Chapter 6
Parameter Setup

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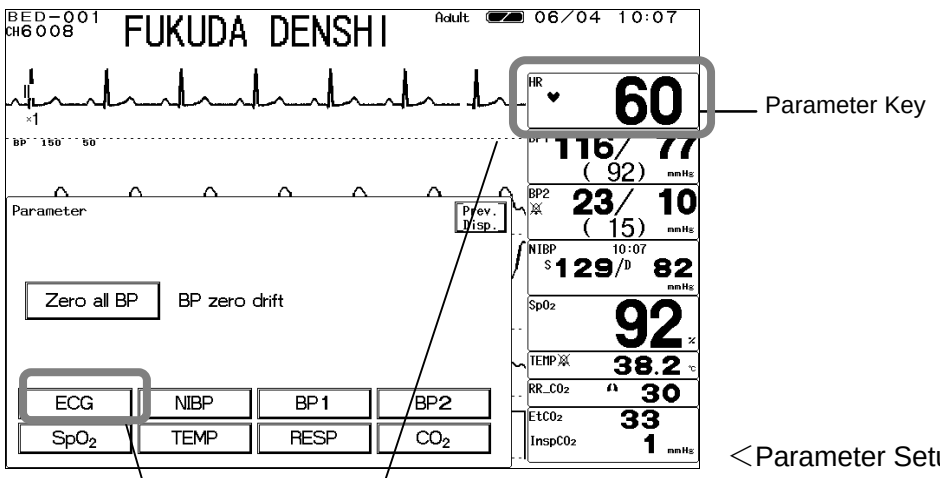
This menu allows setup of measurement condition, waveform size, scale, etc. of ECG, BP, NIBP, SpO_2, RESP, TEMP, and CO_2.

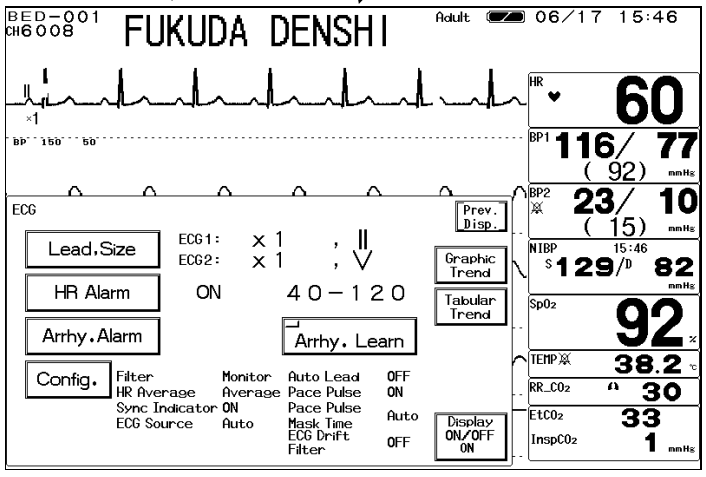
To Display the Parameter Setup Menu

Press the [Menu] → [Parameter] keys to display the parameter setup menu, and select the parameter. On the parameter setup menu, BP zero balance can be performed.

The parameter setup menu for each parameter can be also accessed by pressing the parameter key where numeric data is displayed.



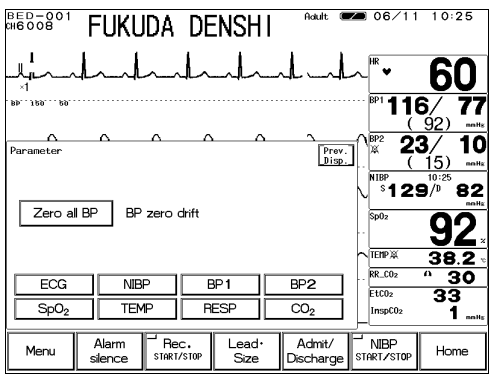
＜Parameter Setup Menu＞



＜ECG Parameter Setup Menu＞

Zero Balance of All Pressure Lines (BP1, BP2)

1. **Open the three-way cock of all pressure transducers to air.**
2. **Press the** [**Zero All BP**] **key.**



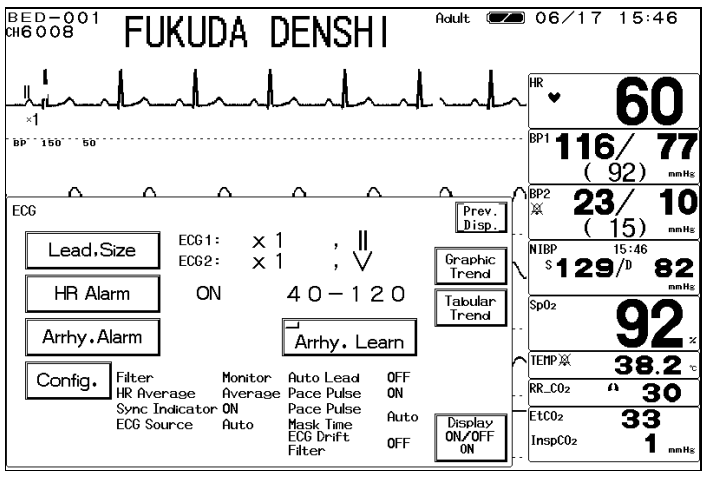
Verify the BP waveform is positioned at zero, and “0” is displayed for the BP value. A message, “BP zero complete” will be displayed when the procedure is complete. A message, “BP zero failed” will be displayed when the process fails. The three-way cock may not be opened to air, artifact may be present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
A message, “BP zero drift” will be displayed when the interface cable is not connected. Check if the cable is firmly connected.

3. **Close the three-way cock when the zero balance is complete.**

⚠CAUTION	Each time the blood pressure transducer or tubing is replaced, the zero balance procedure is required to ensure accurate measurements.

— ECG —

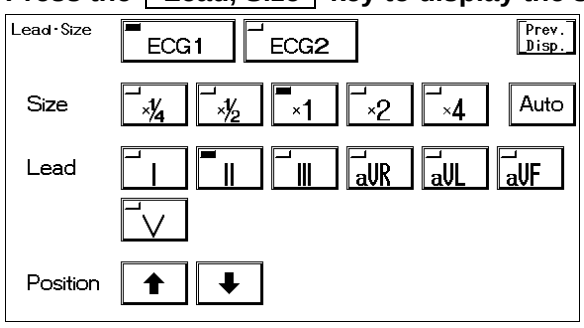
The measurement condition for ECG can be set on this menu.



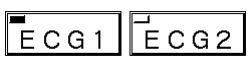
Lead, Size : Sets the waveform size and lead for ECG display and recording.
HR Alarm : Sets ON/OFF of HR alarm, and sets upper and lower alarm limit.
Arrhy. Alarm : Sets ON/OFF and detection threshold for each arrhythmia alarm.
Configuration : Sets the condition for measuring ECG and HR.
Arrhy. Learn : The monitor learns the normal QRS at ECG electrode replacement or at misdetection of the arrhythmia analysis.

ECG Waveform Size and Lead

1. Press the [Lead, Size] key to display the size / lead setup menu.

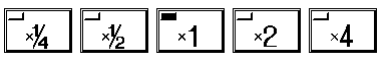


2. Select ECG1 or ECG2.



If 4-electrode or 5-electrode ECG relay cable is used, 2 channels of ECG can be measured.
Select [ECG1] or [ECG2] key to set the waveform size, lead, baseline position. The key LED for the selected channel will light.
When 3-electrode is used, these keys will not be displayed.

3. Select the waveform size.



Select the waveform size for displaying and recording.

Size	×1/4	×1/2	×1	×2	×4
Voltage (10mm)	4mV	2mV	1mV	500uV	250uV

Auto

Pressing the Auto key will automatically adjust the ECG amplitude to 10mm.
The automatic adjustment will function only when the key is pressed.
The automatic adjustment will not function when the monitor is learning arrhythmia.

4. Select the lead.

The leads can be selected from 3 leads, 6 leads, 7 leads depending on the connected ECG relay cable.

ECG Relay Cable	Lead
3-electrode	I II III
4-electrode	I II III aVR aVL aVF
5-electrode	I II III aVR aVL aVF V

5. Set the baseline position.

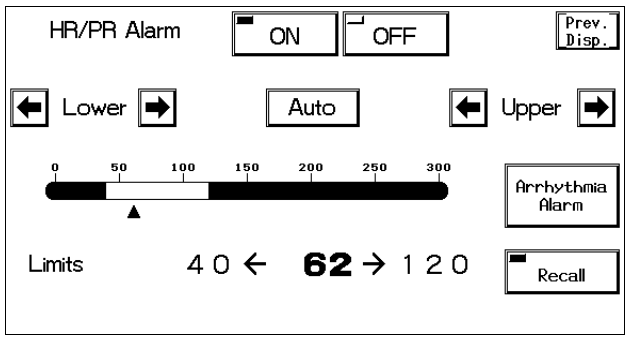
Position

If the waveform is difficult to see due to ECG amplitude, set the 0mV baseline position.
The baseline position for the waveform display and recording will be adjusted.

⚠CAUTION	✍ The threshold level for arrhythmia detection changes with ECG waveform size. Set a proper waveform size for monitoring. When the ECG waveform size is ?1/4, ?1/2, or ?1, the detection threshold is 250 µV. When the ECG waveform size is ?2, or ?4, the detection threshold is 150 µV. ✍ Automatic size/position of the ECG is effective only at the time the AUTO key is pressed. This does not continually adjust size and position.

HR Alarm

1. **Press the HR Alarm key to display the alarm setup menu.**
   Select ON/OFF of HR/PR alarm, and set the upper and lower alarm limit.

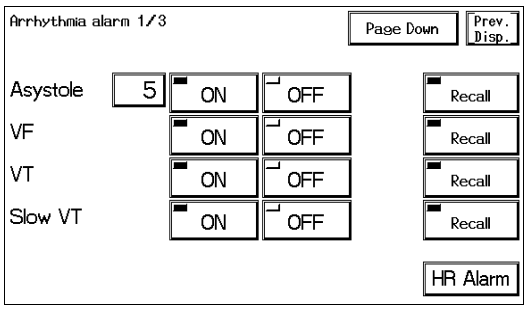


The common alarm value for HR measured from ECG, PR measured from SpO_2, PR measured from BP can be set.
The upper and lower limit can be set in 5 bpm increments.

Key	*Item*	*Description*
ON OFF	Individual Alarm	Selecting ON will generate the HR/PR alarm. Selecting OFF will not generate the HR/PR alarm.
← Lower →	Lower Alarm Limit	Sets the lower alarm limit (20～295bpm). Setting a value 20bpm or below will turn OFF the alarm.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (25～300bpm). Setting a value 300bpm or above will turn OFF the alarm.
Auto	Automatic Setup	Automatically sets the upper limit to ＋40bpm, and the lower limit to －40bpm to the current value.

Arrhythmia Alarm

1. **Press the Arrhy. Alarm key to display the arrhythmia alarm setup menu.**
   ON/OFF of each arrhythmia alarm and analysis threshold level can be set.

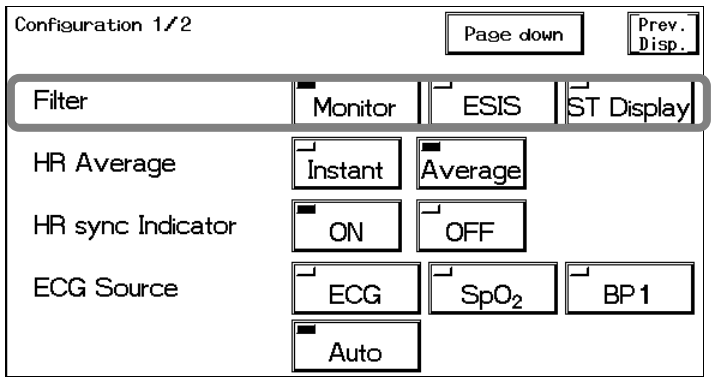


Reference Refer to “4. Monitoring Setup　Alarm Setup” for details.

Filter Mode Selection

The waveform frequency characteristic can be selected from Monitor Mode, ESIS Mode, or ST Display Mode according to the monitoring purpose. Each mode has different frequency characteristic. The AC filter is always set to ON.

1. **Press the [Config.] key to display the setup menu for selecting the filter.**



2. **Select a frequency characteristic to monitor ECG from [Monitor], [ESIS], or [ST Display].**

Monitor Mode

Patient Type	*Frequency Characteristic*
Adult / Child	0.5～40Hz
Neonate	1.6～40Hz

This is the standard mode for ECG monitoring. The upper frequency is set to 40Hz to reduce artifact caused by EMG, etc.

ESIS Mode

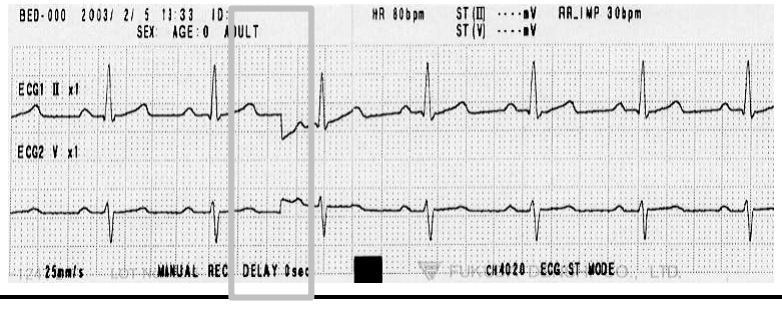
Patient Type	*Frequency Characteristic*
Adult / Child	1.6～15Hz
Neonate	1.6～15Hz

This mode is for ECG monitoring when using electrosurgical instruments. The upper frequency is set to 15Hz which will largely reduce the artifact caused by surgical knife, EMG, etc. However, as this may also reduce the QRS amplitude at the same time, do not select this mode unless using electrosurgical instruments.

ST Display Mode

Patient Type	*Frequency Characteristic*
Adult / Child	0.05～40Hz

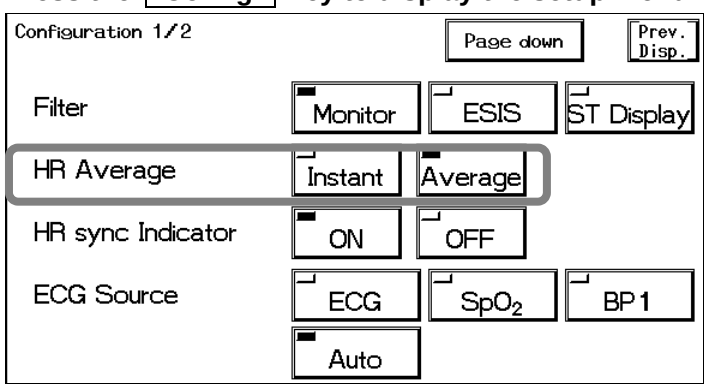
Select this mode if ST measurement is the main purpose of ECG monitoring.
As the lower frequency is set to 0.05Hz, ST level can be accurately measured. If “Neonate” is selected as patient type, this mode can not be selected

NOTE	When the filter setup is changed, a notch will appear on the ECG waveform due to the change in frequency characteristic. 

HR Average Selection

The averaging method of HR measured from ECG can be selected.

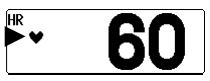
1. **Press the Config. key to display the setup menu for HR Average selection.**



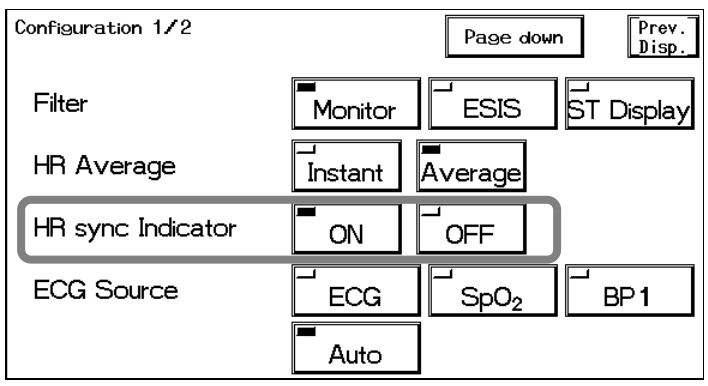
2. **Select Instant or Average.**
   Selecting Instant will display the HR measured from RR interval of each heartbeat.
   Selecting Average will display the HR measured from 6 seconds of heartbeat for adult and child, and 3 seconds of heartbeat for neonate.

HR Synchronized Indicator (ON/OFF of HR Synchronized Tone)

The HR mark synchronized to ECG or PR can be displayed inside the parameter key.
ON/OFF of HR synchronized tone can be also set.

HR Mark 

1. **Press the Config. key to display the setup menu for HR synchronized indicator selection.**

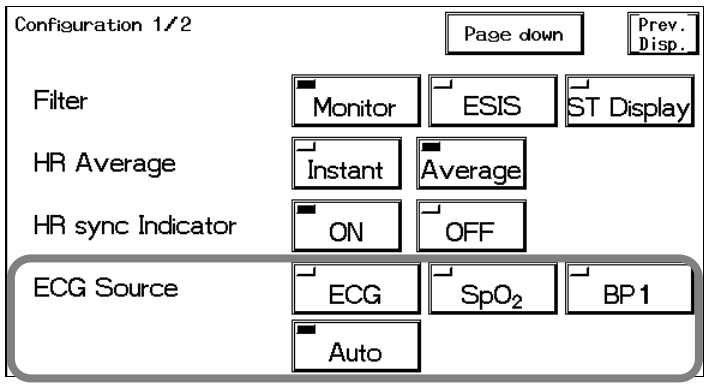


2. **Select ON or OFF.**
   OFF will not display the synchronized mark. The synchronized tone will not be generated.
   ON will display the synchronized mark. The synchronized tone will be generated.

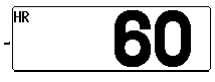
ECG Source

The ECG source to display on the home display can be selected.
The alarm will be generated based on this selection.
The tabular trend and graphic trend will be also based on this selection.

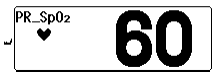
1. Press the [Config.] key to display the setup menu for selecting the ECG source.



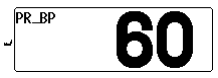
2. Select a parameter.



Selecting [ECG] will measure the HR from ECG.
"HR" will be displayed inside the parameter key.



Selecting [SpO_2] will measure the PR from SpO_2.
"PR_SpO_2" will be displayed inside the parameter key.



Selecting [BP1] will measure the PR from BP1.
"PR_BP" will be displayed inside the parameter key.

Selecting [Auto] will automatically set the measurable HR source in the priority of ECG＞SpO_2＞BP.

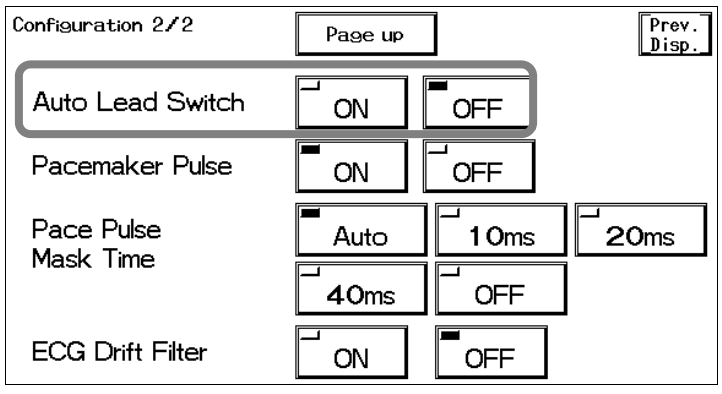
Automatic Lead Switching

By setting the Automatic Lead Switching ON, a new ECG lead will be automatically set when the electrode comes off. When the lead off condition occurs, the " Check Electrodes " message will be displayed and a new ECG lead will be automatically set if the Automatic Lead Switching is set to ON.

Lead Switching

Type	*Electrode Off*	*Auto Lead Selected*	
		ECG1	*ECG2*
5-electrode cable	RA／RA+C	III	III
	LA／LA+C	II	II
	C	II	aVR
4-electrode cable	RA	III	III
	LA	II	II

1. **Press the [Config.] → [Page Down] keys to display the setup menu for setting the auto lead switching.**

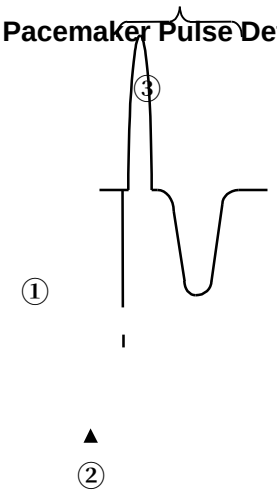


2. **Select [ON] or [OFF].**
   [OFF] will not switch the lead when an electrode comes off.
   [ON] will automatically switch to another lead when an electrode comes off.

Pacemaker Pulse

The artificial pace pulse can be displayed by superimposing on the ECG waveform. The artificial pace pulse will be displayed in yellow.

Pacemaker Pulse Detection Algorithm



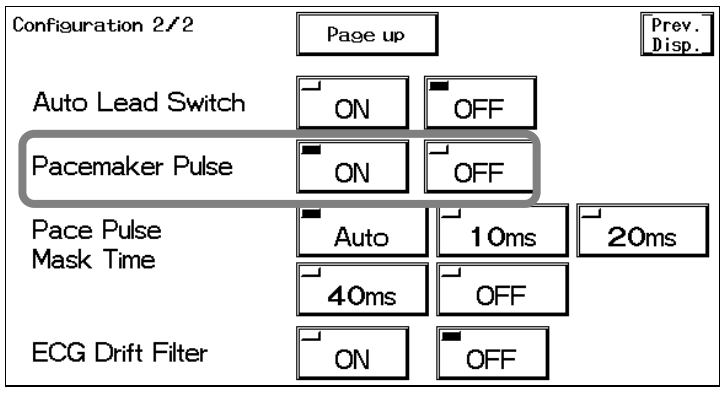
①ECG Signal Input
Inputs ECG signal.

②Suspension of Pacemaker Pulse and QRS Detection
Signals with high frequency and large amplitude will be detected as a pacemaker pulse. When a pacemaker pulse is detected, QRS detection will be suspended for a certain amount of time to prevent the pacemaker pulse erroneously detected as QRS.

③Canceling Arrhythmia Detection
Arrhythmia detection will be cancelled to avoid detecting the waveform succeeding the pacemaker pulse as an abnormal beat.

⚠CAUTION	Precautions about Pacemaker Pulse Detection ✍ There are some cases when pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, electrode lead type (unipolar, bipolar), or electrode placement which causes the pacemaker pulse amplitude to decrease and disables pacemaker pulse detection. ✍ If signals similar to a pacemaker pulse are present, such as electric blanket noise or excessive AC frequency noise, these may be erroneously detected and displayed as a pacemaker pulse. ✍ When the spontaneous QRS and pacemaker pulse overlaps (as in a fusion beat), QRS detection will be suspended and the heart rate will be reduced. ✍ If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will be suspended and the heart rate will be reduced. Also arrhythmia detection will not be possible.

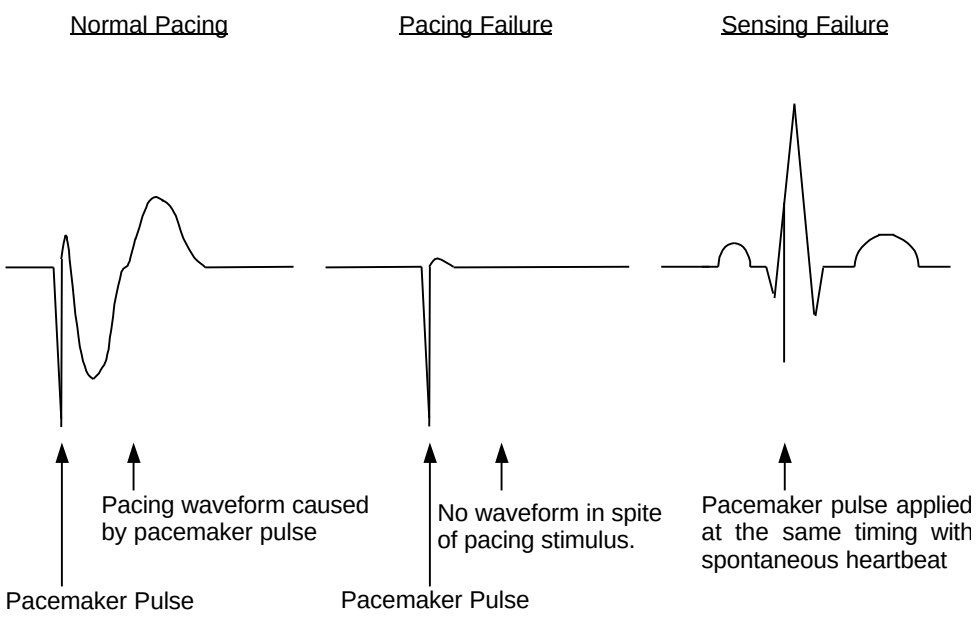
1. **Press the [Config.] → [Page Down] key to display the setup menu for pacemaker pulse selection.**



2. **Select [ON] or [OFF].**
   [OFF] will not display the pacemaker artificial pulse.
   [ON] will display the pacemaker artificial pulse in a different color from the ECG waveform.
   This will automatically set to [ON] when "Used" is selected for pacemaker use on the patient admit / discharge menu.

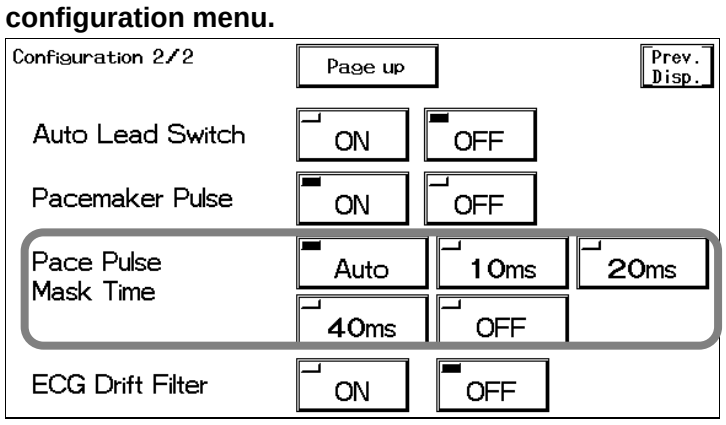
QRS Pace Mask

For patients using pacemakers, there are cases when the pacing waveform may not occur in spite of the pacing stimulus. This condition is called "pacing failure", or "failure to capture". To avoid detecting pacemaker pulses as a QRS complex when this occurs, the monitor has a function to suspend QRS detection for a fixed amount of time starting from the detection of the pacing stimulus. This function is called "pace mask". But if the pacemaker does not detect the patient's spontaneous heartbeat (sensing failure), and the pacing stimulus is applied at the same timing as QRS, this "pace mask" function may erroneously mask the QRS and cause the heart rate measurement to decrease. To avoid this, QRS pace mask function can be turned off for correct measurement of the heart rate. (default setting : ON)



⚠WARNING	If the QRS pace mask function is turned OFF, a decrease in heart rate may not generate HR or ASYSTOLE alarms due to erroneously detected QRS. Turn this function OFF only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.

1. **Press the [Config.] → [Page Down] keys to display the second page of the configuration menu.**

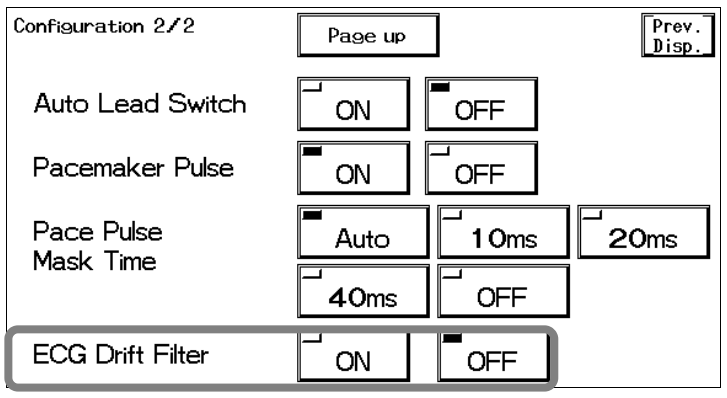


2. **Select the pace pulse mask time.**
   Select from [10ms], [20ms], [40ms] depending on the pace spike amplitude or presence of fusion beat.
   Selecting [OFF] will set the mask time to 0ms.
   Selecting [Auto] will switch between [20ms] and [40ms] depending on the pace spike amplitude.

ECG Drift Filter

By setting the ECG drift filter ON, only the amplitude with frequency component under 1Hz will be attenuated to prevent the ECG baseline drift.

1. **Press the [Config.] → [Page Down] keys to display the second page of the configuration menu.**

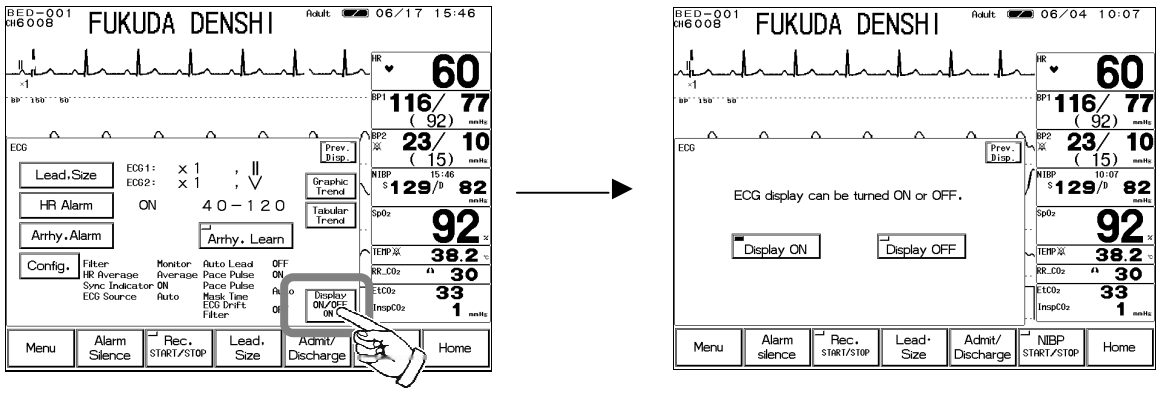


3. **Select [ON] or [OFF] for the ECG drift filter.**
   Selecting [ON] will set the ECG drift filter and controls the baseline drift.
   When the ECG drift filter is set, the patient signal display will delay about 0.5 seconds.
   Selecting [OFF] will not set the ECG drift filter.

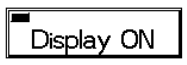
NOTE	When an electrosurgery-proof ECG relay cable is used, ECG drift filter can not be set to [ON].

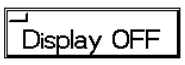
ON/OFF of Parameter Display

1. **Press the** Display ON/OFF **key. The confirmation display for ON/OFF of ECG display will appear.**



2. **Select** Display ON **or** Display OFF**.**





Pressing the Display ON key will display the waveform and numeric data.
Pressing the Display OFF key will not display the waveform and numeric data.

The Display OFF message will be displayed inside the parameter key.

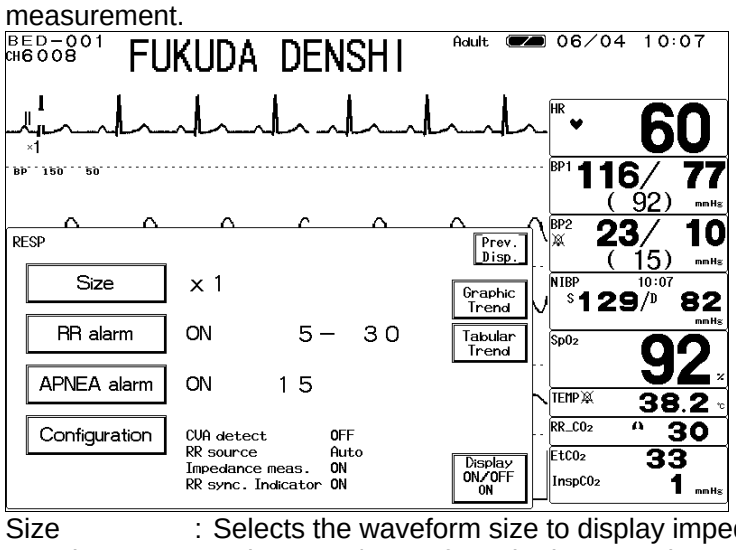
When ECG electrodes are attached to the patient with the ECG display set to OFF, the ECG waveform and numeric data will be automatically displayed after 30 seconds.

⚠CAUTION	When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF.

NOTE	If ECG source is set to other than ECG, selecting Display OFF will display PR_SpO_2 or PR_BP for the HR parameter key.

— Respiration —

This menu allows setup for the impedance respiration measurement and CO_2 respiration measurement.



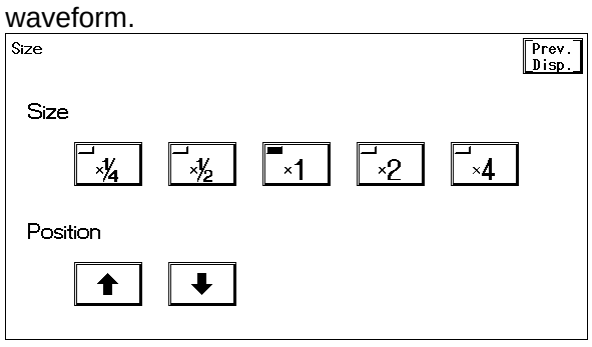
Size : Selects the waveform size to display impedance respiration.
RR Alarm : Selects ON/OFF of respiration rate alarm, and sets upper and lower alarm limits.
APNEA Alarm : Selects ON/OFF of apnea alarm and sets upper alarm limit.
Configuration : Sets the respiration monitoring configuration.

⚠CAUTION	✍ When the following relay cables are used, respiration can not be measured. ✍ Relay Cable CI -700E_3 (Electrosurgery-proof, 3-electrode) ✍ Relay Cable CI -700E_4 (Electrosurgery-proof, 4-electrode) ✍ Relay Cable CI -700E_5 (Electrosurgery-proof, 5-electrode) ✍ When a defibrillator is used during respiration monitoring, a large offset voltage will be placed on the ECG electrodes, which may cause interruption of monitoring for a few seconds. ✍ When the following lead cables are used, respiration cannot be measured. ✍ Lead Cable #3382.0648.16 (Electrosurgery-proof, 3-electrode) ✍ Lead Cable #3382.0661.16 (Electrosurgery-proof, 5-electrode)

Respiration Waveform Size

1. Press the [Size] key to display the size setup menu.

Select the waveform size and baseline position to display and record the impedance respiration waveform.



2. Select the waveform size.

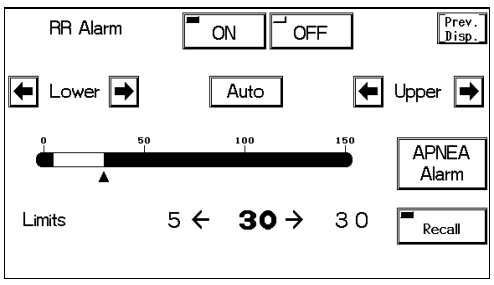
Select the size from [×1/4], [×1/2], [×1], [×2], [×4].

3. Set the baseline position using the [✍], [✍] keys.

Adjust the baseline position for 0Ω if the waveform is hard to see due to the waveform amplitude.

RR Alarm

1. Press the RR Alarm key to display alarm setup menu.



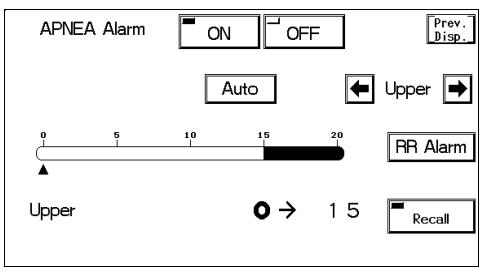
Set ON/OFF of RR alarm and upper and lower alarm limit.
The alarm will be set common to RR measured from impedance respiration waveform or RR measured from CO_2 waveform.
The adjustable increment for upper and lower limit depends on the patient type.
Adult / Child : 5bpm increment
Neonate : 2bpm increment

NOTE	If the alarm is based on the RR measured from CO_2 waveform, RR alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.

Key	*Item*	*Description*
ON OFF	Individual Alarm	Selecting ON will generate the RR alarm. Selecting OFF will not generate the RR alarm.
← Lower →	Lower Alarm Limit	Sets the lower alarm limit (5～145Bpm／5～148Bpm). Setting a value 5Bpm or below will turn OFF the alarm.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (10～150Bpm／4～150Bpm). Setting a value 150Bpm or above will turn OFF the alarm.
Auto	Automatic Setup	Automatically sets the upper limit to ＋20Bpm, and the lower limit to －20Bpm to the current value.

Apnea Alarm

1. Press the Apnea Alarm key to display the alarm setup menu.



Set ON/OFF of apnea alarm and upper limit of apnea time.
Apnea will be set common to apnea time measured from impedance respiration waveform or apnea time measured from CO_2 waveform.
The upper limit can be set in 1-second increment.
There is no lower limit.

⚠WARNING	The purpose of this respiration alarm is to alert the user to evaluate for the possible occurrence of apnea events by identifying the absence of respiration. It is not intended to be classified as an “Apnea Monitor” and will not identify the condition creating the possible event. (Central, Obstructive or Mixed.)

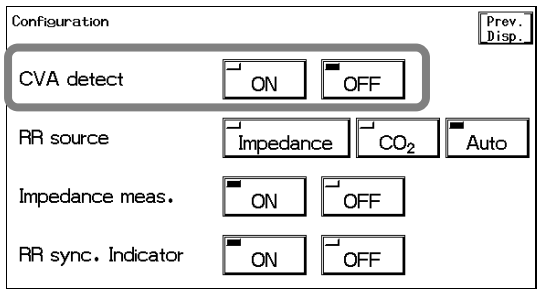
NOTE	If the alarm is based on the apnea time measured from CO_2 waveform, apnea alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.

Key	Item	Description
ON OFF	Individual Setup	Selecting ON will generate the apnea alarm. Selecting OFF will not generate the apnea alarm.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (5～20sec.). Setting a value equal to or above 20sec. will turn OFF the alarm.
Auto	Automatic Setup	Sets the apnea alarm value set for the currently selected alarm mode.

CVA Detection

When the amplitude of the respiration waveform decreases due to causes such as respiratory pause, the ECG waveform may be superimposed on to the respiration waveform, making the RR equal to the HR. This condition is called CVA (Cardio-Vascular Artifact), and is detected using the CVA detection function.
If the ECG waveform is superimposed on to the respiration waveform, with HR (RR) 30bpm, for 20 seconds or over (10 seconds or over for neonates) and the CVA detection function set to ON, the "CVA detected" message will be displayed, and an alarm sound will be generated.
This function will be effective when Impedance is set as the RR source.

1. **Press the Configuration key to display the setup menu for setting the CVA detection.**

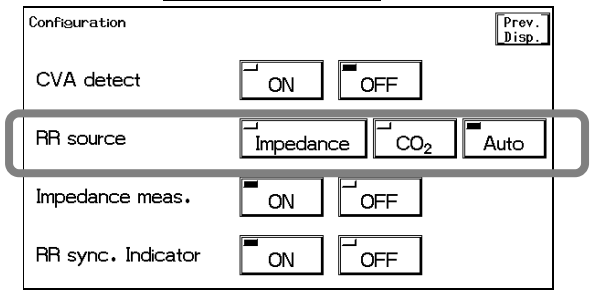


2. **Select ON or OFF.**
   ON will generate an alarm and display a message when CVA is detected.
   OFF will not perform CVA detection.

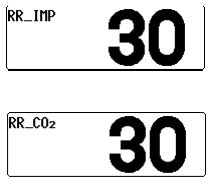
Respiration Source

The parameter to measure respiration rate and apnea time can be selected from impedance, CO_2, or automatic. RR and apnea alarm will be generated according to the selected parameter. These will be also stored as graphic trend or tabular trend.

1. Press the [Configuration] key to display configuration menu for RR source selection.



2. Select the parameter.



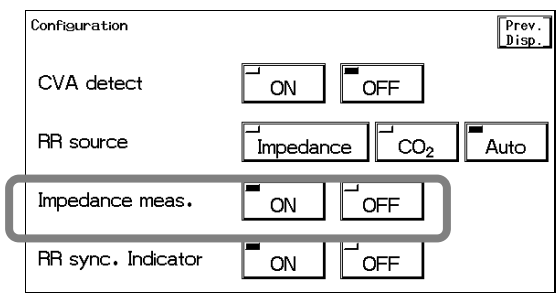
[Impedance] will measure respiration rate from impedance respiration curve. The numeric value will be indicated as "RR_IMP" in the respiration parameter key.
[CO_2] will measure respiration rate from CO_2 waveform. The numeric value will be indicated as "RR_CO_2" in the respiration parameter key.

[Auto] will automatically select the parameter to measure the respiration rate with the priority order of CO_2＞impedance.

Impedance Respiration Measurement

The respiration measurement using the impedance method conducts high-frequency and weak current between the ECG electrodes attached to the patient, and measures the potential difference between the electrodes caused by thoracic movement using the synchronous rectification system. For a patient using the adaptive (minute ventilation) pacemaker, the pacemaker measurement signal and the high-frequency current of this equipment interferes with each other which causes incorrect respiration measurement.
If the patient is using an adaptive (minute ventilation) pacemaker, set the impedance respiration measurement OFF.

1. Press the [Configuration] key to display the setup menu to set the impedance respiration measurement.



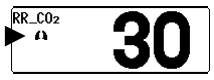
2. Select [ON] or [OFF].

[ON] will perform standard impedance respiration measurement.
[OFF] will stop the impedance respiration measurement and will not display the impedance respiration waveform and RR. A high frequency electric discharge which is a measurement signal will be also ceased.

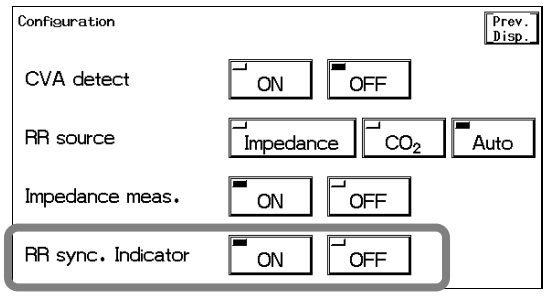
RR Synchronization Mark

The RR mark synchronized to impedance respiration or CO_2 waveform will be displayed inside the parameter key.

RR Mark



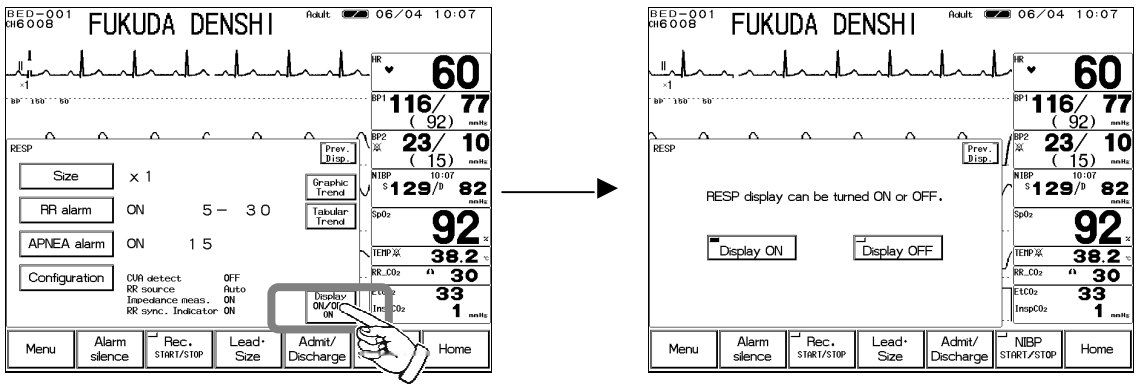
1. **Press the [Configuration] key to display the setup menu for setting the RR synchronized Mark.**



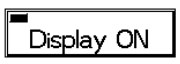
2. **Select [ON] or [OFF].**
   [OFF] will not display the synchronization mark.
   [ON] will display the synchronization mark.

ON/OFF of Parameter Display

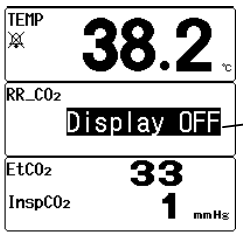
1. **Press the [Display ON/OFF] key. The confirmation display for ON/OFF of RESP display will appear.**



2. **Select [Display ON] or [Display OFF].**



Pressing the [Display ON] key will display the waveform and numeric data.
Pressing the [Display OFF] key will not display the waveform and numeric data.



The Display OFF message will be displayed inside the parameter key.

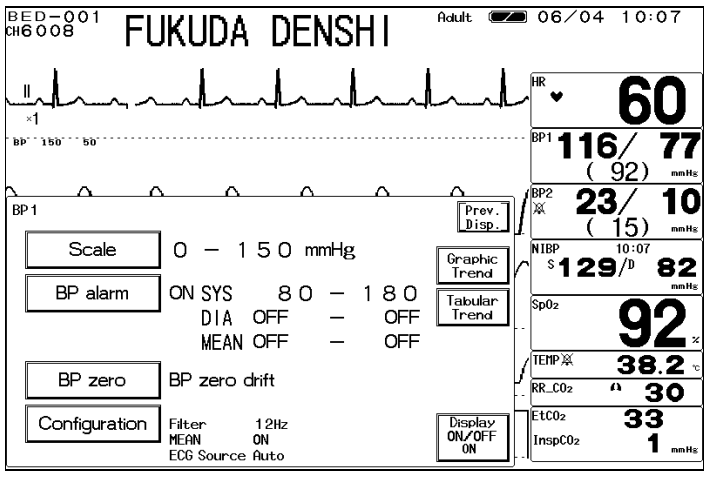
When ECG electrodes are attached to the patient with the respiration display set to OFF, the respiration waveform and numeric data will be automatically displayed after 30 seconds.

⚠CAUTION	When waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF.

NOTE	If RR source is set to other than [Impedance], selecting [Display OFF] will display CO_2_RR for the RESP parameter key.

— Invasive Blood Pressure (BP1, BP2) —

This menu allows setup of the measurement condition for BP1, BP2.



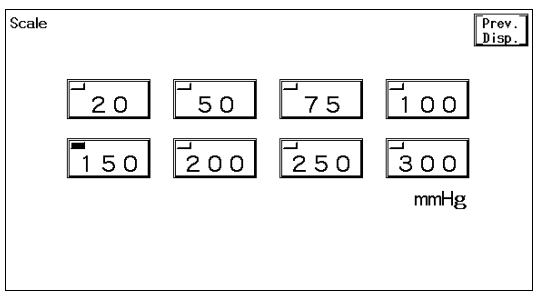
Scale : Selects the scale for BP waveform display.
BP Alarm : Sets the upper and lower alarm limit of systolic, diastolic, mean blood pressure and ON/OFF of the alarm.
BP Zero : Performs zero balance.
Configuration : Sets the BP monitoring condition.

⚠CAUTION	When the main power is turned ON, the BP value will not be displayed until zero balance is performed. Make sure to perform the zero balance.

BP Scale (BP1, BP2)

1. Press the [Scale] key to display the BP scale setup menu.

Select the full scale for displaying and recording.



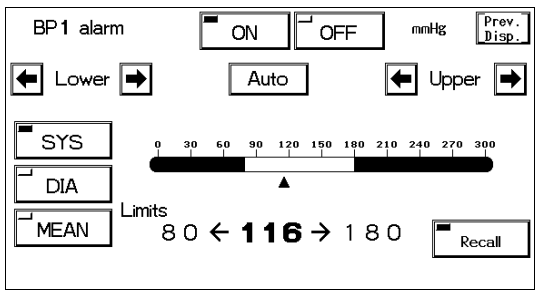
2. Select the scale.

Select from [20], [50], [75], [100], [150], [200], [250], [300] (mmHg).
When the measurement unit is kPa, select from [4], [8], [12], [16], [20], [24], [32], [40] (kPa).

⚠CAUTION	For telemetry transmission, BP waveform with a scale above the programmed scale can not be properly transmitted. Set the BP waveform below the programmed scale.

BP Alarm (BP1, BP2)

1. **Press the [BP Alarm] key to display the alarm setup menu.**
   Select ON/OFF of BP alarm and set the upper and lower alarm limit for systolic (SYS), diastolic (DIA), and mean (MEAN) BP.

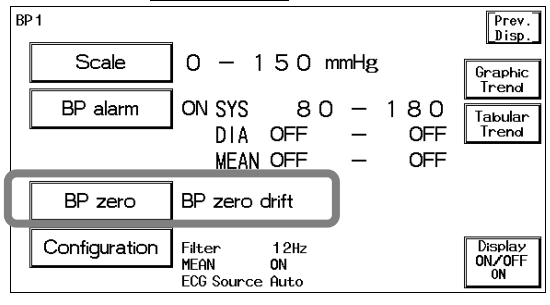


The alarm value is to be set for each measurement unit. (mmHg / kPa)
The adjustable increment for upper and lower limit changes from 50mmHg / 7kPa.
mmHg : 0～50mmHg / 2mmHg increment
55～300mmHg / 5mmHg increment
kPa : 0～7kPa / 0.2kPa increment
7.5～40.0kPa / 0.5kPa increment

Key	*Item*	*Description*
ON OFF	Individual Alarm	Selecting [ON] will generate BP alarm. Selecting [OFF] will not generate BP alarm.
SYS DIA MEAN		Select from SYS (systolic BP), DIA (diastolic BP), MEAN (mean BP).
← Lower →	Lower Alarm Limit	Sets the lower alarm limit (0～295mmHg/0～39.5kPa). Setting a value equal to or below 0mmHg/0kPa will turn OFF the alarm.
← Upper →	Upper Alarm Limit	Set the upper limit (2～300 mmHg/0.2～40.0kPa). Setting a value equal to or above 300 mmHg/40.0kPa will turn OFF the alarm.
Auto	Automatic Setup	Automatically sets the upper limit to ＋40mmHg/＋5.5kPa, and the lower limit to －20mmHg/－2.5kPa to the current value.

Zero Balance of Pressure Lines (BP1, BP2)

1. **Open the three-way cock of the pressure transducer to air.**
2. **Press the [BP zero] key.**



Verify the BP waveform is positioned at zero, and “0” is displayed for the BP value. A message, “BP zero complete” will be displayed when the procedure is complete. A message, “BP zero failed” will be displayed when the process fails. The three-way cock may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
A message, “BP zero drift” will be displayed when the interface cable is not connected. Check if the cable is firmly connected.

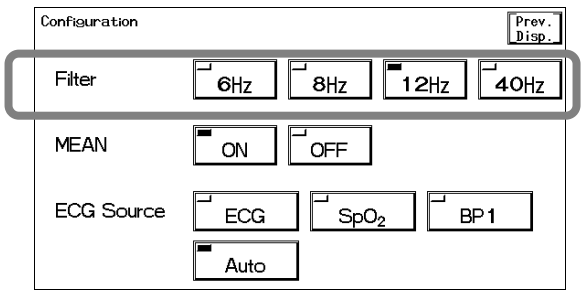
3. **Close the three-way cock when the zero balance is complete.**

⚠CAUTION	Each time the blood pressure transducer or tubing is replaced, the zero balance procedure is required to ensure accurate measurements.

Filter Selection (BP1, BP2)

An artifact may interfere on the BP waveform depending on the combination of BP measurement circuit.
Select an appropriate filter from the low-pass filter of 6Hz, 8Hz, 12Hz, 40Hz.

1. **Press the [Configuration] key to display the setup menu for selecting a filter.**

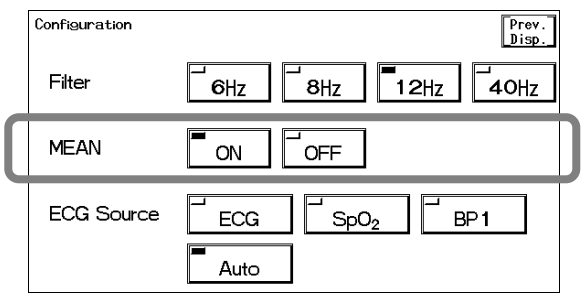


2. **Select the filter.**
   Select an appropriate filter from [6Hz], [8Hz], [12Hz], [40Hz].

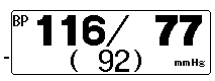
Mean BP Display (BP1, BP2)

The ON/OFF of mean BP display can be selected.

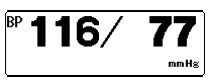
1. **Press the [Configuration] key to display the setup menu for selecting ON/OFF of mean BP display.**



2. **Select [ON] or [OFF].**



Selecting [ON] will display the mean BP.



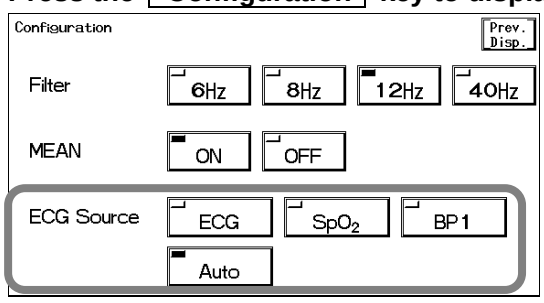
Selecting [OFF] will not display the mean BP.

⚠CAUTION	If the mean BP display is set to OFF, the mean BP alarm will not be generated. Also, the mean BP will not be displayed on the tabular trend. Be cautious when setting the mean BP display OFF.

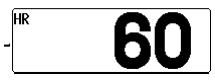
ECG Source (BP1)

The HR/PR source to display on the home display can be selected.
The alarm will be generated based on this selection.
The graphic trend and tabular trend will be also stored based on this selection.
BP2 can not be set as ECG source.

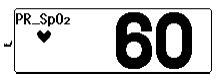
1. Press the Configuration key to display the setup menu to set the ECG source.



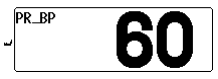
2. Select a parameter.



Selecting ECG will measure the HR from ECG.
"HR" will be displayed inside the parameter key.



Selecting SpO_2 will measure the PR from SpO_2.
"PR_SpO_2" will be displayed inside the parameter key.

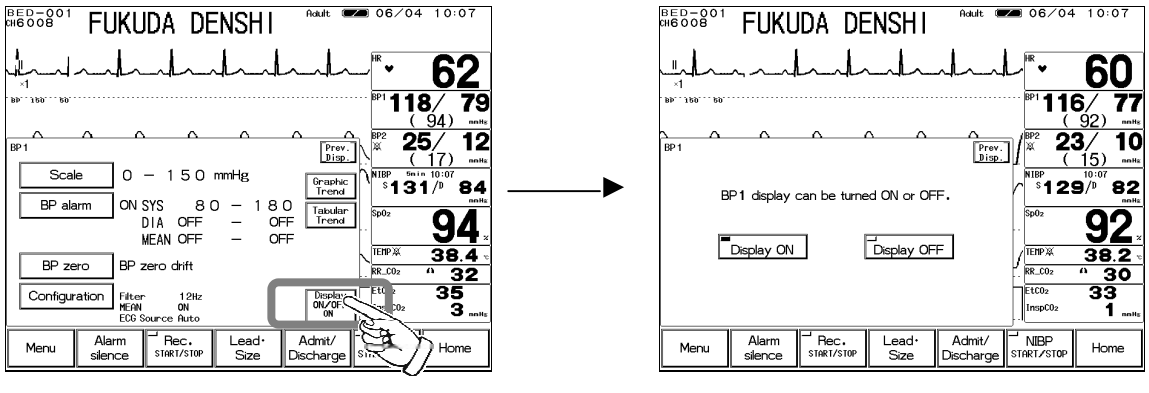


Selecting BP1 will measure the PR from BP1.
"PR_BP" will be displayed inside the parameter key.

Selecting Auto will automatically set the measurable HR source in the priority of ECG＞SpO_2＞BP1.

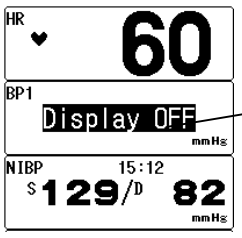
ON/OFF of Parameter Display

1. **Press the [Display ON/OFF] key. The confirmation display for ON/OFF of BP display will appear.**



2. **Select [Display ON] or [Display OFF].**

Pressing the [Display ON] key will display the waveform and numeric data.
Pressing the [Display OFF] key will not display the waveform and numeric data.

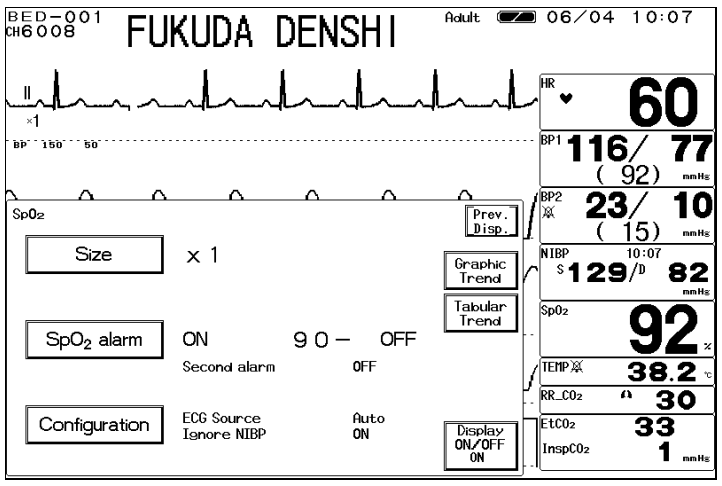


The Display OFF message will be displayed inside the parameter key.

⚠CAUTION	✍ When waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF. ✍ If BP is set as ECG source, the pulse rate will also not be displayed.

— SpO_2 —

This menu allows setup of the measurement condition for the SpO_2.



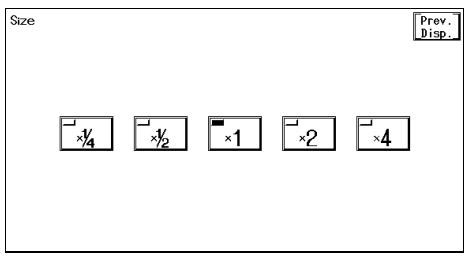
Size : Sets the waveform size for SpO_2 waveform display.
SpO_2 Alarm : Sets ON/OFF of alarm, upper and lower alarm limit, and SEC alarm.
Configuration : Sets the SpO_2 monitoring configuration.

⚠CAUTION	Take the following precautions when monitoring over long periods of time. ✍ To avoid skin rash or low-temperature burn, it is recommended to change the measurement position several times a day. Be especially careful when continuously using on neonates, infants, or patients with peripheral circulatory disturbance. ✍ Direct sunlight to the sensor area can cause a measurement error. Place a black or dark cloth over the sensor in these environments. When not measuring, unplug the relay cable and sensor from the SpO_2 connector. Otherwise, the outside light may affect to falsely display measurements.

⚠CAUTION	✍ The DS-100A is intended for use on finger of adults weighing over 40 kg (approximate). Do not use them on children or neonates. Also do not apply them on the thumb or foot. ✍ The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient. ✍ The DS-100A is not designed for long term use. Remove the sensor every 4 hours. If any inhibition is detected in tissue blood flow, replace it or move the sensor to another finger. ✍ Measuring on a limb with NIBP cuff, arterial catheter, or intracatheter may result in incorrect measurement. ✍ Do not secure the adhesive tape too tight as it may obstruct the blood flow.

SpO_2 Waveform Size

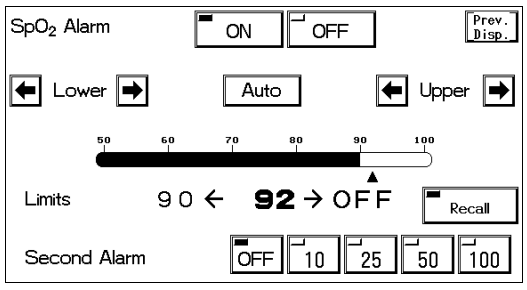
1. **Press the [Size] key to display the SpO_2 waveform size setup menu.**
   Select the waveform size for displaying and recording.



2. **Select the waveform size.**
   Select the size from [×1/4], [×1/2], [×1], [×2], [×4].

SpO_2 Alarm

1. **Press the [SpO_2 Alarm] key to display the alarm setup menu.**
   Select ON/OFF of SpO_2 alarm, and set the upper and lower alarm limit.
   Also, when the SpO_2 value is unstable around the lower alarm limit, the frequently generated alarm can be corrected by setting the SEC (second) alarm function.



Reference Refer to "4. Monitoring Setup SpO_2 SEC Alarm Setup" for details of SEC alarm setup procedure.

The upper and lower limits can be set in 1% increment.

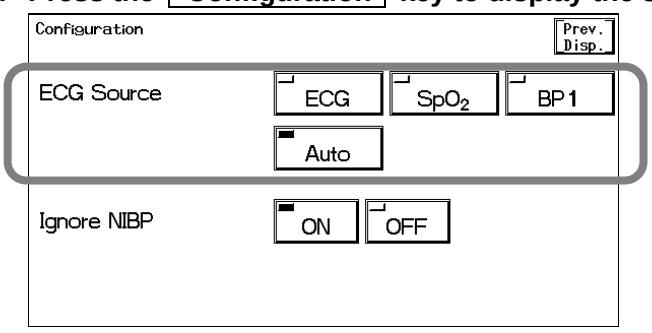
Key	***Item***	***Description***
[ON] [OFF]	Individual Alarm	Selecting [ON] will generate the SpO_2 alarm. Selecting [OFF] will not generate the SpO_2 alarm.
[←] Lower [→]	Lower Alarm Limit	Sets the lower alarm limit (50～99%). Setting a value 50% or below will turn OFF the alarm.
[←] Upper [→]	Upper Alarm Limit	Sets the upper alarm limit (52～100%). Setting a value 100% or above will turn OFF the alarm.
[Auto]	Automatic Setup	Automatically sets the upper limit to OFF, and the lower limit to 95% to the current value.

NOTE	Whether to use the SEC (second) alarm function and its threshold selection should be based on the patient's clinical indication portent and medical evaluation.

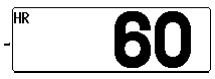
ECG Source

The HR/PR source to display on the home display can be selected.
The alarm will be generated based on this selection.
The graphic trend and tabular trend will be also stored based on this selection.

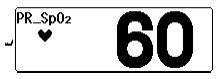
1. **Press the [Configuration] key to display the setup menu to set the ECG source.**



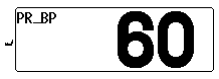
2. **Select a parameter.**



Selecting [ECG] will measure the HR from ECG.
"HR" will be displayed inside the parameter key.



Selecting [SpO_2] will measure the PR from SpO_2.
"PR_SpO_2" will be displayed inside the parameter key.



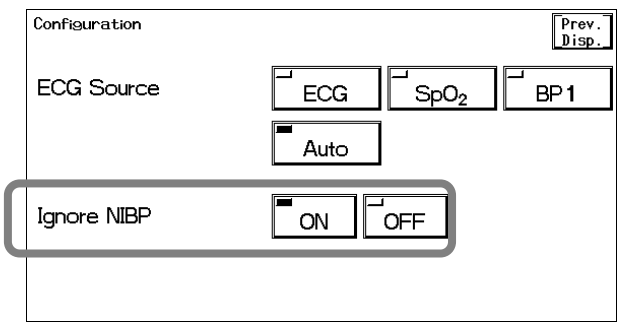
Selecting [BP1] will measure the PR from BP1.
"PR_BP" will be displayed inside the parameter key.

Selecting [Auto] will automatically set the measurable ECG source in the priority of ECG＞SpO_2＞BP1.

SpO_2 Alarm during NIBP Measurement (Ignore NIBP)

This setup is to be made when the SpO_2 sensor and NIBP cuff is placed on the same limb for measurement.
During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of the SpO_2 value and PR, and may generate an improper alarm.
Selecting [OFF] will not generate the alarm until the NIBP measurement is complete. Similarly, when the HR source is set as [SpO_2], the PR alarm will not be generated during NIBP measurement.

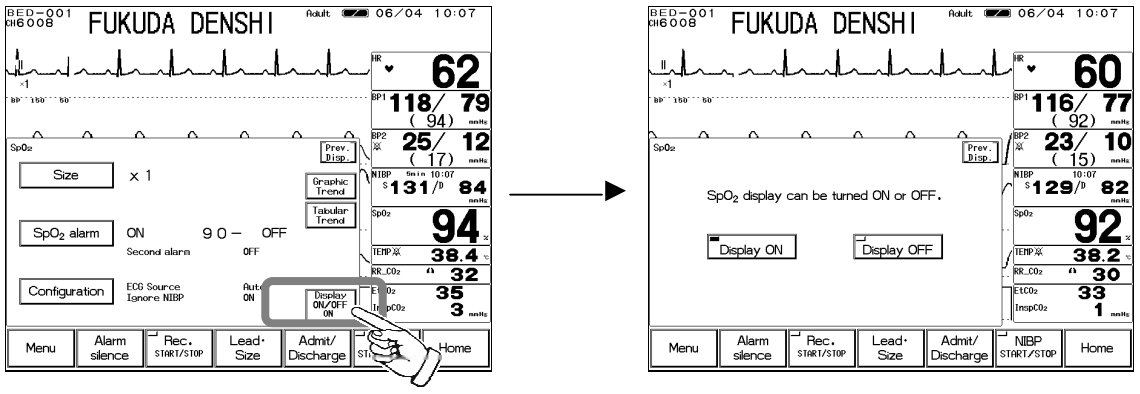
1. **Press the [Configuration] key to display the setup menu for setting "Ignore NIBP".**



2. **Select [ON] or [OFF].**
[ON] will generate the alarm during NIBP measurement.
[OFF] will not generate the SpO_2/PR alarm during NIBP measurement.

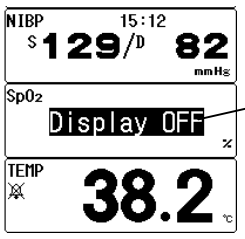
ON/OFF of Parameter Display

1. **Press the [Display ON/OFF] key. The confirmation display for ON/OFF of SpO_2 display will appear.**



2. **Select [Display ON] or [Display OFF].**

Pressing the [Display ON] key will display the waveform and numeric data.
Pressing the [Display OFF] key will not display the waveform and numeric data.



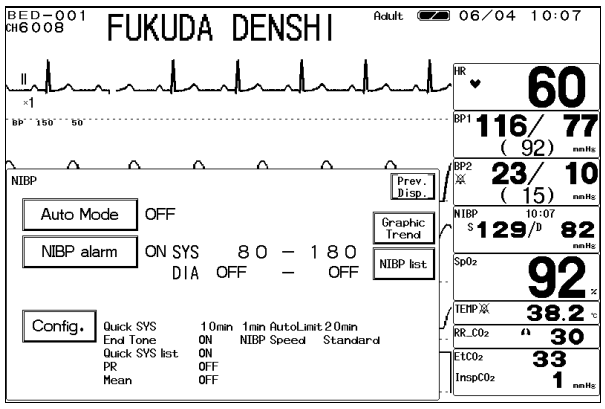
The Display OFF message will be displayed inside the parameter key.

When SpO_2 sensor is attached to the patient with the SpO_2 display set to OFF, and SpO_2 can be measured for 30 seconds, the SpO_2 waveform and numeric data will be automatically displayed.

⚠CAUTION	✍ When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF. ✍ If SpO_2 is set as ECG source, the pulse rate will also not be displayed.

— Non-Invasive Blood Pressure —

This menu allows the setup of NIBP monitoring condition.



Auto Mode : Sets the automatic interval measurement and starts the 1-minute interval measurement and Quick SYS measurement.

NIBP Alarm : Sets the ON/OFF of NIBP alarm and upper / lower limit of systolic, diastolic, and mean BP.

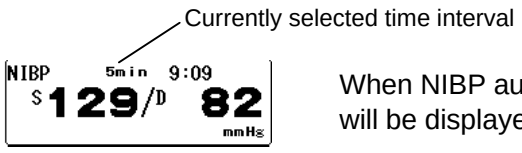
Configuration : Sets the NIBP monitoring configuration.

⚠CAUTION	For the following situation, measurements will be terminated. ✍ When the measurement time has exceeded 120 seconds for adult, 90 seconds for child, 60 seconds for neonate. ✍ When the inflation value has exceeded 300mmHg for adult, 200mmHg for child, 150mmHg for neonate.

⚠CAUTION	If used with the incorrect patient type, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to child or neonate causing a dangerous situation to the patient.

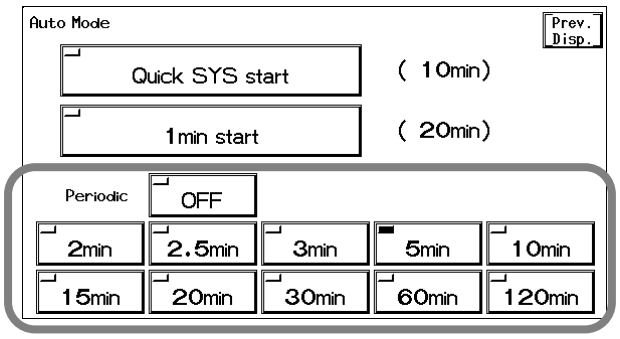
NIBP Automatic Measurement

Non-invasive blood pressure can be measured automatically at selected time intervals. If Quick SYS measurement is performed during the NIBP automatic measurement, the automatic measurement will automatically resume when Quick SYS measurement completes.



When NIBP automatic measurement is set, the set interval time will be displayed inside the parameter key.

1. **Press the Auto Mode key to display the measurement interval setup menu for the automatic measurement.**



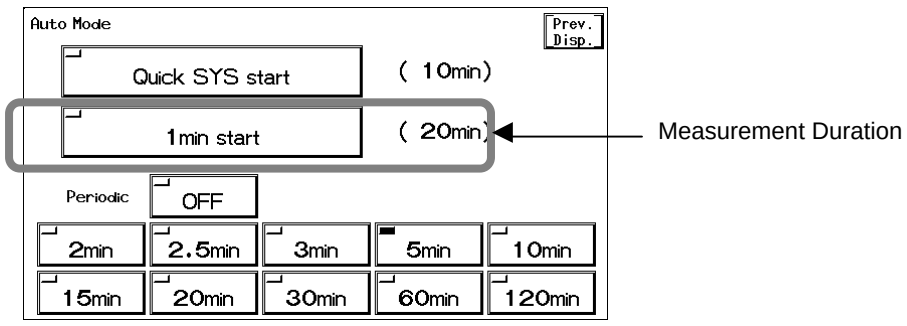
2. **Select an interval time.**
   Select from [2 min] / [2.5 min] / [3 min] / [5 min] / [10 min] / [15 min] / [20 min] / [30 min] / [60 min] / [120 min].
   Select [OFF] if not performing the interval measurement.

   The measurement time will be the integral multiple of the selected interval time beginning with 0 minute.
   Ex.) If the present time is 13:14, the measurement time will be as follows for each interval time.
   2 min. : 13:16, 13:18, 13:20, . . .
   2.5 min. : 13:15, 13:17:30, 13:20, . . .
   3 min. : 13:15, 13:18, 13:21, . . .
   5 min. : 13:15, 13:20, 13:25, . . .

NIBP 1-Minute Interval Measurement

The 1-minute interval measurement will automatically stop after 10 minutes or 20 minutes and returns to the previous interval mode setup.

1. **Press the [Auto Mode] key to display the measurement interval setup menu to start the 1-minute interval measurement.**



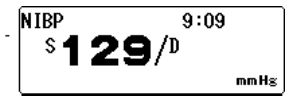
2. **Press the [1min Start] key to start the 1-minute interval measurement.**
   Pressing the [NIBP START/STOP] key will not stop the 1-minute interval measurement.
   To cancel the measurement, press the [1min Start] key again.

   The measurement duration of 1-minute interval measurement can be selected on the “1min Auto” of the NIBP configuration menu.
   [10min.] will automatically stop the 1-minute interval measurement after 10 minutes and returns to the previous interval mode setup.
   [20min.] will automatically stop the 1-minute interval measurement after 20 minutes and returns to the previous interval mode setup.

⚠CAUTION	✍ The 1-minute interval measurement will always start from 00 second. Pressing the [1min Start] key will start the measurement from the next 00 second. ✍ The 1-minute interval measurement will automatically stop after 10 minutes or 20 minutes and returns to the previous interval mode setup. The selection of [10min] / [20min] can be made on the NIBP configuration menu. (Refer to “1-Minute Measurement Duration” of this section”

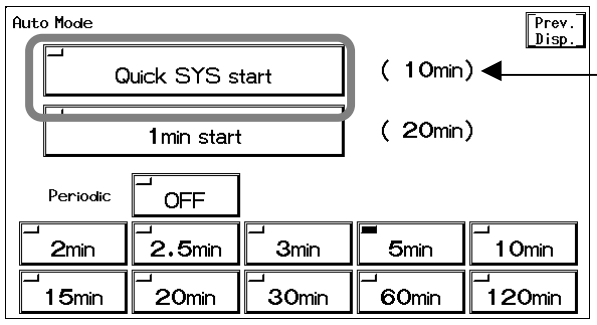
Quick SYS Start

The NIBP measurement can be continuously performed for 3 min. / 5 min. / 10 min.
If any abnormality on the cuff hose, etc. is found during the Quick SYS, the continuous measurement will be ceased.



Only the systolic blood pressure will be measured and displayed.

1. **Press the [Auto Mode] key to display the measurement interval setup menu to start the Quick SYS.**



Measurement Duration

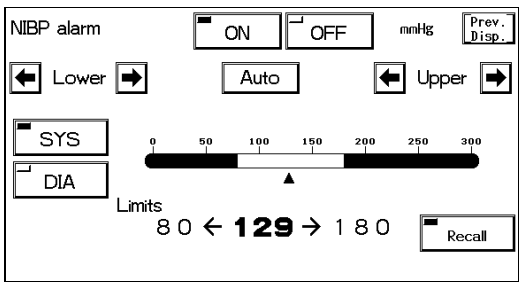
2. **Start the Quick SYS.**
   Pressing the [Quick SYS Start] key will start the continuous measurement.
   To cease the measurement, press the [NIBP START/STOP] key, or press again the [Quick SYS Start] key.

The duration of continuous measurement can be selected on the “Quick SYS” of the NIBP configuration menu.
The continuous measurement will automatically cease after the selected duration from [3min], [5min], or [10min].

⚠CAUTION	The alarm function will be ineffective for the BP value measured by Quick SYS regardless of the ON/OFF selection of NIBP alarm.

NIBP Alarm

1. **Press the [NIBP Alarm] key to display the alarm setup menu.**
   Set ON/OFF of NIBP alarm, upper and lower alarm limits of systolic (SYS), diastolic (DIA), mean (MEAN) NIBP.



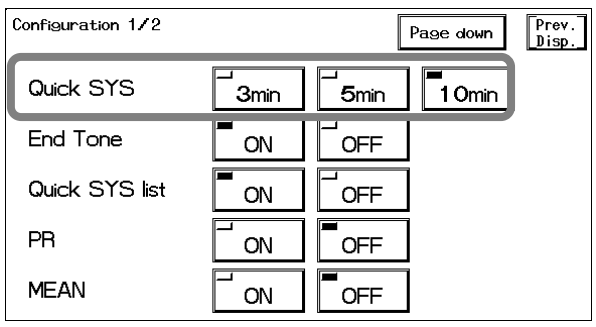
Set the alarm value for each measurement unit (mmHg / kPa).
The upper and lower limit can be set in 5mmHg / 0.5kPa increment.

Key	Item	Description
ON OFF	Individual Alarm	Selecting ON will generate the NIBP alarm. Selecting OFF will not generate the NIBP alarm.
SYS DIA MEAN		Select from SYS (systolic BP), DIA (diastolic BP), or MEAN (mean BP)
Lower	Lower Alarm Limit	Sets the lower alarm limit (10～295mmHg/1.5～39.5kPa). Setting a value 10mmHg/1.5kPa or below will turn OFF the alarm.
Upper	Upper Alarm Limit	Sets the upper limit (15～300mmHg /2.0～40.0kPa). Setting a value 300bpm/40.0kPa or above will turn OFF the alarm.
Auto	Automatic Setup	Automatically sets the upper limit to ＋40mmHg/＋5.5kPa to the current value, and the lower limit to －20mmHg/－2.5kPa to the current value.

Quick SYS Measurement Duration

The duration of Quick SYS can be selected from 3 min., 5 min., or 10 min.
The long duration of continuous measurement may congest the blood stream of the measured location. Set the duration according to the patient condition.

1. **Press the Configuration key to display the NIBP configuration menu to set the Quick SYS.**

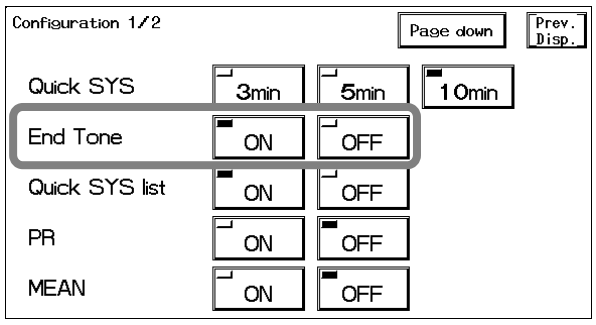


2. **Select the measurement duration.**
   Select an appropriate time from 3min, 5min, 10min.
   Quick SYS will automatically cease after the selected duration.

End of Measurement Tone

By selecting ON for the “End Tone”, a tone will be generated when the NIBP measurement completes.

1. **Press the [Configuration] key to display the NIBP configuration menu to set ON/OFF for the End Tone.**



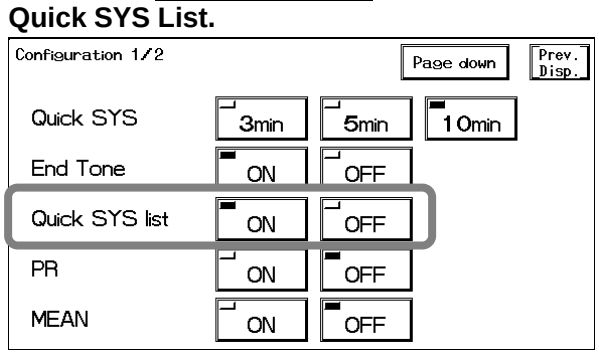
2. **Select [ON] or [OFF].**

[ON] will generate a tone when the measurement completes.
[OFF] will not generate a tone when the measurement completes.

Quick SYS List

The systolic blood pressure measured by Quick SYS can be included in the NIBP list.

1. **Press the [Configuration] key to display the NIBP configuration menu for setting the Quick SYS List.**



2. **Select [ON] or [OFF].**

Quick SYS

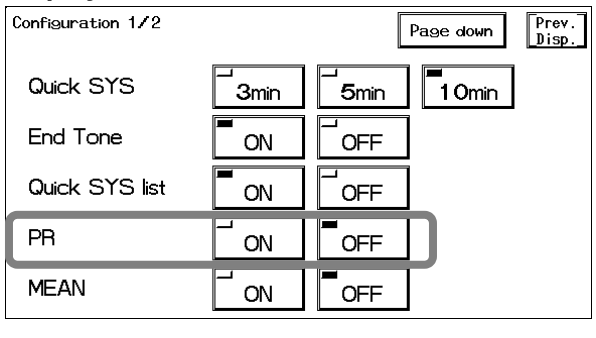
NIBP mmHg	HR	PR-SpO2	SpO2
128/	76	76	96
120/	76	76	96
129/	76	76	96
129/	76	76	96
129/	76	76	96
128/ 91	78	78	95
129/ 90	76	76	96
129/ 90	76	76	98
129/ 90	76	76	96
132/ 93	76	76	96

[ON] will include the systolic blood pressure value to NIBP list.
[OFF] will not include the systolic blood pressure value to NIBP list.

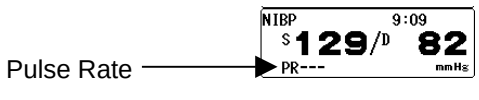
PR Display

The measured pulse rate can be displayed. This selection is for display only, and alarm function and tabular trend function will be ineffective.

1. **Press the [Configuration] key to display the NIBP configuration menu for setting the PR display.**



2. **Select [ON] or [OFF].**

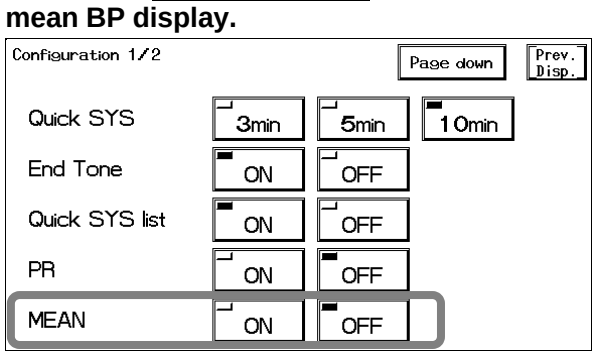


Selecting [ON] will display the pulse rate.
Selecting [OFF] will not display the pulse rate.

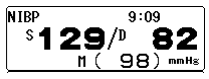
Mean BP Display

The ON/OFF of mean BP display can be selected.

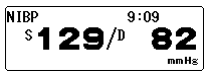
1. **Press the [Configuration] key to display the NIBP configuration menu for setting the mean BP display.**



2. **Select [ON] or [OFF].**



[ON] will display the mean BP.

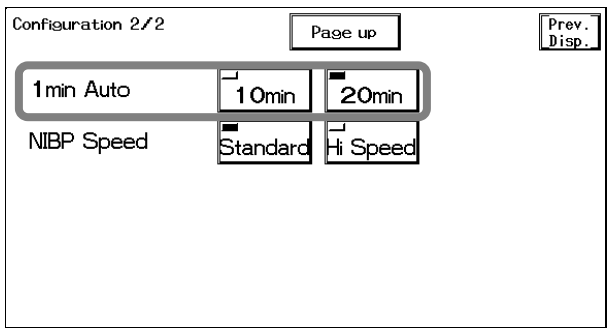


[OFF] will not display the mean BP.

1-Minute Measurement Duration

The duration for 1-minute measurement can be selected from 10 minutes or 20 minutes.
When the previous measurement is prolonged due to patient motion, etc, the cuff pressure release time until the next measurement will be shortened, and the measured location may congest. Be cautious when performing long duration of continuous measurement.

1. **Press the Configuration → Page Down keys to display the NIBP configuration menu for setting the 1-minute measurement duration.**

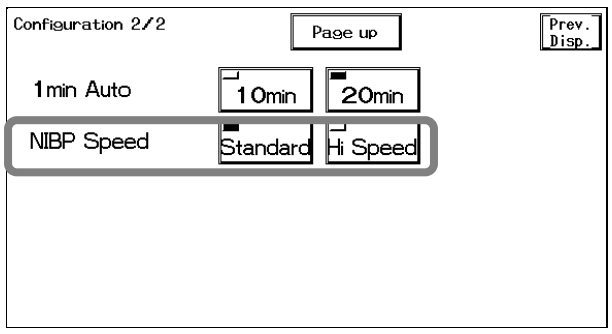


2. **Select the measurement duration.**
   Select an appropriate duration from 10min, 20min.
   The 1-minute measurement will automatically cease after the selected duration.

NIBP Speed

The NIBP cuff inflation speed can be selected from standard or high speed.

1. **Press the Configuration → Page Down keys to display the second page of the configuration menu.**

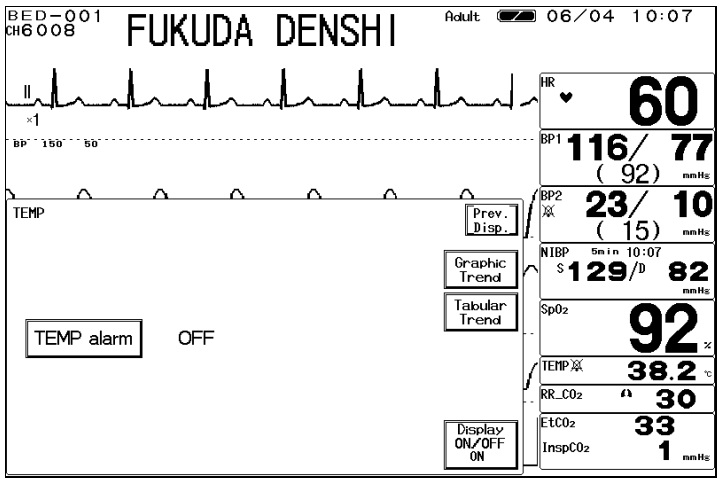


2. **Select the NIBP speed.**
   Select an appropriate speed from Standard or Hi Speed.
   When Standard is selected, it will take about 10 seconds to inflate to 300mmHg with 500cc tank connected.
   When Hi Speed is selected, it will take about 6 seconds to inflate to 300mmHg with 500cc tank connected. (for adult)
   When an adult cuff is wrapped around an arm with a space allowing one finger fitting in between the cuff and arm, the speed to inflate to 190mmHg is within 11 seconds for normal speed, and within 7 seconds for high speed.

NOTE	The NIBP speed setup is effective only when adult or child is selected for patient type. The NIBP speed for neonate will be fixed in spite of the speed selection.

― Temperature ―

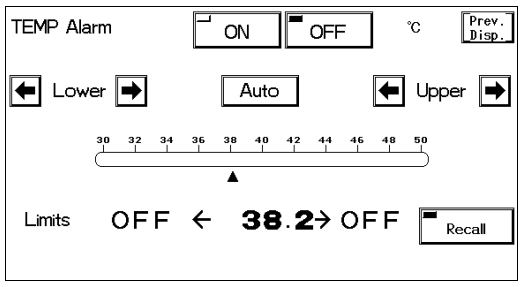
This menu allows the setup of the temperature monitoring condition.



TEMP Alarm　: Sets ON/OFF of temperature alarm, and upper and lower alarm limits.

Temperature Alarm

1. **Press the [TEMP Alarm] key to display the alarm setup menu.**
   Select ON/OFF of temperature alarm, and set the upper and lower alarm limit.

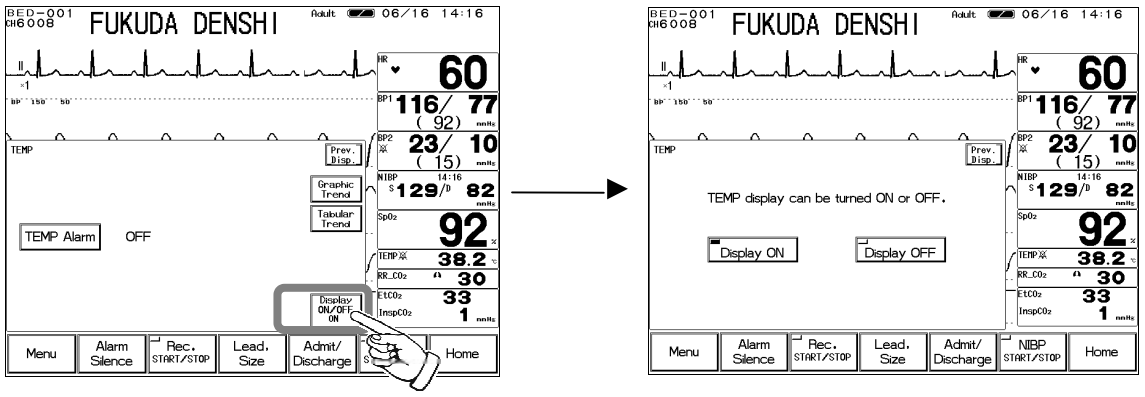


The alarm limit can be set for each measurement unit (?C / ?F).
The upper and lower limit can be set in increments of 0.5?C / 0.5?F.

Key	*Item*	*Description*
ON OFF	Individual Alarm	Selecting [ON] will generate the TEMP alarm. Selecting [OFF] will not generate the TEMP alarm.
← Lower →	Lower Alarm Limit	Sets the lower alarm limit (30.0～49.0?C / 86.0～120.0?F). Setting a value 30.0?C / 86.0?F or below will turn the alarm OFF.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (31.0～50.0?C / 88.0～122.0?F). Setting a value 50.0?C / 122.0?F or above will turn the alarm OFF.
Auto	Automatic Setup	Automatically sets the upper limit to ＋2.0?C /＋3.0?F to the current value, and lower limit to－2?C /－3.0?F to the current value.

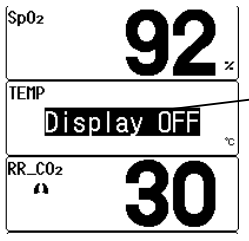
ON/OFF of Parameter Display

1. **Press the Display ON/OFF key. The confirmation display for ON/OFF of TEMP display will appear.**



2. **Select Display ON or Display OFF.**

Pressing the Display ON key will display the numeric data.
Pressing the Display OFF key will not display the numeric data.

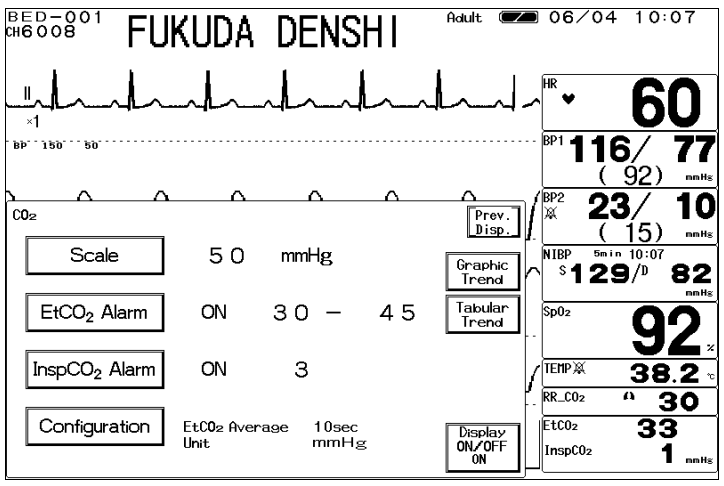


The Display OFF message will be displayed inside the parameter key.

⚠CAUTION	When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF.

— CO_2 Concentration — (DS-7141)

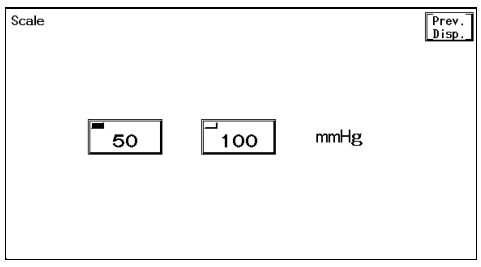
This menu allows setup of CO_2 concentration measurement.



Scale : Sets the CO_2 waveform scale.
$EtCO_2$ Alarm : Sets ON/OFF of $EtCO_2$ alarm, and upper and lower alarm limits.
$InspCO_2$ Alarm : Sets ON/OFF of $InspCO_2$ alarm and upper alarm limit.
Configuration : Sets CO_2 monitoring conditions.

CO_2 Scale

1. **Press the [Scale] key to display the scale setup menu.**

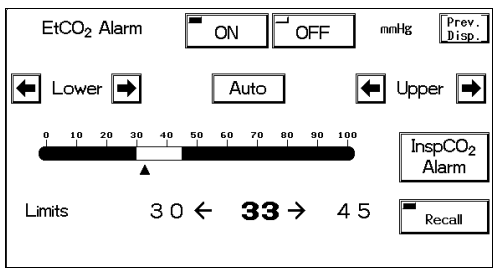


＜Scale setup menu for the unit in mmHg＞

2. **Select the CO_2 waveform scale for displaying and recording.**
   For the measurement unit in mmHg, select the scale from [50], [100].
   For the measurement unit in kPa and %, select the scale from [4], [8], [10].

$EtCO_2$ (End-Tidal CO_2) Alarm

1. **Press the [$EtCO_2$ Alarm] key to display the alarm setup menu.**



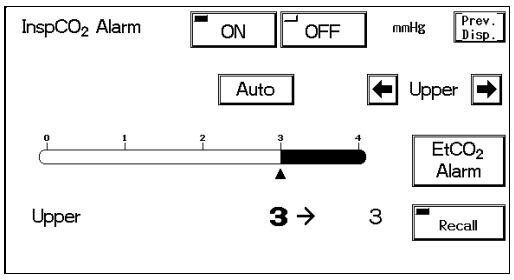
Select ON/OFF of $EtCO_2$ alarm, and set the upper and lower alarm limits.
Set the alarm condition for each measurement unit (mmHg / kPa / %).
Upper and lower alarm limits can be set in increments of 1mmHg, 0.1kPa, 0.1%.

NOTE	$EtCO_2$ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.

Key	Item	Description
ON OFF	Individual Alarm	Selecting ON will generate the $EtCO_2$ alarm. Selecting OFF will not generate the $EtCO_2$ alarm.
← Lower →	Lower Alarm Limit	Sets the lower alarm limit (1～98mmHg, 0.1～13.1kPa, 0.1～13.1%). Setting a value equal to or below 1mmHg, 0.1kPa, 0.1% will turn the alarm OFF.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (3～100mmHg, 0.4～13.3kPa, 0.3～13.3%). Setting a value equal to or above 100mmHg, 13.3kPa, 13.3% will turn the alarm OFF.
Auto	Automatic Setup	Automatically sets the upper alarm limit to ＋10mmHg, ＋1.3kPa, ＋1.3% to the current value, and the lower alarm limit to －10mmHg, －1.3kPa, －1.3% to the current value.

$InspCO_2$ (Inspiratory CO_2) Alarm

1. Press the InspCO₂ Alarm key to display the alarm setup menu.



Select ON/OFF of $InspCO_2$ alarm, and set the upper alarm limit.
Set the alarm condition for each measurement unit (mmHg / kPa / %).
Upper alarm limit can be set in increments of 1mmHg, 0.1kPa, 0.1%. Lower alarm limit can not be set.

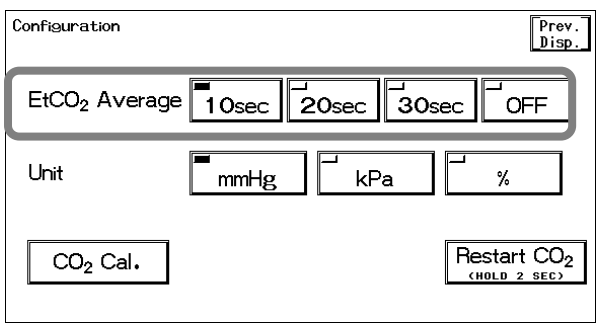
NOTE	$InspCO_2$ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.

Key	Item	Description
ON OFF	Individual Alarm	Selecting ON will generate the $InspCO_2$ alarm. Selecting OFF will not generate the $InspCO_2$ alarm.
← Upper →	Upper Alarm Limit	Sets the upper alarm limit (1～4mmHg, 0.1～0.4kPa, 0.1～0.4%). Setting a value equal to or above 4mmHg, 0.4kPa, 0.4% will turn the alarm OFF.
Auto	Automatic Setup	Automatically sets the upper alarm limit to ＋3mmHg, ＋0.4kPa, ＋0.4% to the current measurement.

$EtCO_2$ Average Duration

The duration to average the $EtCO_2$ value can be selected from 10 sec., 20 sec., 30 sec., or OFF.

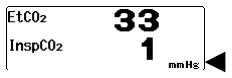
1. **Press the [Configuration] key to display configuration menu for $EtCO_2$ average duration selection.**



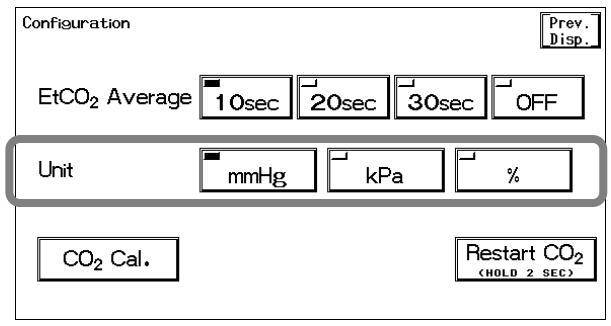
2. **Select the average duration.**
   Select the duration to average the $EtCO_2$ value from [10sec], [20sec], [30sec].
   If [OFF] is selected, $EtCO_2$ value for each respiration will be displayed.
   As the $EtCO_2$ value display is updated each second, $EtCO_2$ value for each respiration can not be displayed if respiration rate is above 60 Bpm.

Measurement Unit

The measurement unit can be selected from mmHg, kPa, or %.



Measurement Unit

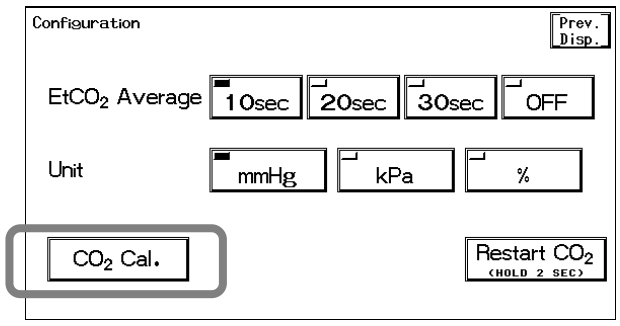


1. **Press the [Configuration] key to display the configuration menu for measurement unit selection.**
2. **Select the measurement unit from [mmHg], [kPa], [%].**
   The graphic trend and tabular trend will be displayed with the selected measurement unit.
   If the measurement unit is changed frequently, the continuity of the graphic trend and tabular trend may be lost.
   When the measurement unit is changed, make sure to set the alarm condition for that unit. The alarm setup is necessary for each measurement unit.

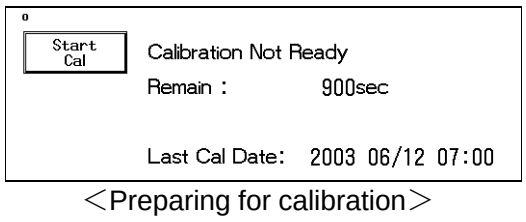
CO_2 Calibration

CO_2 calibration can be performed using calibration gas. Calibration should be conducted every 6 months or when any measurement error is found.

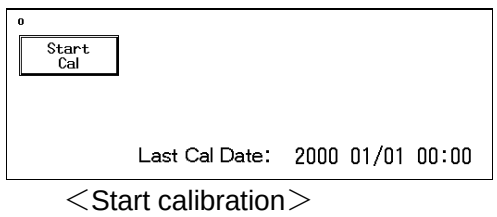
1. **Press the [Configuration] key to display the configuration menu for [CO_2 Cal.] key display.**



2. **Press the [CO_2 Cal.] key to display the calibration menu.**
   Due to precision matter, CO_2 calibration can not be started until 20 minutes has elapsed after the power is turned ON.
   During this time, [Start Cal] key will be displayed in gray which indicates that the key is ineffective.
   The message, "Calibration not ready" and the remaining time for preparation will be displayed.

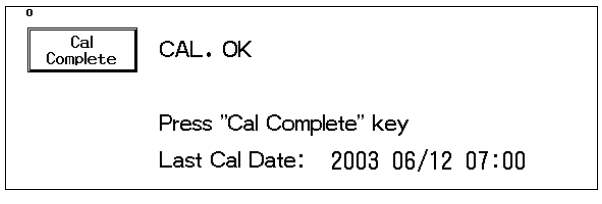


＜Preparing for calibration＞



＜Start calibration＞

3. **Press the [Start Cal] key and conduct calibration according to the displayed messages.**
4. **The message, "Feed CAL. GAS" will be displayed. Press the injection button to inject the calibration gas.**
5. **The message, "Calc. Gas can be removed" will be displayed. Stop pressing the injection button to cease the injection.**
6. **The message, "CAL. OK" will be displayed. "Last Cal. Date" will be updated to the current date.**
   If any of the following messages is displayed, start the procedure again from step 2.
   "CAL. error", "CAL GAS error", "Auto Zero fail", "No stable gas flow", "CAL. failure"



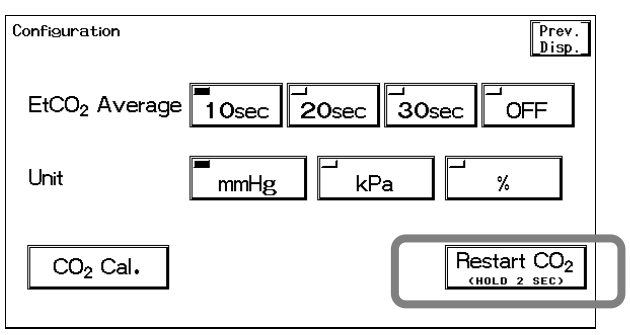
7. **Press the [Cal Complete] key to end the calibration.**

⚠CAUTION	✍ Perform calibration after 20 minutes from turning ON the power of the DS-7100 system. ✍ Do not disconnect the sampling tube during calibration. If disconnected, calibration will cease.

Restarting the CO_2 Unit

The sampling tube will cease functioning when erroneous condition such as blocking of exhaust tube, sampling tube or nasal prong is detected. When the pump ceases functioning, "Check CO_2 unit" message will be displayed. After resolving the problem, press the Restart CO_2 key and restart the measurement.

1. **Press the Configuration key to display the configuration menu for Restart CO_2 key display.**



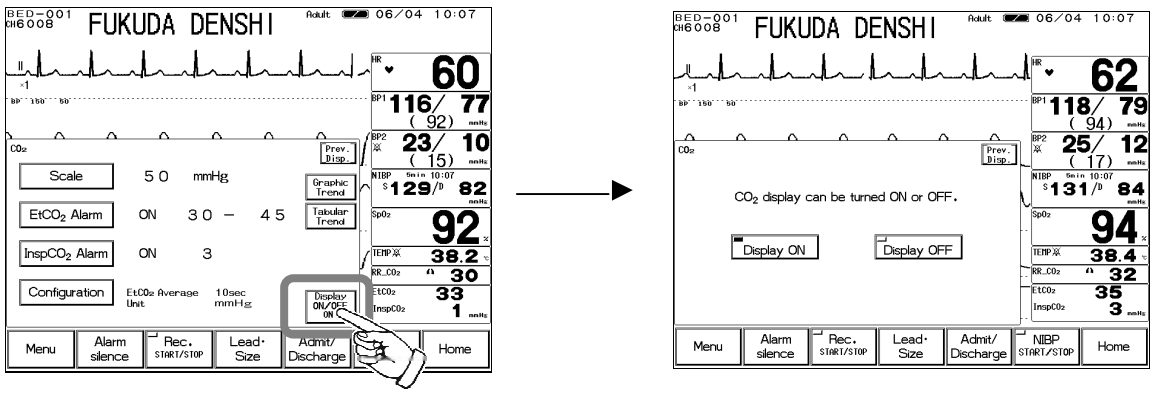
2. **Press the Restart CO_2 key for 2 seconds.**
   If the "Check CO_2 unit" message is not displayed, the Restart CO_2 key will not function.

3. **Check that the unit is restarted.**
   The sampling pump will start to function, and the "Check CO_2 unit" message will disappear. Check that the message has disappeared and the measurement data is displayed.

NOTE	If the "Check CO_2 unit" message does not disappear after restarting the unit, the replacement of CO_2 unit part may be necessary. Contact our service representative.

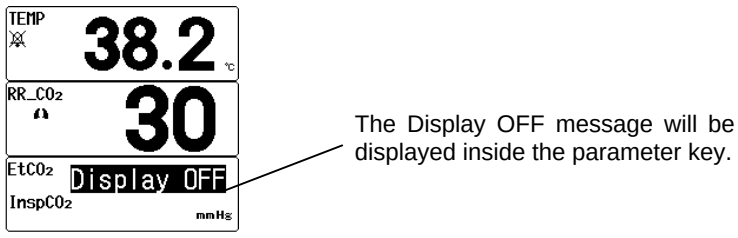
ON/OFF of Parameter Display

1. **Press the Display ON/OFF key. The confirmation display for ON/OFF of CO_2 display will appear.**



2. Select Display ON or Display OFF.

Pressing the Display ON key will display the waveform and numeric data.
Pressing the Display OFF key will not display the waveform and numeric data.



When filter line is attached to the patient with the CO_2 display set to OFF, and 2 or more respiration is detected within 30 seconds, the CO_2 waveform and numeric data will be automatically displayed.

⚠CAUTION	✍ When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend will be also set to OFF. ✍ If CO_2 is set as RR source, the pulse rate will also not be displayed.

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Chapter 7

Function

This chapter describes the functions such as arrhythmia analysis, trend, and recall.

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●Arrhythmia Type ••••••••••••••••••••••••••••2
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This section explains the arrhythmia analysis and alarm setup procedure.

Arrhythmia Definition

The arrhythmia detection is performed by learning the normal waveform of the patient and determining VPC by comparing the waveform (QRS pattern) and R-R interval of each heart beat. A pattern matching is performed with the VPC detected from R-R interval, QRS amplitude, QRS area, QRS polarity, etc., and determines as VPC after discriminating the noise and VPC.

●QRS Classification

The QRS analysis is performed by comparing with the learned waveform and QRS pattern matching.

N (Normal)	Normal QRS beat
V (VPC)	Ventricular Extrasystole
? (Undetermined beat)	Learning arrhythmia, or beat not matching the pattern
P (Pacing beat)	Pacing beat
F (Fusion beat)	Fusion beat of pacing and spontaneous beat
S (SVPC)	Supraventricular Extrasystole

●Arrhythmia Type

The alarm is generated according to the arrhythmia classification by the pattern or HR of normal QRS and VPC determined QRS.

Type	***Meaning***	***Detection Criteria***
ASYSTOLE	Cardiac Arrest	Cardiac arrest is detected for more than preprogrammed time.
VF	Ventricular Fibrillation	A random, rapid electrical activity of the heart is detected.
VT	Ventricular Tachycardia	9 or more continuous ventricular beats are detected. (HR: 140bpm / 120bpm or over)
SLOW_VT		9 or more continuous ventricular beats are detected. (HR: under 140bpm / 120bpm)
TACHY	Tachycardia	HR is over the upper alarm limit.
BRADY	Bradycardia	HR is below the lower alarm limit.
RUN	Consecutive VPC	Continuous VPC exceeding the preprogrammed value is detected.
COUPLET	Couplet Ventricular Extrasystole	2 continuous beats of VPC is detected.
PAUSE		Cardiac arrest of 1.5 seconds or more is detected.
BIGEMINY	Ventricular Bigeminy	QRS pattern of V-N-V-N-V-N is detected.
TRIGEMINY	Ventricular Trigeminy	QRS pattern of V-N-N-V-N-N is detected.
FREQUENT	Frequent VPC	VPC exceeding the preprogrammed value is detected within 1 minute.

Reference Refer to “8. System Configuration Ward Setup” for setup of HR reference for VT analysis.

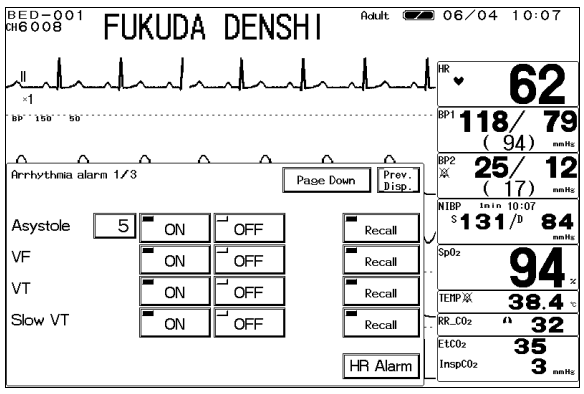
⚠WARNING	Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor. However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection. Therefore, physicians should make final decisions using manual recording, alarm recording and recall waveform for evaluation.

⚠CAUTION	For proper arrhythmia detection and ECG monitoring, verify proper electrode placement, lead selection, and ECG waveform size. If necessary, turn ON the AC filter. Improper electrode placement, lead selection, and ECG waveform size can cause errors in detection.

To Set the Arrhythmia Alarm

ON/OFF of arrhythmia alarm and reference of arrhythmia analysis can be set.

1. Press the [Menu] → [Alarm] → [Arrhy.] keys.



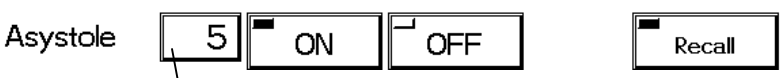
＜Arrhythmia Alarm Setup (1/3) Menu＞

The arrhythmia alarm setup menu consists of 3 pages.

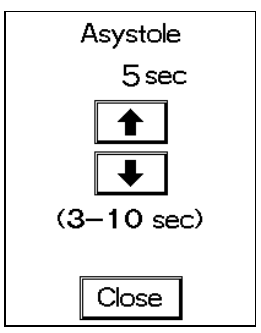
Page 1/3 : ASYSTOLE, VF, VT, SLOW_VT
Page 2/3 : RUN, BIGEMINY, TRIGEMINY, PAUSE
Page 3/3 : COUPLET, TACHY, BRADY, FREQUENT

Use the [Page Down] or [Page Up] keys to switch the pages.

2. Set the reference range.



Pressing the reference value key will display the [✍] [✍] keys.

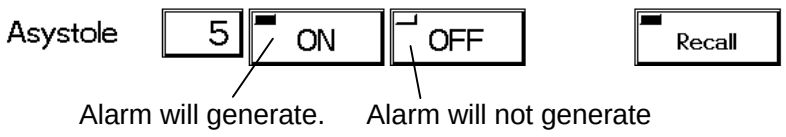


Use the [✍] [✍] keys to set the reference value. After setting the reference value, press the [Close] key.

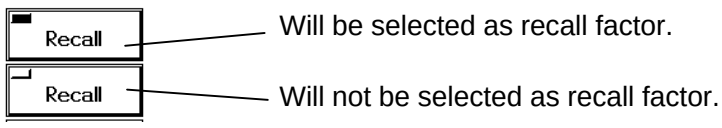
＜**Arrhythmia Reference Range**＞

Arrhythmia	***Reference Range***	***Default***
ASYSTOLE	3 sec.～10 sec.	5 sec.
RUN	2 beats～8beats	3 beats
PAUSE	1.5 sec. ～5 sec.	3 sec.
FREQUENT	1 beat～50 beats/min.	10 beats/min.

3. Select ON or OFF for the alarm.



4. Select ON or OFF for recall factor.
ON/OFF of recall factor can be set on the alarm setup menu.

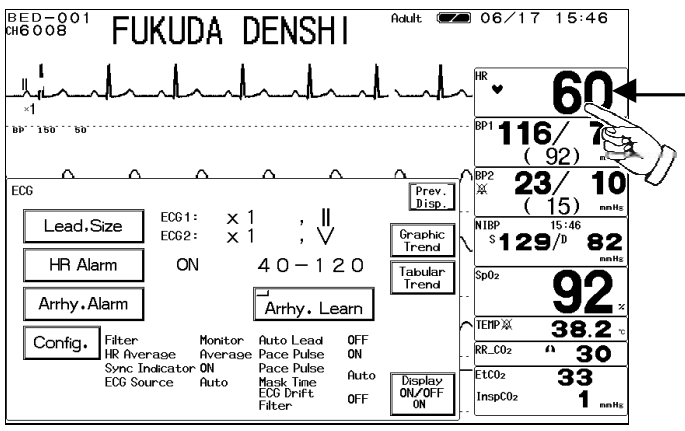


Pressing the Recall key will switch the ON/OFF selection.

To Perform Arrhythmia Learning

Learning of normal ECG largely affects the accuracy of arrhythmia analysis.
If any error occurs in arrhythmia detection and QRS judgement, performing arrhythmia learning will recover the original analyzing accuracy.
Arrhythmia learning will be performed for about 20 beats for the normal ECG, but it may take longer if the heartbeat is unstable.
During arrhythmia learning, arrhythmia alarm other than ASYSTOLE, TACHY, BRADY will not be generated.

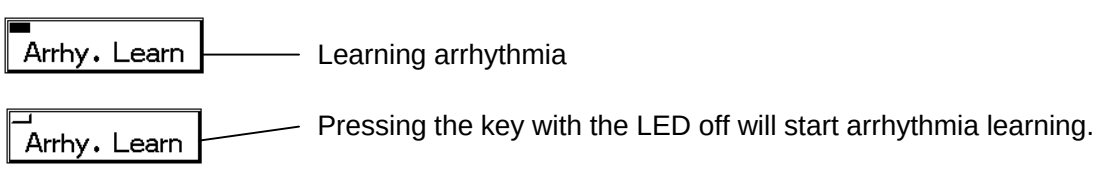
1. Press the Menu → Parameter → ECG keys.



Pressing the HR parameter key will also display the ECG parameter setup menu.

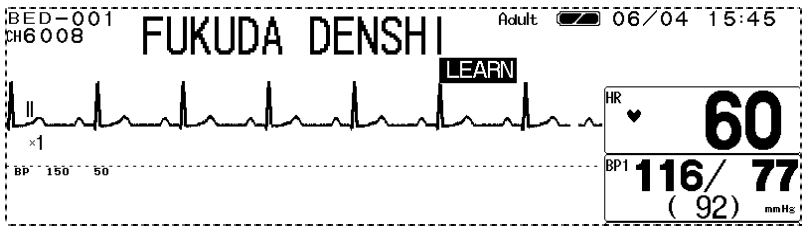
＜ECG Parameter Setup Menu＞

2. Start arrhythmia learning.



Pressing the key while learning arrhythmia will not stop the learning.

3. During arrhythmia learning, a message will be displayed.



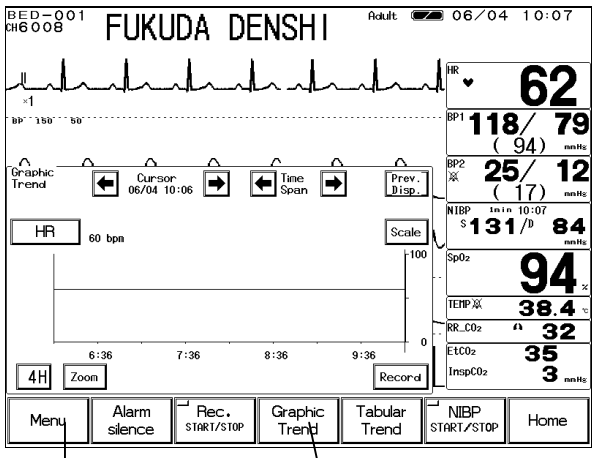
— Graphic Trend Data —

Display / Record

This section explains the graphic trend function and recording procedure.

To Display the Graphic Trend

The graphic trend menu can be accessed from the menu, or from the preprogrammed user key.

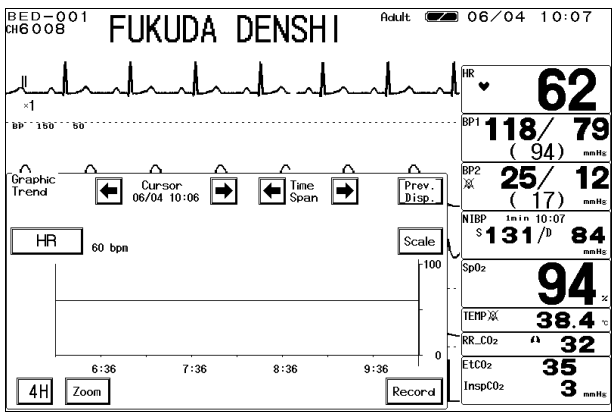


To display from the menu

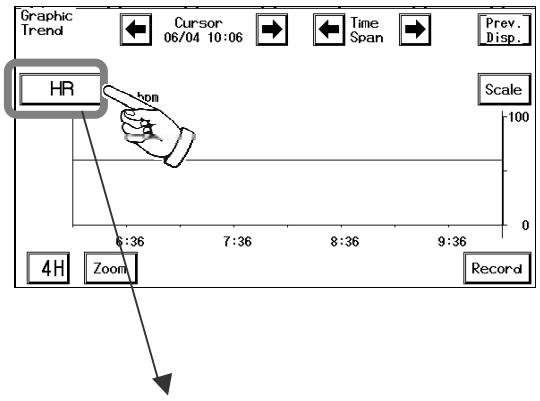
To display from the user key.

The 24 hours of graphic trend data in 1-minute interval will be automatically stored and displayed if the data is displayed on the home display.

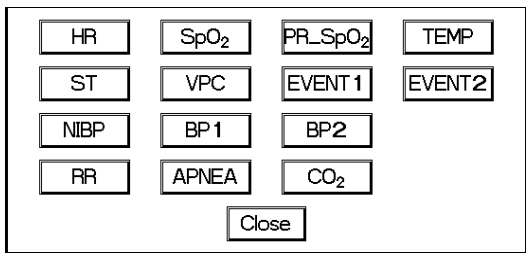
1. Press the [Menu] → [Graphic Trend] keys to display the graphic trend menu.



2. Select the parameter to display.



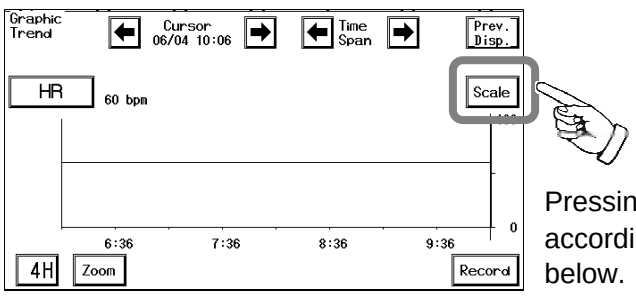
Pressing the parameter selection key will display the selection for display.



Select a parameter and press the Close key.

Parameter	*Description*
HR	HR, PR (SpO_2, BP)
ST	ST1, ST2
VPC	VPC beats
BP1	BP1 (SYS / Mean / DIA)
BP2	BP2 (SYS / Mean / DIA)
NIBP	NIBP (SYS / DIA)
SpO_2	SpO_2 value
PR_ SpO_2	SpO_2 pulse rate
TEMP	Temperature
RR	Respiration Rate (Impedance, CO_2)
APNEA	Apnea Time (Impedance, CO_2)
CO_2	$EtCO_2$ / $InspCO_2$
EVENT1	ASYSTOLE, VF, VT, SLOW_VT, RUN, BIGEMINY
EVENT2	TRIGEMINY, PAUSE, COUPLET, TACHY, BRADY, FREQUENT

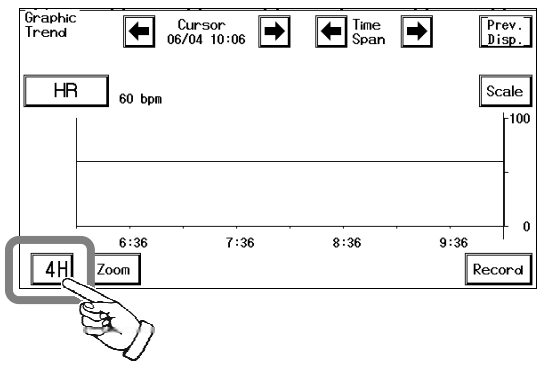
3. Select the scale for display.



Pressing the Scale key will switch the scale according to the displayed parameter as shown below.

Parameter	*Scale*	*Unit*
HR	100, 200, 300	bpm
ST	±0.2, ±0.5, ±1.0, ±2.0	mV
	±2, ±5, ±10, ±20	mm
VPC	20, 50, 100	beat
BP1, BP2	20, 50, 100, 150, 200, 300	mmHg
	4, 8, 16, 20, 24, 40	kPa
NIBP	100, 150, 200, 300	mmHg
	16, 20, 24, 40	kPa
SpO_2	0～100, 50～100, 80～100	%
PR_ SpO_2	100, 200, 300	bpm
TEMP	20～45, 30～40	?C
	68～113, 86～104	?F
RR	50, 100, 150	Bpm
APNEA	15, 30	Sec
CO_2	4.0, 8.0, 10.0	%, kPa
	50, 100	mmHg
EVENT	none	

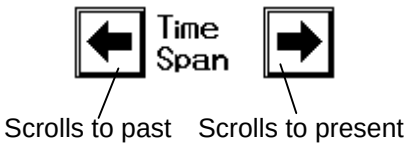
4. Select the display time range.



Pressing the time range key will sequentially change the key as follows; 1H→2H→4H→8H→12H→24H→1H

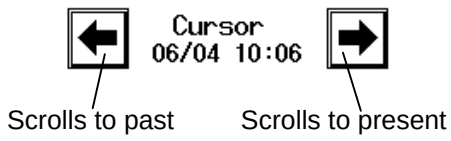
Time Range	*Resolution*
1 hour	1 min.
2 hour	1 min.
4 hour	1 min.
8 hour	1 min,
12 hour	3 min.
24 hour	3 min,

5. Select the time span.



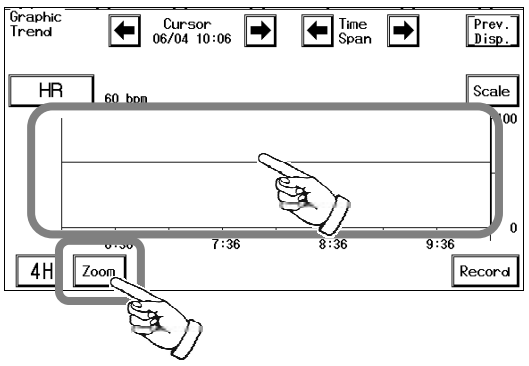
Scrolls the graphic trend display to past or present data with the selected time range.
Pressing the key will scroll to the past data.
Pressing the key will scroll to the present data.

6. Move the cursor.



The data of selected time can be displayed by moving the cursor.
Pressing the [✍] key will scroll to the past data with the selected time range.
Pressing the [✍] key will scroll to the present data.

7. Enlarge the display.

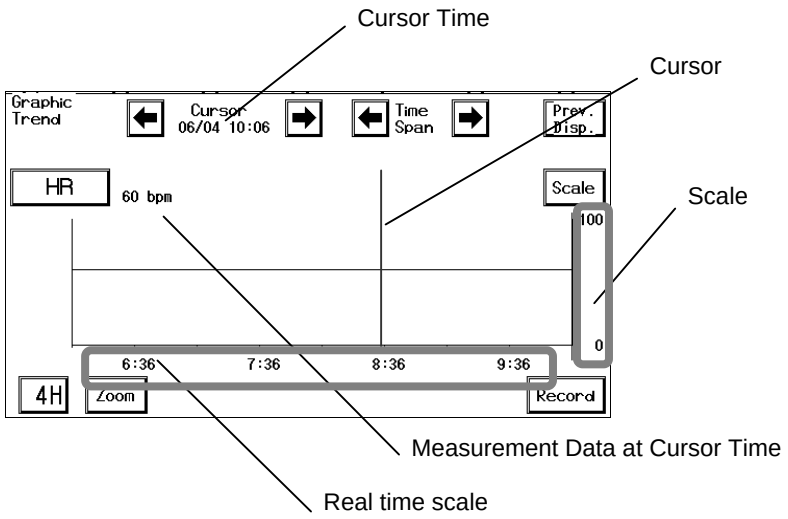


Pressing the [Zoom] key will display the 1-hour data with the cursor time in center.
Directly pressing the graphic trend display area will also display the 1-hour data with the pressed time in center.

8. Store the graphic trend data.

The displayed graphic trend data will be stored.

The Description of the Display



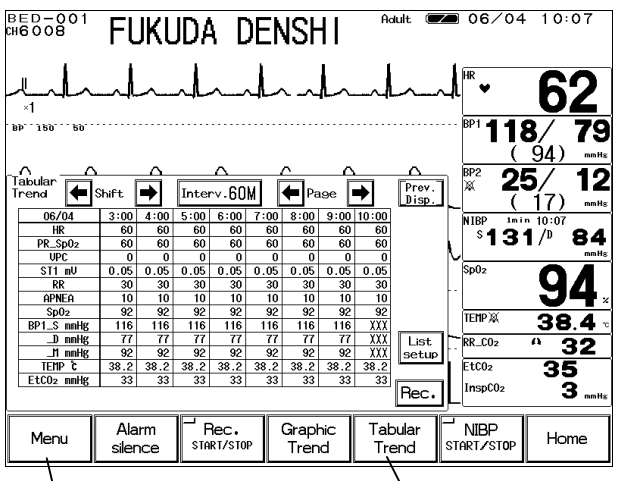
The measured data will be compressed for the 12-hour / 24-hour display.

Parameter	***Compressed Form***
HR	Mean Value
ST	Mean Value
VPC	Maximum Value
BP1, BP2	Mean Value
NIBP	Current Value
SpO_2	Mean Value
PR	Mean Value
TEMP	Mean Value
RR	Mean Value
APNEA	Maximum Value
CO_2	Mean Value
EVENT	Logical Sum

This section explains the tabular trend function and recording procedure.

To Display the Tabular Trend

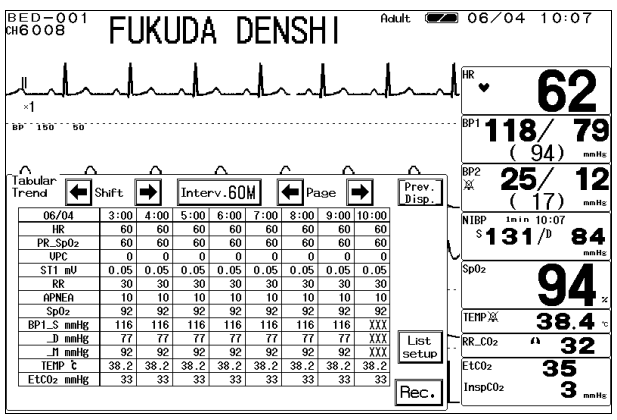
The tabular trend menu can be accessed from the menu, or from the preprogrammed user key. The 24 hours of data in 1-minute interval will be automatically stored and displayed if the data is displayed on the home display.



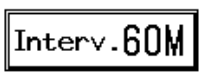
Display from the menu

Display from the user key.

1. Press the [Menu] → [Tabular Trend] keys to display the tabular trend.



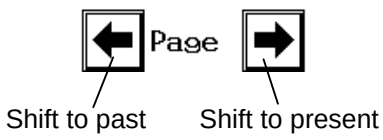
2. Select the time interval.



Pressing the key will sequentially select the time interval as follows; 1M→5M→10M→15M→30M→60M→1M

Selecting [5M] will display the data in real time such as 10:00, 10:05, 10:25.
Selecting [60M] will display the data in real time such as 10:00, 11:00, 12:00.
If the list is displayed at 10:35, the data from 10:00 will be displayed.

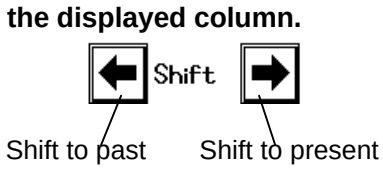
3. Shift the page.



The page can be shifted past or present by page with the selected time range.
Pressing the key will shift one page to the past data.
Pressing the key will shift one page to the present data.

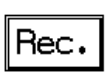
The data will be listed in 8 columns.
If 5-minute time range is selected and the starting time on the list is 10:00, 35 minutes from 10:00 to 9:25 will be listed in 1 page.
Pressing the key will display the list from 9:20 to 8:45.

4. Shift the displayed column.



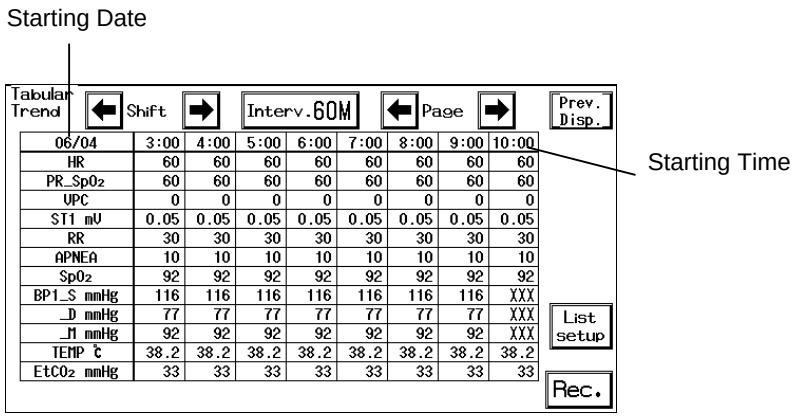
The list data can be shifted in displayed columns.
Pressing the key will shift the display to past.
Pressing the key will shift the display to present.

5. Store the list data.



The displayed list data will be stored.

The Description of the Display



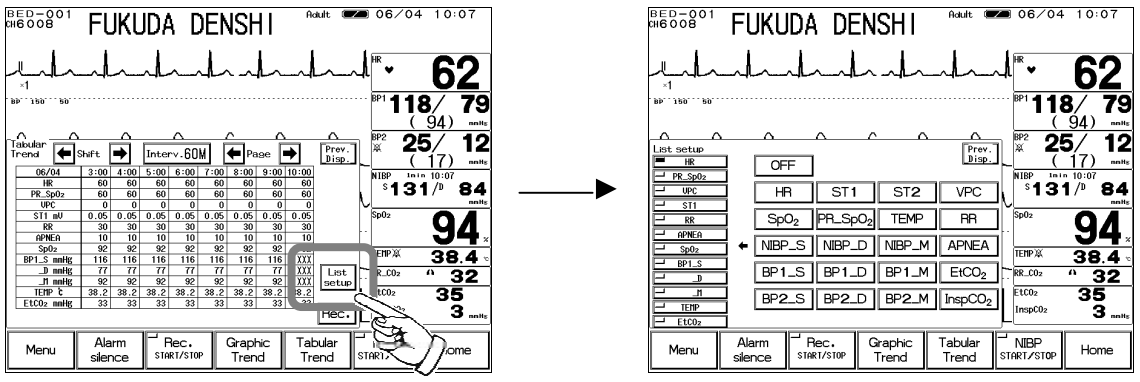
06/04	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00
HR	60	60	60	60	60	60	60	60
PR_SpO2	60	60	60	60	60	60	60	60
VPC	0	0	0	0	0	0	0	0
ST1 mV	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
RR	30	30	30	30	30	30	30	30
APNEA	10	10	10	10	10	10	10	10
SpO2	92	92	92	92	92	92	92	92
BP1_S mmHg	116	116	116	116	116	116	116	XXX
_D mmHg	77	77	77	77	77	77	77	XXX
_M mmHg	92	92	92	92	92	92	92	XXX
TEMP ℃	38.2	38.2	38.2	38.2	38.2	38.2	38.2	38.2
EtCO2 mmHg	33	33	33	33	33	33	33	33

If the data is within 24 hours or if the monitoring is suspended, the time will be displayed as "??:??".
Also, if the data is not displayed on the home display, or the BP is not zero balanced, the data will be displayed as "- - -".

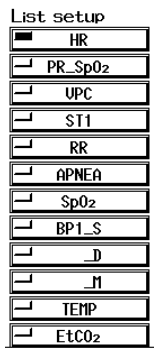
Parameter Setup for Tabular Trend

The parameters for tabular trend can be selected.

1. **Press the [List Setup] key on the tabular trend menu to display the tabular trend setup menu.**

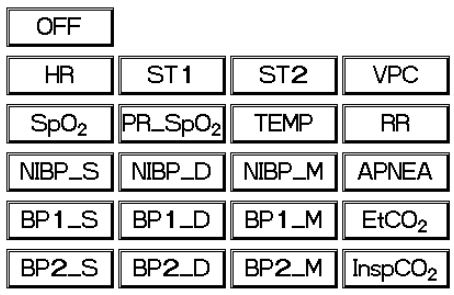


2. **Select the position on the list.**



Select the position.
There are 12 positions on the list to set the parameter.

3. **Select the parameter for display.**

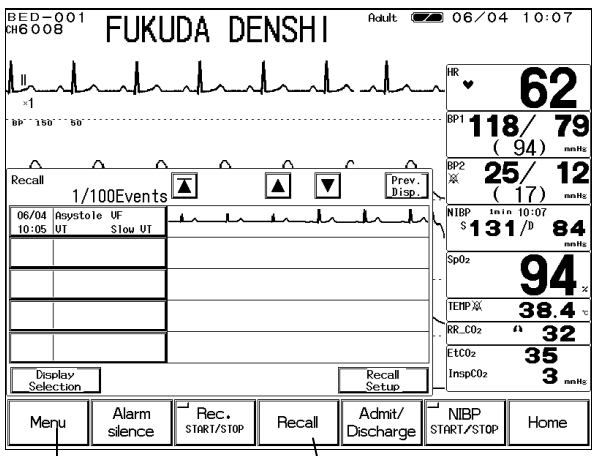


Select the parameter to display for the previously selected position. The position will automatically shift downward so that consecutive parameter selection is possible.

This section explains the recall menu function and recording procedure.

To Display the Recall Menu

The recall menu can be accessed from the menu, or from the preprogrammed user key.



Display from the menu

Display from the user key

When the alarm factor assigned on the recall setup occurs, the assigned waveform and the numeric data at alarm occurence can be stored for up to 100 data.
The recall data to be displayed can be selected on the display selection menu.
On the recall list display, 5 compressed recall waveform will be displayed. Pressing one of the compressed recall waveform will enlarge the waveform.

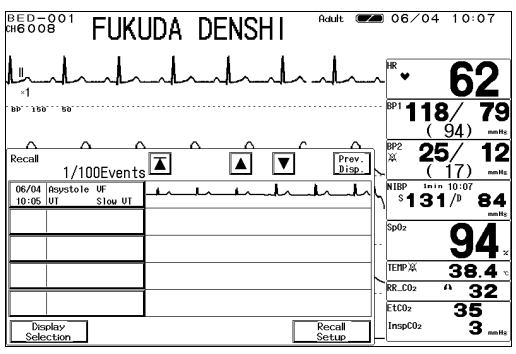
Time at Alarm Occurrence

Recall Factor

Recall Waveform (Compressed)

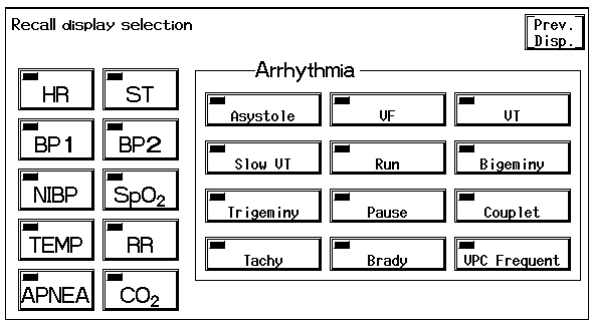
●Recall List Display

1. Press the [Menu] → [Recall] keys to display the recall menu.



The alarm occurrence time, the recall factor occurred at the same time, and the compressed waveform of recall waveform 1 will be displayed.

2. **Select the recall factor to display on the recall list.**
   Press the Display Selection key and select the recall factor.



   Select the numeric data, arrhythmia to display as recall factor.

   HR — If the key LED is lighted, recall data will be displayed.

   HR — If the key LED extinguished, recall data will not be displayed.

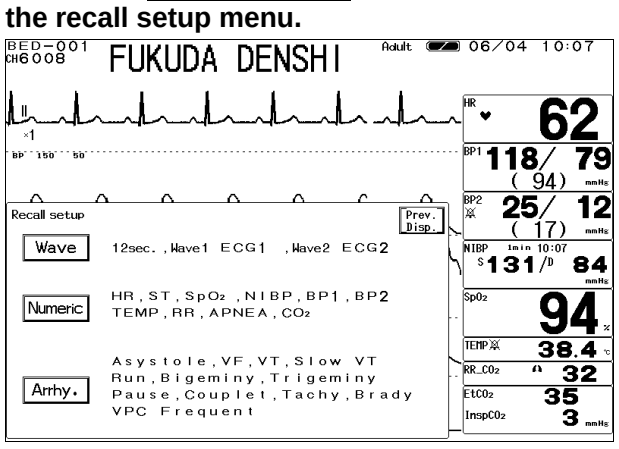
3. **Shift the recall list display.**

   The newest 5 data will be displayed from the recall list.

   Shift the recall list to newer data by 1 page (5 data).

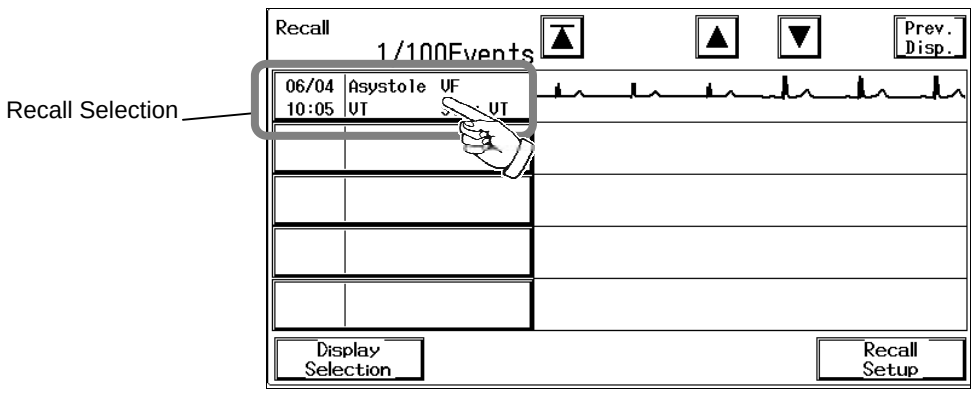
   Shift the recall list to older data by 1 page (5 data).

4. **Press the Recall Setup key. The recall factor and recall waveform can be selected on the recall setup menu.**

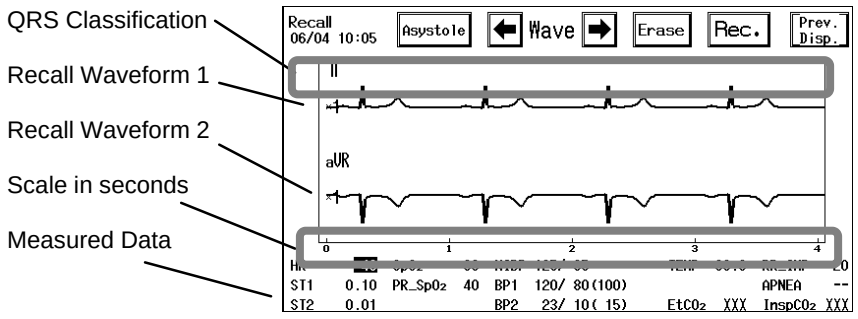


●To Display and Record the Enlarged Recall Waveform

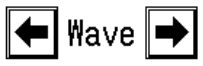
On the recall list display, pressing one of the recall factor will display the enlarged recall waveform. On the enlarged recall waveform display, the recall waveform will be displayed in 25mm/s and by using the cursor, the data before and after the alarm occurrence can be checked.



1. Pressing one of the recall factors will display the enlarged recall waveform.



2. Shift the waveform left or right.

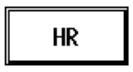


The recall waveform display can be shifted to left or right.

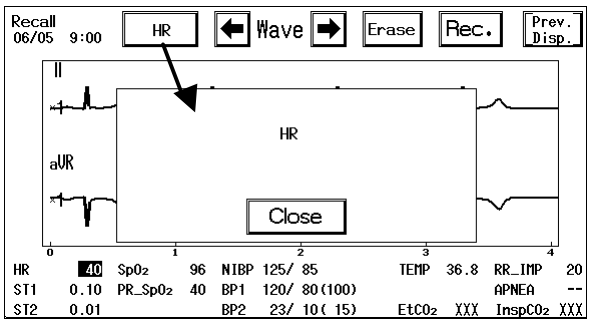
key will shift to the older data.

key will shift to the newer data.

3. The alarm factor occurred at the same time will be displayed.



Pressing the recall factor key will display the recall factor occurred at the same time.



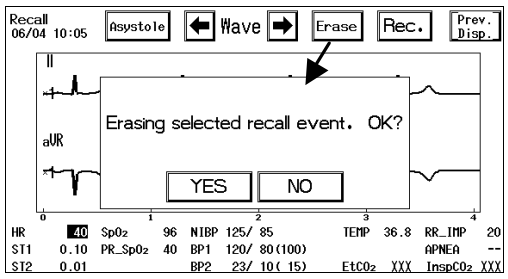
4. Store the recall waveform.

Pressing the Rec. key will store the displayed recall waveform and numeric data.

5. Erase the recall waveform.

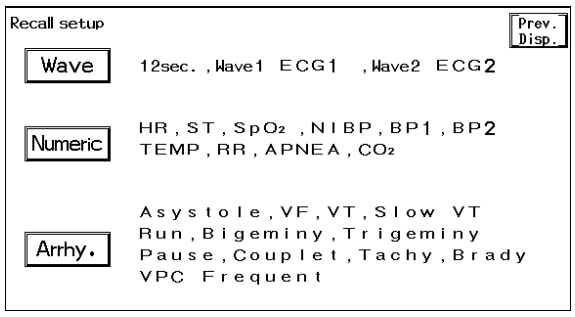
Erase the unnecessary recall waveform.

Pressing the Erase key will display the confirmation message.
YES will erase the waveform and displays the recall list display.
NO will return to the previous display.

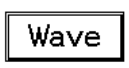


To Set the Recall Condition

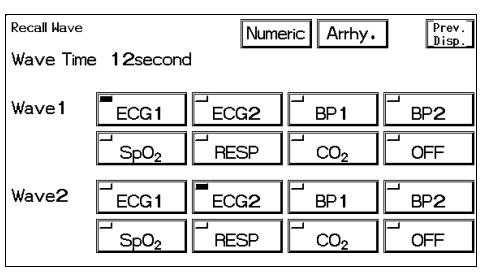
On the recall menu, the storing condition at alarm occurrence can be set.
The recall waveform and recall factor (numeric data, arrhythmia) can be selected.



1. Select the recall waveform.



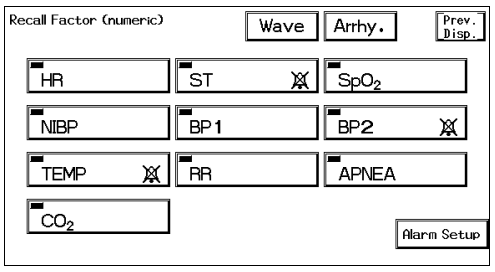
Pressing the Wave key will display the menu to select the recall waveform.



Up to 2 waveforms can be selected for recall waveform.
Select the recall waveform from No. 1 waveform and No. 2 waveform. The key with the LED lighted is the selected waveform.

2. Select the recall factor (numeric data).

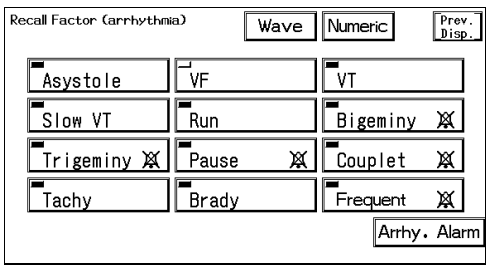
Pressing the Numeric key will display the menu to select the numeric data recall factor.



Select the recall factor by pressing the keys.
The key with the LED lighted will be the recall factor.

3. Select the recall factor (arrhythmia).

Pressing the Arrhy. key will display the menu to select the arrhythmia alarm factor.



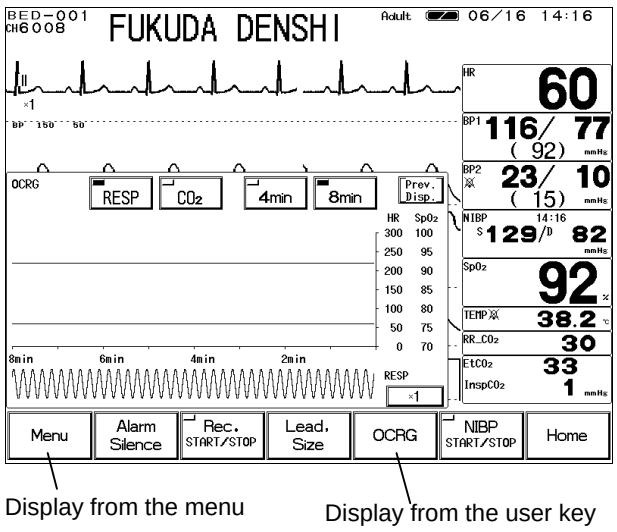
Select an arrhythmia for recall factor. The key with LED lighted will be the recall factor.

NOTE

The recall waveform will start with the following delay time tracing back from the alarm occurrence.

	Adult	Child	Neonate	
			Meas. Data Alarm	Arrhy. Alarm
Delay Time	12sec.	12sec.	8sec.	12sec.

This section describes the procedure for OCRG display.
The OCRG display can be accessed from the menu, or from the preprogrammed user key.

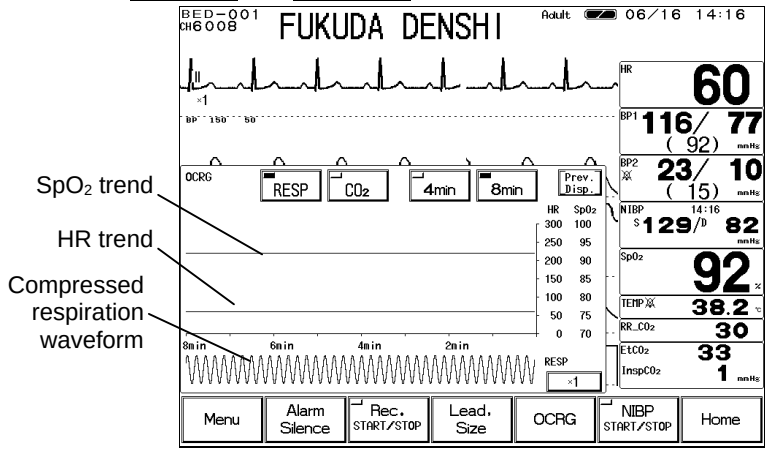


Display from the menu

Display from the user key

On the OCRG display, compressed respiration waveform, HR trend and SpO_2 trend are displayed simultaneously.

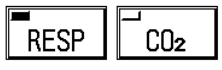
1. Press the [Menu] → [OCRG] keys to display the OCRG menu.



The trend scale is a fixed scale.

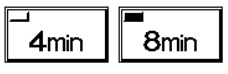
HR : 0～300bpm
SpO_2 : 70～100%

2. Select the respiration waveform.



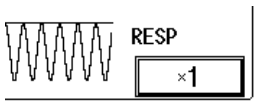
Select [RESP] or [CO_2] to display the compressed respiration waveform from impedance respiration (RESP) or CO_2 waveform.

3. Select the displaying duration.



Select a displaying duration from [4min] or [8min].

4. Select the waveform size for compressed respiration waveform.



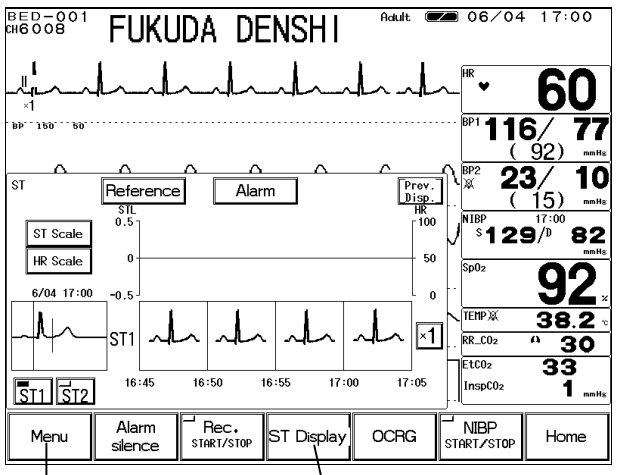
Pressing the size key will sequentially change the waveform size.

Respiration Waveform	*Size, Scale*
Impedance, RESP	×1/4→×1/2→×1→×2→×4→×1/4
CO_2	100→50→100 (unit : mmHg)
	4→8→10→4 (unit : % or kPa)

This section describes the operation procedure for the ST display and alarm setup.

To Display the ST Measurement Menu

The ST display can be accessed from the menu, or from the preprogrammed user key.

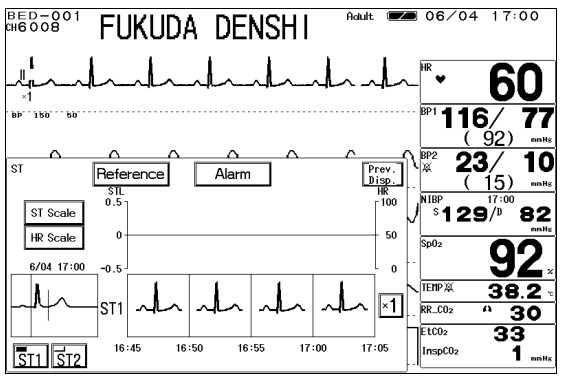


Display from the menu

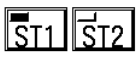
Display from the user key

On the ST display, the averaged ECG waveform of 16 beats will be superimposed for 5 minutes. 3 frames of superimposed waveform will be displayed. Also, HR and ST level will be simultaneously displayed as graphic trend. ST1 will be measured from ECG1, and ST2 will be measured from ECG2. On the ST display, ST alarm limit and ST reference point / measurement point can be set.

1. **Press the [Menu] → [ST Display] keys to access the ST display.**



2. **Select the superimposed waveform.**



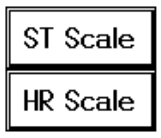
Press the [ST1] or [ST2] key to select the superimposed waveform.

3. **Select the waveform size for the superimposed waveform.**

Pressing the key will sequentially change the key as follows; ×1/4→×1/2→×1→×2→×4→×1/4.

NOTE	The selection of displayed waveform size for the superimposed waveform interlocks with ECG waveform size.

4. **Select the trend scale.**



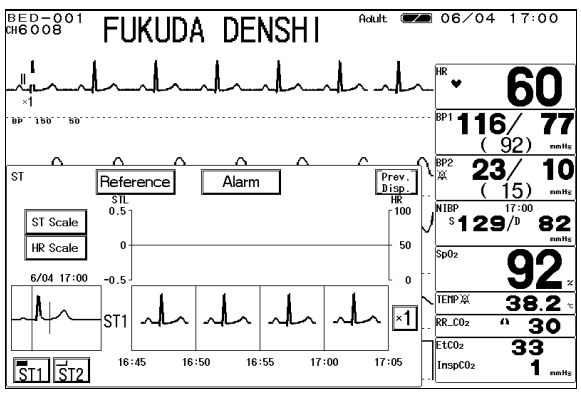
Select the displayed scale for the trend.

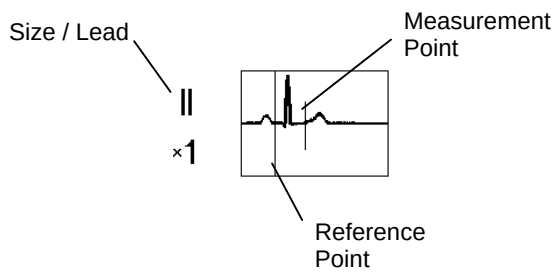
Trend	*Scale*	*Unit*
HR	100, 200, 300	bpm
ST	±0.2, ±0.5, ±1.0, ±2.0	mV
	±2, ±5, ±10, ±20	mm

●To Set the Reference Waveform

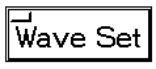
Set the reference waveform for the ST display and set the reference point and measurement point on the reference waveform.

1. **Press the [Menu] → [ST Display] → [Reference] keys to display the reference waveform setup menu.**





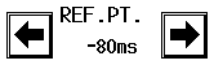
2. **Read the waveform by pressing the [Wave Set] key.**



16 beats average of the ECG judged as normal QRS by arrhythmia analysis will be read. If during arrhythmia learning, or if VPC is present, the reference waveform setup will take for more than 16 beats.

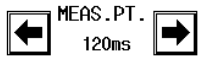
During the reference waveform setup, the key LED will light.

3. **Set the reference point on the ST display.**



The reference point can be set in the range of -240ms ～0ms in increments of 10mS from the peak of QRS to the P wave direction.

4. **Set the measurement point on the ST display.**

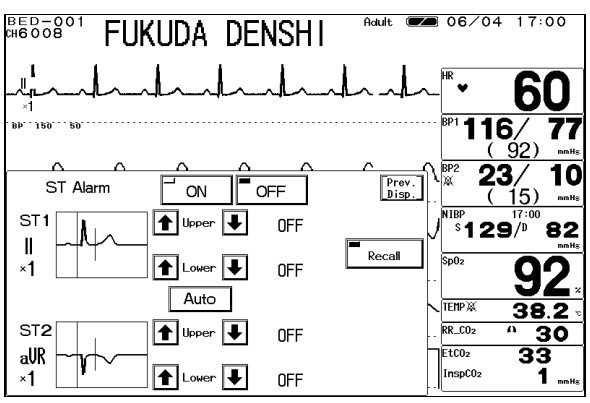


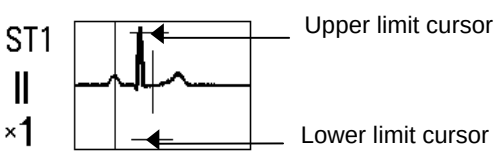
The measurement point can be set in the range of 0ms～560ms in increments of 10mS from the peak of QRS to the T wave direction.

●ST Alarm Setup

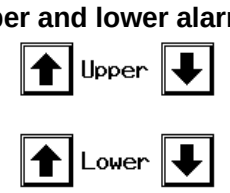
The ST upper value and lower value compared with the reference waveform will be set.
The alarm value is to be set for each measurement unit (mm / mV). The upper and lower limit can be set in 1mm / 0.1mV increment.

1. Press the [Menu] → [ST Display] → [Alarm] keys to display the alarm setup menu.





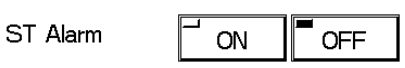
2. Set the upper and lower alarm limit.



Use the [✍], [✍] keys to adjust the alarm limit.

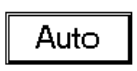
Item	*Description*
Lower Alarm Limit	Select the lower alarm limit (±20mm / ±2.0mV). Alarm will be set to OFF if the value −20mm / −2.0mV or lower is selected.
Upper Alarm Limit	Select the upper alarm limit (±20mm / ±2.0mV). Alarm will be set to OFF if the value +20mm／+2.0mV or above is selected.

3. Select ON/OFF of ST alarm.



[ON] will generate the ST alarm.
[OFF] will not generate the ST alarm.

4. Select "Auto" for automatically setting the alarm limit.

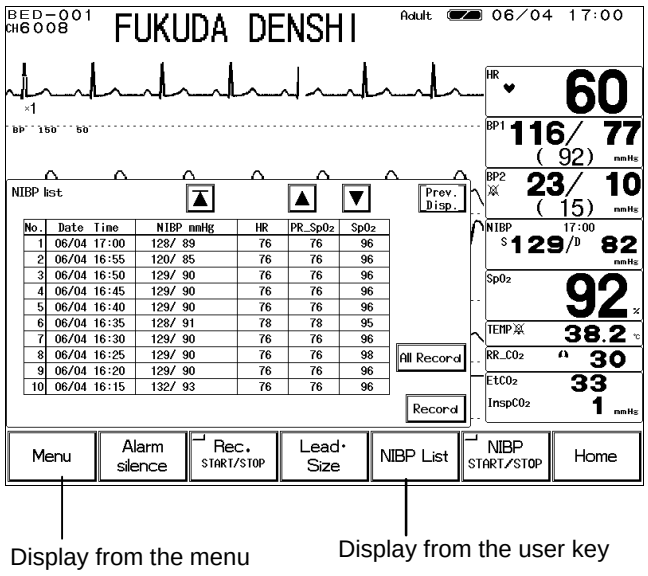


Pressing the [Auto] key will automatically set the upper alarm limit to current ST value +0.2mV (+2mm), and lower alarm limit to current ST value -0.2mV (-2mm).
Selecting "Auto" will automatically turn ON the ST alarm.
If the upper or lower limit is OFF, the limits will remain to be OFF.

This section explains the NIBP list function and recording procedure.

To Display the NIBP List

The NIBP list display can be accessed from the menu, or from the preprogrammed user key.

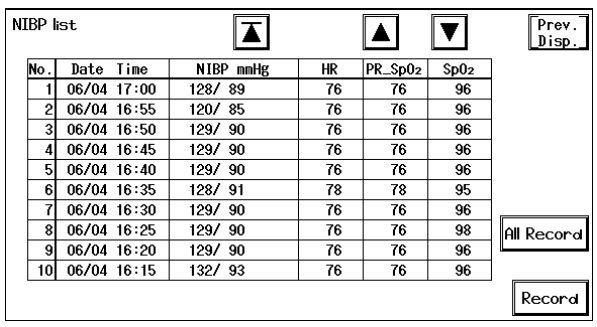


Display from the menu

Display from the user key

On the NIBP list, NIBP data and HR, SpO_2 pulse rate, SpO_2 value at the commencement of NIBP measurement will be stored and displayed for 120 NIBP measurements.

1. Press the [Menu] → [NIBP List] keys to display the NIBP list display.



2. Shift the displayed column.

- [⏮] — Displays the newest 10 data of the NIBP list.
- [▲] — Shifts the display to newer data by 1 page (10 data).
- [▼] — Shifts the display to older data by 1 page (10 data).

3. Record the NIBP list.

- [All Record] — All the data stored on NIBP list will be recorded.
- [Record] — Currently displayed NIBP list will be recorded.

The Description of the Display

No.	Date Time	NIBP mmHg	HR	PR_SpO2	SpO2
1	06/04 17:00	128/ 89	76	76	96
2	06/04 16:55	120/ 85	76	76	96
3	06/04 16:50	129/ 90	76	76	96
4	06/04 16:45	129/ 90	76	76	96
5	06/04 16:40	129/ 90	76	76	96
6	06/04 16:35	128/ 91	78	78	95
7	06/04 16:30	129/ 90	76	76	96
8	06/04 16:25	129/ 90	76	76	98
9	06/04 16:20	129/ 90	76	76	96
10	06/04 16:15	132/ 93	76	76	96

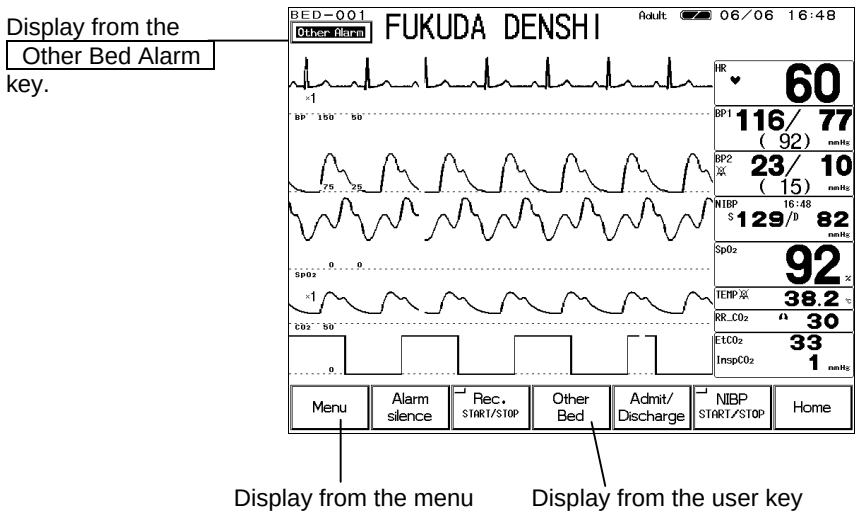
The mean BP will be displayed on the NIBP list only if it is displayed on the home display.
If HR or SpO_2 is not measured, or not correctly measured at the commencement of NIBP measurement, the measured data will be displayed as “？？？”.
For Quick SYS measurement, only the SYS (highest BP value) will be displayed.

NOTE	If the NIBP measurement was not completed, the data will not be displayed on the NIBP list. At the telemetry center, the time and measurement will be displayed as “00:00” and “？？？” respectively.

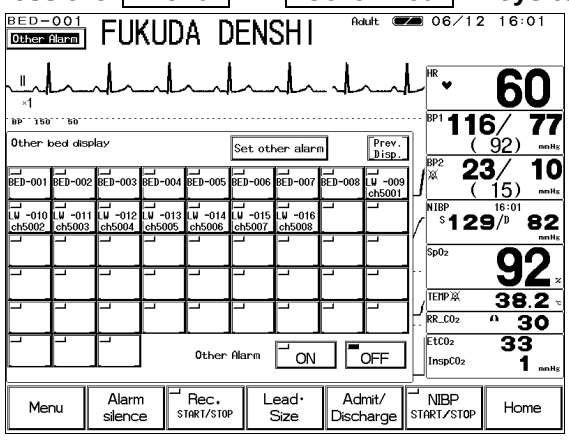
This section explains about the function to display the waveform and numeric data and to set alarms for other bedside monitors.
To use this function, wired network connection is required.

Other Bed Display

The other bed display can be accessed from the menu or from the preprogrammed user key. Also, by setting the other bed alarm ON, Other Bed Alarm key will be displayed when other bedside monitor generates an alarm. By pressing this Other Bed Alarm key, the display for the other bed can be accessed.



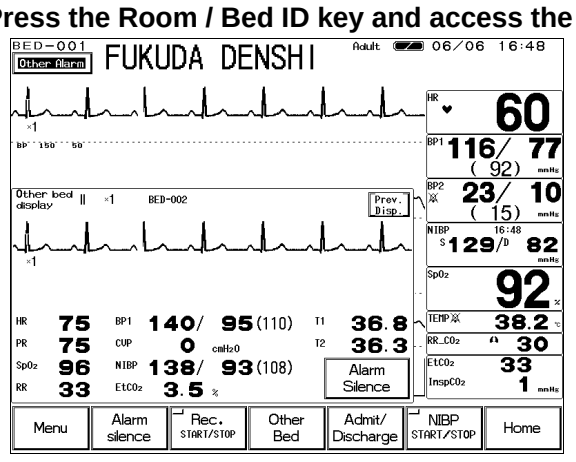
1. Press the Menu → Other Bed keys to display the other bed selection menu.



On the other bed selection menu, select the Room / Bed ID to display from the 48 beds connected to the wired network.

The Room / Bed ID for the alarm generating bed will be displayed in red.
The bed displaying this menu will be displayed in gray.
The key LED for the bed selected as the other bed alarm generating bed will be lighted.

2. Press the Room / Bed ID key and access the display for the other bed.

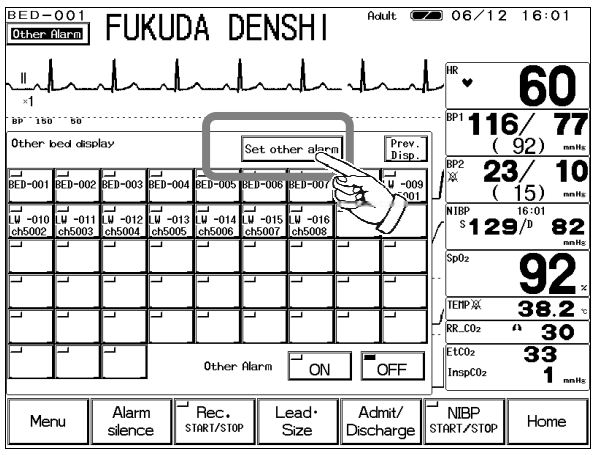


ECG waveform and numeric data for the selected bed will be displayed.

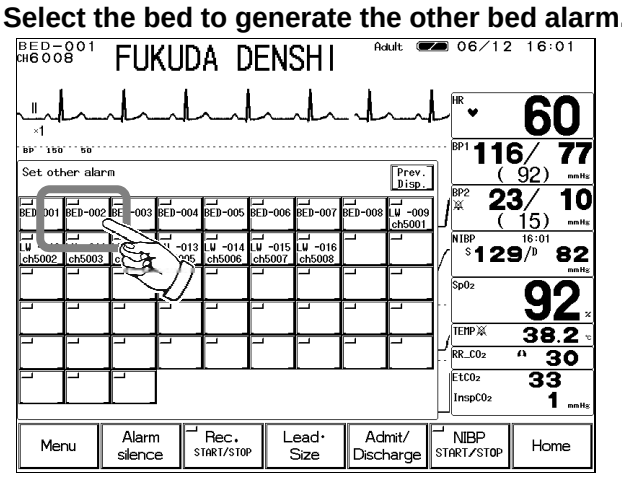
If an alarm is generated for this bed, the physiological alarm / arrhythmia alarm message will be displayed.
By pressing the Alarm Silence key on the other bed display, the alarm sound for the displayed bed can be silenced.

Other Bed Alarm Setup

From the 48 bedside monitors, the bed to generate the other bed alarm and ON/OFF of other bed alarm display can be performed.



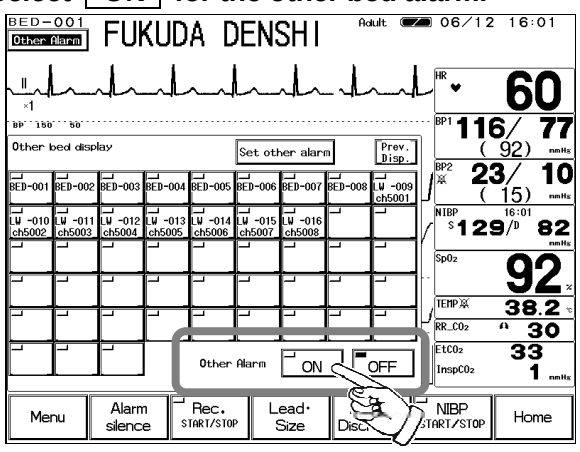
1. **Select the bed to generate the other bed alarm.**



Press the Set other alarm key to display the other bed alarm setup menu.
Select the bed to generate the other bed alarm.

The key LED for the bed selected as the other bed alarm generating bed will be lighted.

2. **Select ON for the other bed alarm.**



Press the Prev. Disp. key and display the other bed selection menu.
Selecting ON will generate the other bed alarm when an alarm generates at the other bed.
Selecting OFF will not generate the other bed alarm.