OxiCliq N were tested on patients >40 kg.*

Neonatal accuracy	When sensors are used on neonatal subjects as recommended, the specified accuracy range is increased by ±1 digit as compared to adult usage, to account for the theoretical effect on oximeter measurements of fetal hemoglobin in neonatal blood. For example, MAX-N accuracy on neonates is ±3 digits, rather than ±2 digits.

Temperature

Measurement method	Direct, continuous
Displayed parameters	T1, T2, delta temperature (DT) requires two probes
Temperature site labels	Esophageal (Tesoph), rectal (Trect), skin (Tskin), bladder (Tblad), tympanic (Ttymp), axillary (Taxil), pulmonary artery (Tpa), central venous (Tcv), blood (Tblood), myocardial (Tmyo), nasopharyngeal (Tnaso), core (Tcore), Temp1, Temp2
Sensor type	Skin, rectal, esophageal
Probe type	YSI 400 or YSI 700; automatically identifies series number and processes both
Measurement range	0° to 50° C
Resolution	0.1° C
Numeric update rate	Every 3 seconds
Accuracy	±0.2° C (0° to 25° C); ±0.1° C (25° to 41° C); ±0.2° C (41° to 50° C)

Physical Specifications

Dimensions (H x W x D)	11.3 x 5.66 x 18 cm (4.45 x 2.23 x 7.1 in)
Weight	0.8 kg (1.75 lbs)
Controls	Stop NIBP
Volatile memory	Data is preserved for 10 minutes. Module ceases data collection when power is removed.

Electrical Specifications

Power source	Powered directly from monitor
Protection against electric shock	Module is electrically isolated from host device.
Defibrillator protection	Type CF, meets IEC 60601-2-27, AAMI EC-13

Environmental Specifications

Ambient temperature	Operating: 0° to 50° C (32° to 122° F) Storage and transport: -40° to 75° C (-40° to 167° F)
Relative humidity	Operating: 95% (non-condensing) up to 30° C (86° F), 10% to 75% up to 40° C (104° F), 10% to 45% up to 50° C (122° F) Storage and transport: 95% (non-condensing) up to 50° C (122° F), 10% to 50% up to 75° C (167° F)
Altitude	Operating: 0 to 3,000 meters (0 to 9,843 feet) Storage and transport: 0 to 12,192 meters (0 to 40,000 feet)
Water ingress	Meets EN 60529 IPX1 only when installed in 91393 Xprezzon®, 91390 Qube®, and 91389 Qube Mini patient monitors.

Ordering Information

Module configurations	
91496-A	ECG, respiration, NIBP, pulse oximetry, two temperatures
91496-B	ECG, respiration, NIBP, pulse oximetry, two invasive blood pressures, two temperatures
91496-C	ECG, respiration, NIBP, pulse oximetry, four invasive blood pressures, two temperatures, cardiac output
91496-I	NIBP, pulse oximetry, two temperatures
91496-L	Four invasive blood pressures, pulse oximetry (SpO_2D), two temperatures

Software options	Arrhythmia* (F–Basic, G–Standard, or H–Advanced) Diagnostic 12-lead reports* (D–with interpretation or E–without interpretation) SpO_2 technology (M–Masimo SET, N–Nellcor OxiMax, or U–Spacelabs) Data Shuttle* (Q) Respiration* (R) ST segment analysis* (S) Varitrend® oxycardiorespirogram* (V)

* *Not available with 91496-I and 91496-L configurations.*

For further ordering information and details on compatible accessories, please contact your Spacelabs Healthcare representative or refer to the product documentation.

This product may not be approved for market release in all countries.

Documentation

All operations, system administration, and service manuals are available in PDF format on CD-ROMs that ship with the product.

Regulatory Approvals

C US	CSA certified. Meets CSA C22.2 No. 60601-1 and ANSI/AAMI ES60601-1. IEC 60601-1: basic safety; IEC 60601-2-25: ECG; IEC 60601-2-27: ECG; ISO 80601-2-30: NIBP; IEC 60601-2-34: IBP; IEC 60601-2-49: multiparameter monitors; ISO 80601-2-56: clinical thermometers; ISO 80601-2-61: SpO_2.
CE 0123	CE marked in accordance with the Medical Device Directive 93/42/EEC. EN 1060-3: NIBP; EN 60601-1: electrical safety; EN 60601-1-2: EMC; EN 60601-2-25: ECG; EN 60601-2-27: ECG; EN 80601-2-30: NIBP; EN 60601-2-34: IBP; EN 60601-2-49: multifunction monitors; EN 80601-2-56: clinical thermometers; EN 80601-2-61: SpO_2.
RoHS2 2011/65/EU	Does not contain hazardous substances — Europe
	Does not contain hazardous substances — China

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