ADMIT, DISCHARGE, AND PATIENT DEMOGRAPHIC INFORMATION

This chapter tells you how to admit and discharge patients to the PatientNet System and how to enter, view, modify and print patient demographic information.

The settings described in this section are displayed on the Patient Settings screen (fig. 30). To display this screen, press **Setup** on the Main screen.

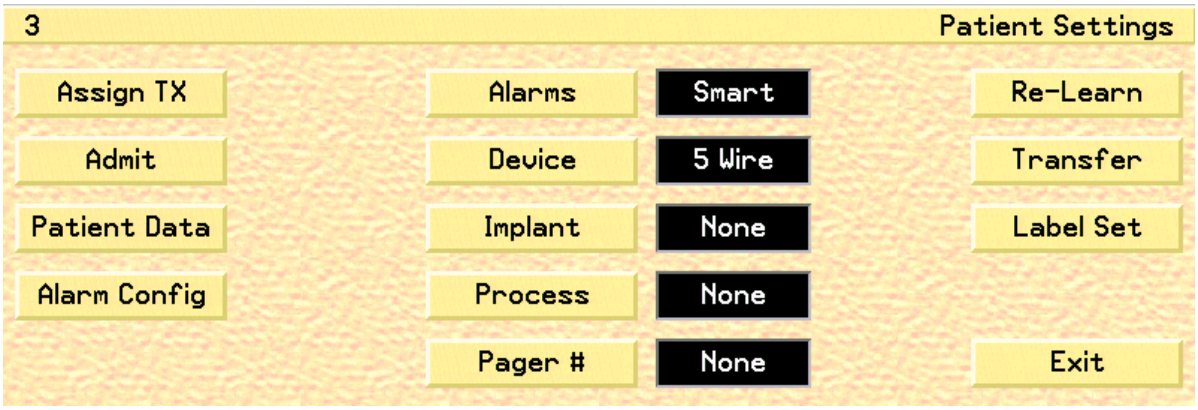

Fig. 30. Patient Settings screen

Admitting a Patient to the System

Admit a patient at the Central Station as follows:

1. Select an available patient channel by clicking on the waveform area. The presence of the **Admit** button on the Patient Settings screen indicates that a channel is available.
2. Press the **Admit** button.
3. Enter demographic information and clinical setting for this patient as instructed in the following sections.

If the transceiver is transmitting when you press Admit, the system verifies that the transceiver or device type matches the configuration for the channel. If the data does not match, the `?? SOURCE` alarm is triggered.

Note: The System Administrator may configure the system to make it mandatory to enter specific patient demographic data before admitting a patient. The required fields may include name, nursing unit, room number, physician, and ID number.

Entering Patient Information

Once a patient is admitted, press the **Patient Data** button to display the Patient Data Entry screen (fig. 31).

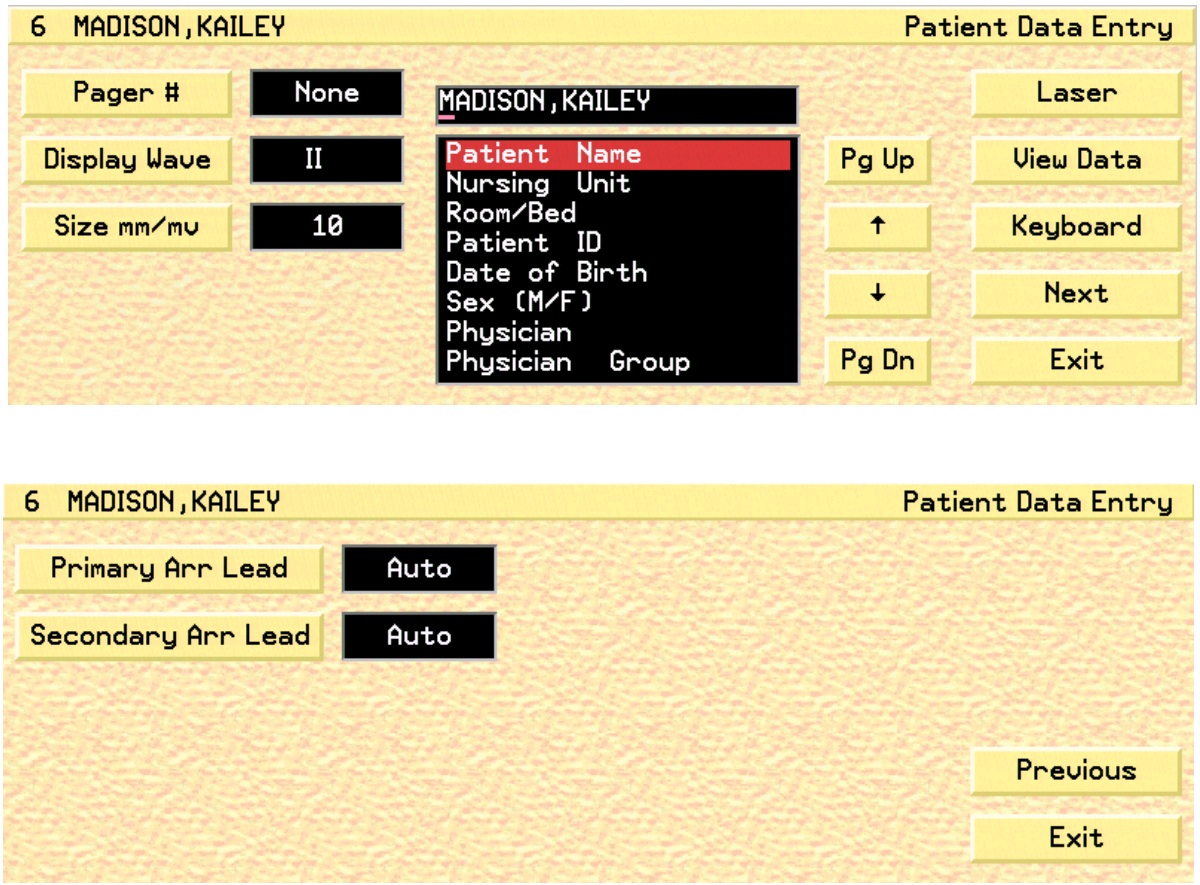

Fig. 31. Patient Data Entry screen

1. Highlight **Patient Name** in the list of items.
2. Press the **Keyboard** button.
3. Using the on-screen keyboard, type in the patient's name then press the **Enter** button. You can also enter information with the external keyboard.
4. Enter the additional demographic information for other items in the same way.

Note: Notice that the patient's name and ID number now appear on the waveform area. Available fields are shown below. The Number of Characters value is the maximum number allowed in each field.

5. Click the **Pager #** button to display the number pad and enter the pager number that is assigned to the patient. If a pager is not assigned, then click **N** on the number pad to indicate None.
6. Click on the **Display Wave** button to toggle through the available waveforms for the selected patient.

7. Click the **size mm/mv** button (this button varies depending on the device type) to select the size of the waveform that is displayed.
8. Click the **Next** button to select the **Primary** and **Secondary** leads for Arrhythmia analysis.

Note: For best results, select lead II for your Primary Lead, and lead V or I for your Secondary Lead.

Note: The Primary and Secondary Lead selection is a configurable option. See your system administrator if these buttons are inactive.

Table 6. Patient information fields and character amounts.

Patient Data Field	Number of Characters
Patient Name	18
Room/Bed	6
Nursing Unit	18
Patient ID	20
Date of Birth	18
Sex (M/F)	1
Physician	18
Physician Group	18
Diagnosis	18
Orders	18
Notes 1	18
Notes 2	18
Notes 3	18
Medication 1	18
Medication 2	18
Medication 3	18

Viewing Patient Information

1. Press **Patient Data** on the Patient Settings screen (fig. 30). The View Data screen appears, showing the information entered when the patient was admitted along with the admit date and time and the time since admit.
2. Use the arrow buttons and **PgUp** and **PgDn** to scroll through the information fields.

Modifying Patient Information

Modify existing patient demographic information on the View Data screen (fig. 32).

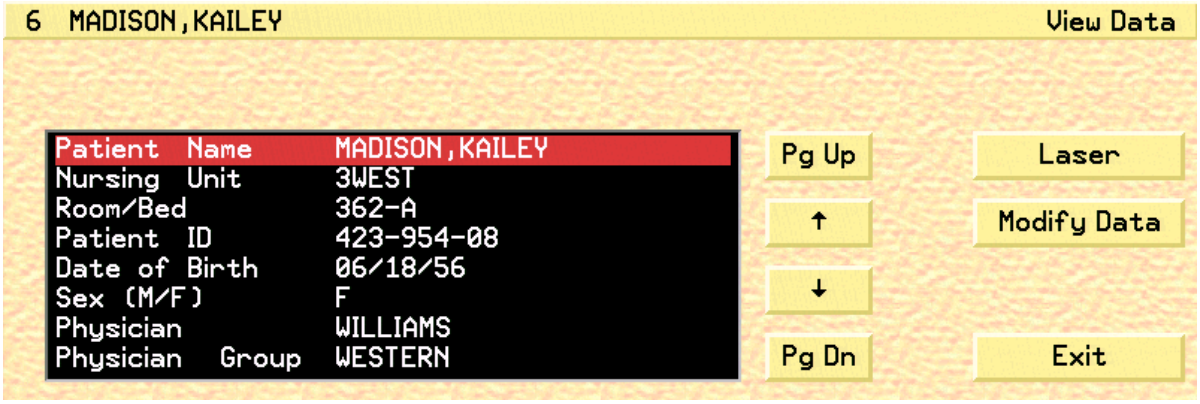

Fig. 32. View Data screen

1. Press **Patient Data** on the Patient Settings screen.
2. Press **Modify Data** on the View Data screen to re-display the Patient Data entry screen.
3. Highlight the information field you wish to change and type in your changes for that field using either the on-screen keyboard or the external keyboard.
4. Press the **Enter** button on the keyboard.

Note: If any of the demographic fields are set to Pre-Admit by the System Administrator, then the appropriate demographic information must be entered before a patient may be admitted. If any of the demographic settings are set to Pre-Admit and you attempt to admit a patient without entering the proper information, then a popup will be displayed stating that the information must be entered prior to admitting the patient.

Printing Patient Information

You may want to maintain a record of patient demographic information as contained in the PatientNet System. To do so, print the Patient Data Report (fig. 33) from the laser printer for the patient's file.

1. Press **Patient Data** on the Patient Settings screen to display the Patient Data Entry screen (fig. 31) or the View Patient Data screen.
2. Press **Laser** to print the Patient Data Report.

PatientNet Patient Setup

Ch:42 Patient Name:KATHY BENNETT ID:536-983-77 Room:5 EAST-526-A 11:34:53 13-Nov-2001

Channel Status	Admitted
Physician	WILLIAMS,AJ
Diagnostics	CVA
Orders	
Note 1	
Note 2	
Note 3	
Date of Birth	5-30-29
Sex	F
Medication 1	
Medication 2	
Medication 3	
Nursing Unit	5 EAST
Admit Date	13-Nov-2001
Admit Time	9:22:51
Time on System	2 Hours 12 Minutes
Pager Number	None
Alarm Source	Central
Arrhythmia/ST	ON
Alarm State	ON
Augment Setting	N/A
Device	Pass 2
Top Wave	ECG1
Bottom Wave	TYPE 1
ECG Gain	10 mm/mv
P1 Gain	6 mmHg/mm
P2 Gain	6 mmHg/mm
SpO2 Gain	1x
RESP Gain	1x
CO2 Gain	1x
Implant	None
Net Transfer	YES
Process	None

Page 1

Fig. 33. Patient Data Report

Discharging a Patient From the System

Discharging a Patient at the Central Station

To discharge a patient at the Central Station:

1. Press **Discharge** on the Patient Settings screen. If you want to print a discharge report, click **Yes** on the popup; otherwise click **No**. The information printed on the Patient Discharge Report is similar to that of the Patient Data Report, except that no ST or alarm configuration data is printed.
2. A confirmation popup appears asking if you want to clear patient data. Click **No** to cancel the discharge request and retain the patient. Or click **Yes** to clear information and discharge the patient.

   If there are tagged events in the patient's history file (see page 142), another popup informs you that continuing the discharge will erase these events. If any reports are queued for printing, another popup informs you that continuing with the discharge will cancel all queued reports.

CAUTION: Selecting Yes permanently clears all patient data and discharges the patient.

The **Discharge** button now becomes **Admit** and may be used to admit a new patient.

Note: If you have the Retrospective Viewer (page 181) option installed, then the discharged patient data will remain in a saved file on the Retrospective Viewer.

Note: Merely deleting the name or identifying information from the trace display area does not stop data collection for the associated patient.

Discharging a Patient at a Bedside Device

If you discharge a patient at a Bedside Device, the **Remote Discharge** screen will appear at the Central Station.

Note: This feature is available only if it is enabled in the System Configuration Remote Functions screen. See your system administrator for details.

Note: While the Remote Discharge screen is displayed, the main screen buttons and functions (except for the Strip/Laser button) are disabled.

Click **Yes** to clear patient information, or **No** to cancel the discharge request and retain the patient in the system.

Note: You must select either Yes or No in order to remove the Remote Discharge screen and re-enable the main screen buttons and functions.

Printing a Discharge Report

To print a Discharge Report:

1. Select **No** on the Remote Discharge screen.
2. Click the **Setup** button on the menu tool bar.
3. Click the Discharge button on the Patient Settings screen. The Discharge Report popup will appear. If you want to print a discharge report, click **Yes** on the popup; otherwise click **No**. The information printed on the Patient Discharge Report is similar to that of the Patient Data Report, except that no ST or alarm configuration data is printed.
4. A confirmation popup appears asking if you want to clear patient data. Click **No** to cancel the discharge request and retain the patient. Or click **Yes** to clear information and discharge the patient.

   If there are tagged events in the patient's history file (see page 142), another popup informs you that continuing the discharge will erase these events. If any reports are queued for printing, another popup informs you that continuing with the discharge will cancel all queued reports.

CAUTION: Selecting Yes permanently clears all patient data and discharges the patient.

The **Discharge** button now becomes **Admit** and may be used to admit a new patient.

Note: Merely deleting the name or identifying information from the trace display area does not stop data collection for the associated patient.

Note: The Room Number, Nursing Unit, Pager Number, and List Trend Report parameters can be configured to be retained at the time of discharge.

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PATIENT SETTINGS

Once a patient is admitted and demographic information is entered into the system, you can tailor the system to the individual patient. This section shows you how to make settings to accommodate patients' specific monitoring needs.

Note: All settings described in this chapter are channel-specific; they apply only to the patient channel selected when you make the settings.

To select the patient, click on or touch the desired patient's waveform. A box around the waveform indicates the selected patient.

Unless otherwise noted, all instructions begin on the Patient Setting screen (fig. 34), and with the relevant patient's waveform selected.

Note: All patient settings modified at the Interactive-PatientNet Viewer (IRVS) are also modified at the Central Station.

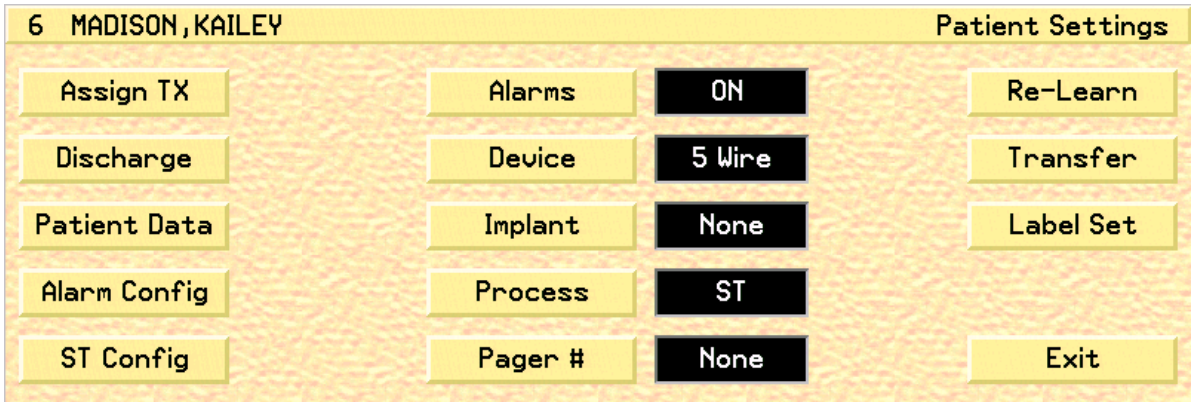

Fig. 34. Patient Settings screen

Setting Device Types

Patients are classified as ambulatory, bedside monitored, or ventilator, depending on whether they are connected to an ambulatory transceiver, a bedside monitoring device, or a ventilator. Monitored parameters are different for the three types of patient. When you define the patient's device, the system determines the set of monitoring options available for the patient.

To enter or change the device type that is connected to the selected patient:

1. Press the **Device** button on the Patient Settings screen to display the Device popup (fig. 35).

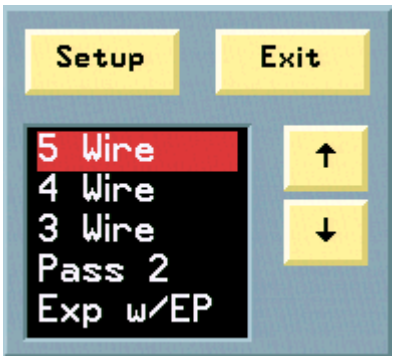

Fig. 35. Device popup

Note: The device types that are displayed in the popup can be selected by the system administrator. If a device type that you need is not displayed here, then see your system administrator for details.

2. Highlight the patient's device type in the popup (available devices are listed in table 7).The device type setting *must match* the device transmitting the patient's data. Otherwise, if alarms are enabled, the **??SOURCE** alarm is triggered.
3. Press **Setup** in the popup to select the highlighted device. If you change the device type, channel settings revert to the default settings of the new device.
4. To leave the device type setting unchanged, press **Exit** on the popup.

Table 7. Device types

Device Type	Specific Device	
Ambulatory	• 5 wire • 4 wire • 3 wire	
Bedside Monitor	• AT w/PRO • Passport 2 • Exp w/EP • Encore • Passport • Expert • MPS • PRO-1000	• DASH • Radical • Propaq • NK 4000 • NK 2300 • Agilent
Ventilator	• PB 7200 • Bird	

Selecting Monitored Parameters for the Configurable Data Block

The configurable block displays up to four monitored parameters at a time. You can change the displayed parameters at any time as a patient's monitoring needs change. The available parameters for each patient type are shown below.

Table 8. Available parameters for configurable data block

Patient Type	Available Parameters	
Ambulatory	• Heart rate • PVC • Battery level of transceiver	• Percent of paced beats • Transceiver ID • High/low heart rate limits • Leadset (3-, 4-, 5-wire) • ST level
Bedside Monitor	• Heart rate • P_1 systolic/diastolic • P_1 mean • P_2 systolic/diastolic • P_2 mean • P_3 systolic/diastolic • P_3 mean • P_4 systolic/diastolic • P_4 mean • P_5 systolic/diastolic • P_5 mean • P_6 systolic/diastolic • P_6 mean • BP systolic/diastolic • BP mean • $EtCO_2$ • $InCO_2$ • SpO_2	• $Temperature_1$ • $Temperature_2$ • Temperature Δ • Respiratory rate • PVC • Heart rate source • RESP rate source • Battery • Percent of paced beats • BP Elapsed Time • Transceiver ID • Cardiac Output • Cardiac Index • Body Surface Area • PAWP • High/low heart rate limits • Device type name • ST level
Ventilator	• Heart rate • SpO_2 • Respiratory rate • Inspiration: Expiration ratio • Tidal volume • Minute volume • Spontaneous minute volume	• Peak inspiratory pressure • Mean airway pressure • Plateau pressure • Oxygen % • PEEP/CPAP • Transceiver ID • Device Type Name

To Select a monitored field:

1. Click one of the four display fields in configurable block to display a popup (fig. 36) listing choices available for the type of patient.

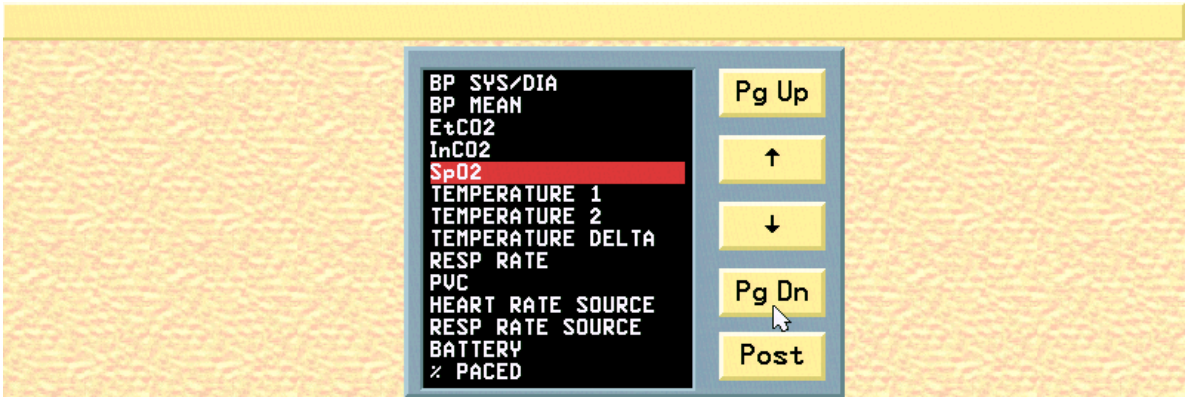

Fig. 36. Digital Parameter Popup - Bedside Device

2. Highlight the data option you wish to display in the block and press **Post.**
3. To display a blank field on the screen, highlight the blank space at the top of the popup screen and press **Post**.

Assigning a Transceiver ID to a Patient

Note: This button is configurable in the system administrator screens. If this button is unavailable, then see your system administrator for details.

To assign a transceiver to a patient channel:

1. Click the **Assign TX** button on the Patient Settings screen (see Figure 34 on page 81) to display the Assign Transceiver screen (fig. 37).

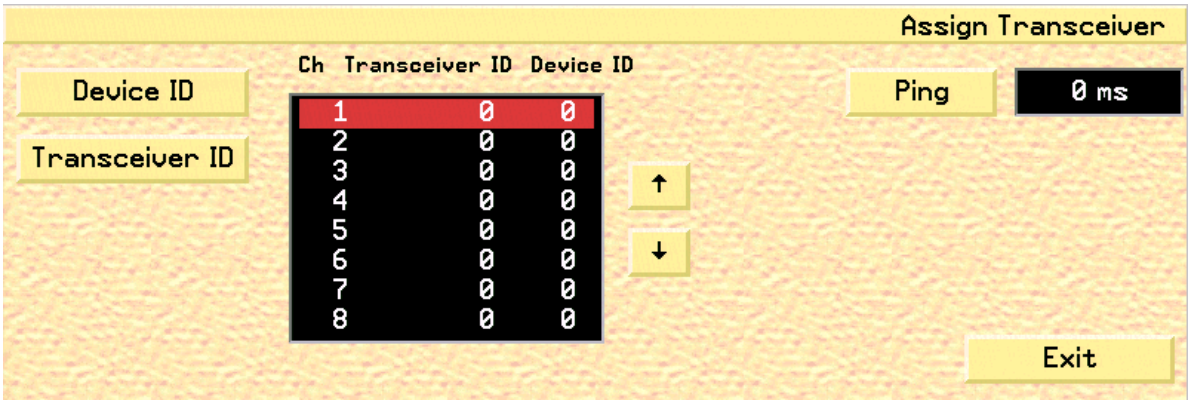

Fig. 37. Assign Transceiver Screen

2. Use the **arrow** buttons to scroll through the patient channels that are currently available on the Central Station.
   Select and highlight the patient channel that will be assigned.
3. Click the **Device ID** button to display the Numeric Pad Popup.
   Enter the Device's Identification number and press **Enter**.
4. Select **Transceiver ID** button to display the Numeric Pad Popup.
   Enter the 6-digit transceiver's identification number from the transceiver's label and press **Enter**.
5. If an invalid identification is entered, then the error message "Invalid transceiver (or device) ID. Please try again." is displayed. Click **OK** in the message box to re-enter the transceiver identification number.
6. Click the **Ping** button to measure and display the time that a message takes to travel back and forth between the Central Station and the transceiver.

Note: This button is for administrative purposes only. Do not attempt to set the Ping.

7. Click the **Exit** button to close the Assign Transceiver screen and return to the Patient Settings screen.

Selecting Waveforms for Display on the Main Screen

Since more than one waveform is transmitted from the patient to the Central Station, you may select which waveform(s) appear on the Main screen. The monitoring device type of the patient determines the set of choices available for display.

Note: Ventilator patients have no waveforms.

Ambulatory Patients

Ambulatory patients show one waveform on the Main screen. To select the waveform:

1. Press **Patient Data** on the Patient Settings screen to display the Patient Data Entry screen.

   If patient demographic information has been previously entered, the View Data screen appears instead. In this case press **Modify Data** to show the Patient Data Entry screen.

2. Press **Display Wave** button on the Patient Data Entry screen to cycle through the available waveforms.
   - For 3-wire devices, only one lead is available.
   - For 4-wire devices, the choices are leads I, II, and III.
   - For 5-wire devices, the choices are leads I, II, III and V.
   - Augmented leads (aVR, aVL, aVF) are available when Augment is enabled.

Note: Enable Augmented Leads by clicking Label Set button.

3. To select the size of the displayed waveform, press **Size mm/mv** repeatedly to choose a waveform of 2.5, 5, 10, 20 or 40 mm/mv.

Note: Changing the waveform size on the monitor display does not change the size of the waveform that the arrhythmia analysis software views and reads.

CAUTION: Select a size that is easy to see but stays within the display area borders.

Bedside Monitored Patients

For bedside patients, you can display one or two waveforms.

1. Press **Patient Data** on the Patient Settings screen to display the Patient Data Entry screen. If patient demographic information has been previously entered, the View Data screen appears; in this case press **Modify Data** to show the Patient Data Entry screen.
2. Press the **Top Wave** button to select the ECG wave. The choices are **ECG1**, **ECG2**, and **None**.
3. Select the size of the ECG waveform by pressing **Top Size**. Choices are 2.5, 5, 10, 20 or 40 mm/mv.

4. Press the **Bottom Wave** button to select the non-ECG wave. The choices are **PLETH**, **P1**, **P2**, **RESP, CO2** and **None**.
5. Select the size of the bottom wave by pressing **Bottom Size**. Choices are as follows:
   - **P1** and **P2**: 1.5, 3, 6, 12 or 24 mm/Hg, where 24 is the smallest and 1.5 the largest.
   - **RESP**, **CO2** and **PLETH**: 0.25x (smallest), 0.5x, 1x, 2x, 4x (largest).

Labeling Waveforms

You can select labels for each transmitted wave; the number of available waveforms depends on the device type selected in the Patient Settings screen. Available waveforms are shown in table 9. OpenNet-compatible bedside monitors can transmit up to three waves of data.

To label the waves:

1. Press **Label Set** on the Patient Settings screen to display the Label Set Definition popup shown in fig. 38. See table 9 for available wave labels.

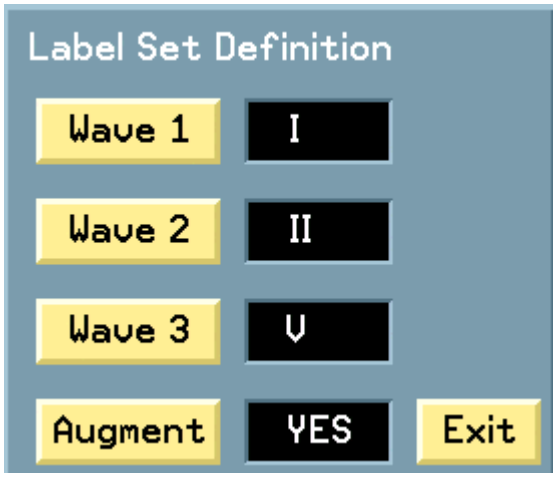

Fig. 38. Label Set Definition popup

2. Press the three **Wave** buttons to cycle through available waves.
3. For 4- and 5-wire transceivers, toggle the **Augment** button to **Yes** if you wish the system to derive the augmented leads aVR, aVL, and aVF automatically. If augmented leads cannot be derived from the leads, **N/A** appears.

Note: Lead III is derived regardless of the Augment setting.

4. Press **Exit** on the popup to save the new waveform labels.

Table 9. Waveform labels

	3-Wire	4-Wire	5-Wire	Bedside
Wave 1	N/A	I, ML1	I	ECG I
Wave 2	I, II, III, ML1, ML6	II, ML6	II	P1
Wave 3	N/A	N/A	V, V_1, V_2, V_3, V_4, V_5, or V_6	P2
Augment	N/A	No, Yes, N/A	Yes, No	N/A

Alarms

Information on alarms and instructions on how to set and work with alarms are covered in detail in the "Alarm Management" chapter starting on page 105.

Enabling Remote Alert

With Remote Alert enabled, a designated PatientNet Viewer automatically displays an alarming patient's channel and sounds the alarm. See "Remote Viewing Stations" on page 175 for more information.

To enable Remote Alert:

1. Press the **Alarm Config** button on the Patient Settings screen.
2. Highlight the desired alarm in the alarm configuration screen and toggle the **Assign** button to **On**.

Note: This applies to the PatientNet Viewer and the Interactive-PatientNet Viewer.

Assigning a Pager Number to a Patient

Note: This applies only if your system includes the paging option. See "Paging" starting on page 238 for further instructions and details on paging.

To assign a pager number or telephone extension to a patient for notification in case of alarms:

1. Press **Pager #** on the Patient Settings screen to bring up the on-line numeric keypad.
2. Enter the pager number or telephone extension (maximum 7 characters) to be assigned to this patient and press **Enter**.
3. If the patient belongs to a zone (a group of up to ten different pager numbers), enter **Z** and then the zone number. Alarms enabled for paging will be sent to all pagers in the zone. Zone group paging is set up by the system administrator.
4. Select **None** if you wish no page to be sent.

Note: Pagers may also be set-up by group, where a number of pagers belong to a single group.

Note: If the Pager # button is set to Pre-Admit, then a pager number must be entered before a patient may be admitted. If the Pager # setting is set to Pre-Admit and you attempt to admit a patient without a pager number, then a popup will be displayed stating that a pager number must be entered prior to admitting the patient.

Implants

Press the **Implant** button on the Patient Settings screen to cycle through the choices for patient implant. Choose the type below that applies to the patient:

Type	Definition
Pacer	Pacemaker
AICD	Automatic Implantable Cardioverter Defibrillator
PCD	Pacer-Cardioverter-Defibrillator
None	No implant

Setting the Implant field to a value other than None is for display only and has no effect on pacer processing or arrhythmia analysis.

If the Central Station is currently processing arrhythmia, implant labels (except None) are displayed in the patient block.

Pacer Processing or ST Analysis

You can select ST analysis or pacer processing, or neither, for a patient, but not both. ST analysis and pacer processing are mutually exclusive functions.

WARNING: Always set Process to Pacer for patients who have working electronic pacemakers. Do not set Process to Pacer for patients who do not have an electronic pacemaker.

Note: The Pacer button is not available if a 3-Wire device type is selected. Pacer Processing is not available for 3-Wire ambulatory patients.

Press the **Process** button on the Patient Settings screen to scroll through **Pacer**, **ST** or **None**.

CAUTION: If you select Pacer, no ST alarms are triggered.

Setting the Pacer Blanking Period

Setting a blanking period before and after the pacer spike removes residual pacer artifact from the ECG signal. See “Pacemaker Processing” on page 95 for details.

Note: This feature availability is configurable. If the Pacer Filter button is not available, then see your system administrator for details.

Arrhythmia Processing

Arrhythmia processing can take place at the Central Station or at the bedside patient monitor. See “Arrhythmia Analysis” on page 51 and “ST Analysis” on page 167 for details.

The Central Station can perform arrhythmia processing on up to three ECG waves. It analyzes data sent by the patient monitor and issues alarms on arrhythmia events.

Patient Transfers

You can transfer a patient’s settings and data from one channel on a Central Station to another channel or to a different Central Station on the same network.

Note: Transferring the room number, nursing unit, transceiver ID, alarm actions are configurable options in the administrator’s screens.

WARNING: If the Transceiver ID is not configured to transfer with the patient data, then transceivers will remain associated with their original channels. Therefore, the patient must be physically moved to the transceiver that is associated with the new channel to continue monitoring.

Local Transfer

A *local transfer* is a transfer of a patient’s settings and data from one channel to another on the same Central Station.

1. Press **Transfer** on the Patient Settings screen and select the patient. The Transfer popup appears directing you to select the channel (ignore the bottom half of the popup; this applies to network transfers).
2. Choose an empty channel and click on its waveform area to transfer the patient’s data and settings

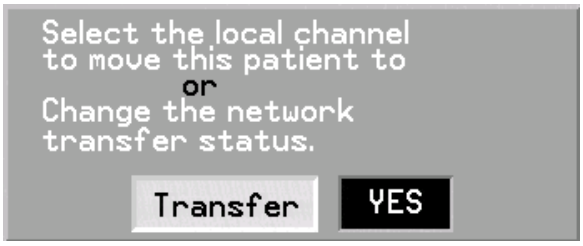

Fig. 39. Transfer popup

Network Transfer

You can move a patient's settings and data from one Central Station to another in a network transfer.

Setting The Network Transfer Status of a Patient

The network transfer status of a patient determines whether or not he or she can be transferred to a different Central Station. To make a patient transferable on the network:

1. Press **Transfer** on the Patient Settings screen.
2. On the Transfer popup, toggle the Transfer button to **Yes**.

Transferring the Patient from One Central Station to Another

1. Press **Setup** on the Main screen and select the waveform area of an *empty* channel.
2. Press the **Transfer** button to display a list showing all patients on the network who are available for network transfers. If no patients are available, a No Patients Available popup appears.
3. From this list, choose the patient you wish to transfer to the selected empty channel on the current Central Station and click **Select**.
4. Once the transfer is complete, with the transferred patient's waveform area highlighted, press the **Alarms** button on the Patient Settings screen and select **On** to reactivate the alarms.

Note: During a network transfer, all event storage for the patient being transferred stops. This includes any event you manually try to store or any alarm condition that would cause the storage of an event.

Note: To ensure that 24-hour or 72-hour full disclosure data is transferred, the transfer popup must indicate "Yes" in the text field. see Figure 39 on page 92.

WARNING: A network transfer with full disclosure data may take at least twenty minutes or longer, depending on the amount of data being transferred. During this time, alarms are OFF. After a network transfer, alarms must be reactivated.

WARNING: It is possible that you can abort patient a transfer operation. If you abort the transfer, then the patient waveform will revert back to the source channel. The destination channel will not be monitored, and alarms at the source channel must be turned back on manually. System operators must diligently monitor patients undergoing transfers to assure that if an abort does occur, the transfer can be re-initiated.

Aborting Transfers in Progress

You can stop a transfer while it is in progress by pressing the Transfer button a second time. A popup message will appear asking you if you wish to halt/abort the transfer (fig. 40). Click **Yes** if you wish to stop the transfer, or **No** to continue with the transfer as described above.

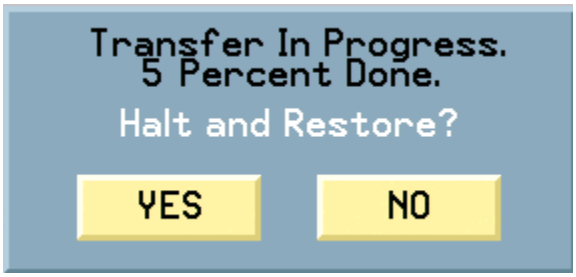

Fig. 40. Halting a Transfer Popup

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PACEMAKER PROCESSING

You can select pacemaker processing, ST Analysis, or neither for a patient, but not both. These two processes are mutually exclusive functions.

WARNING: Always set Process to Pacer for patients who have working electronic pacemakers. Do not set Process to Pacer for patients who do not have an electronic pacemaker.

Press the **Process** button on the Patient Settings screen to toggle through **Pacer**, **ST**, or **None**.

Note: The Pacer button is not available if a 3-Wire device type is selected. Pacer Processing is not available for 3-Wire ambulatory patients.

CAUTION: If you select Pacer, no ST alarms are triggered.

Pacemaker Detection

Pacemaker pulses are detected by the bedside monitor or ambulatory transceiver and sent to the Central Station, which processes pacemaker data in the same way for both ambulatory and bedside patients. See page 90 for instructions on how to make pacemaker settings.

Note: False beat detections can be caused by low amplitude artifact on paced patients. To eliminate false beats, reposition the LA electrode. See "Patients with a Pacemaker" on page 49.

Pacemaker Analysis

When pacemaker analysis is enabled in the Central Station, the central "looks" for the encoded pacemaker flag in the digital ECG data. The system indicates where pacemaker pulses were detected by inserting a pacemaker flag in the ECG data. The pacemaker flag is displayed in a selected color in order to easily distinguish the pacer flag from the background ECG. The pacemaker flag is represented in printed ECG data as a thick 10 mm line (See Figure 41 on page 96).

Note: The PatientNet System complies with the Pacemaker Detection requirement per ANSI/AAMI EC-13 Cardiac monitors, heart rate meters, and alarms. We do not validate specific pacemakers. If the pacemaker does not produce pacer pulses at the skin within the parameters described under ANSI/AAMI EC-13, then the DT 4000 or DT4500 may not be able to detect the pacemaker.

WARNING: Close surveillance of patients that have a pacemaker is required.

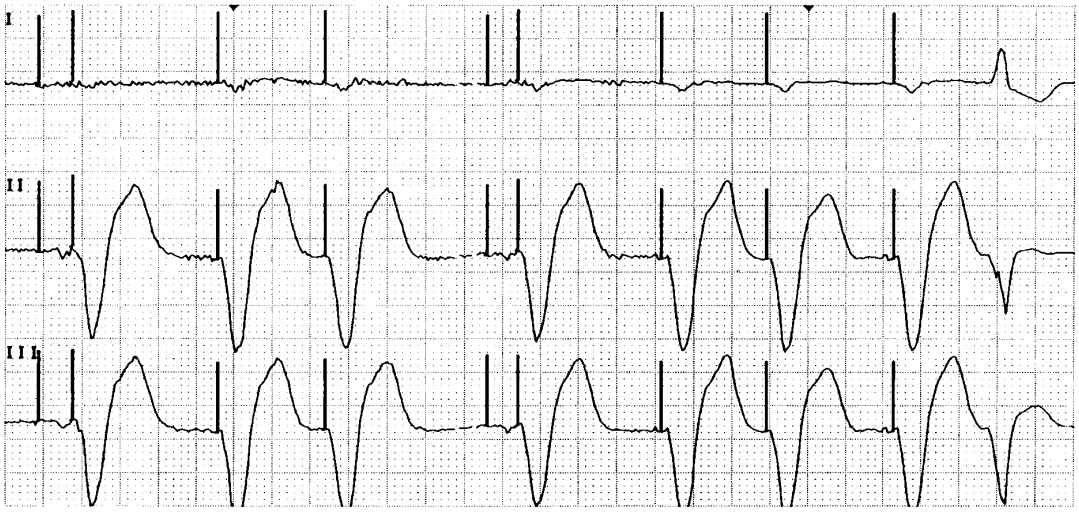


Fig. 41. Three Lead Depiction of Pacemaker Rhythm

Pacemakers are electronic devices that stimulate the myocardium with an electrical impulse. The type of pacemaker and its settings determine the frequency of the impulse. Demand pacemakers detect the underlying heart rhythm and send an impulse only when the heart rate falls below a preset level/rate. Fixed-rate pacemakers send an impulse at a specific rate regardless of the intrinsic heart rate. Pacemakers are often set to sense and stimulate the ventricle, but may also sense and stimulate the atria, or both the atria and the ventricles (DDD or A-V sequential pacemakers). Whatever type of pacemaker is used, there are certain characteristics that the pacemaker detection algorithm looks for in order to identify a pacemaker spike. As noted earlier, when a pacemaker spike is detected, the resulting beat is tagged or flagged. These tagged beats activate a special algorithm to process and count the paced beats.

Because not all pacemaker spikes have the same width and amplitude, detection of the spike and the subsequent QRS complex poses a two-fold challenge for the monitor.

The first challenge is to differentiate the pacer spike from the QRS. This is not a problem when each pacer spike is followed by an actual QRS complex. The problem arises if the patient should go into cardiac standstill and the pacemaker continues to fire. The monitor could count the spikes as if they were actual beats. This condition is commonly referred to as “dead-man” pacer. Regardless of the use of arrhythmia monitoring, pacemaker patients always require additional surveillance.

The second challenge is to filter out the residual pacemaker artifact, which might trip the QRS detector, without filtering too much of the QRS complex. The front-end device monitor (ambulatory transceiver or bedside monitor) must detect and flag the spike so that the residual artifact can be filtered correctly; thus allowing the algorithm to make the appropriate response.

Determining Pacer Filter Blanking Periods

WARNING: If the pacer filter is changed from 25 ms, an increased level of surveillance should be instituted.

Note: This feature availability is configurable. If the Pacer Filter button is not available, then see your system administrator for details.

The pacer filter is enabled when Process is set to Pacer. The pacer filter setting controls the blanking interval, applied before and after the pacer flag, to remove residual pacer artifact from the ECG signal. The default pacer filter is 25 msec, which should be adequate for the majority of pacemaker signals from the PatientNet transceivers. In some cases, it may be necessary to increase or decrease the pacer filter. If the pacer filter is changed from 25 msec, an increased level of surveillance should be instituted.

Annotated disclosure review can help differentiate which beat detection performance issues may be attributed to pacer artifact or pacer filter problems. There should be one, and only one, beat annotation associated with every QRS complex. In general, if the system is calling false low rates, or false Asystoles, due to fused beats (missing beat annotations), then the pacer filter should be decreased (fig. 42). If the system is calling false high rates due to the detection of pacer artifact as beats (more than one annotation per beat), then the pacer filter should be increased (See Figure 43 on page 99).

Note: The pacer filter does not affect pacer detection

FALSE ASYSTOLE ALARMS ON FUSED BEATS

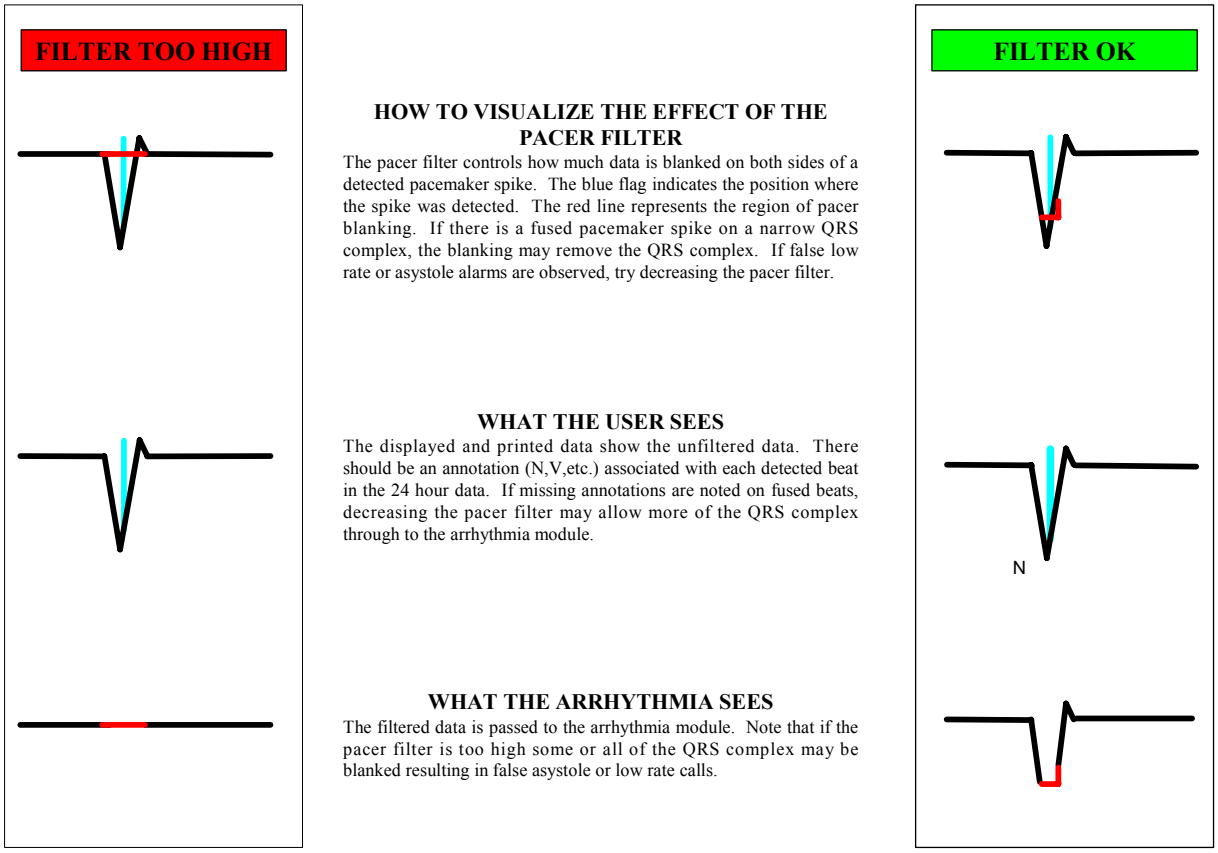


Fig. 42. False Asystole Alarms on Fused Beats

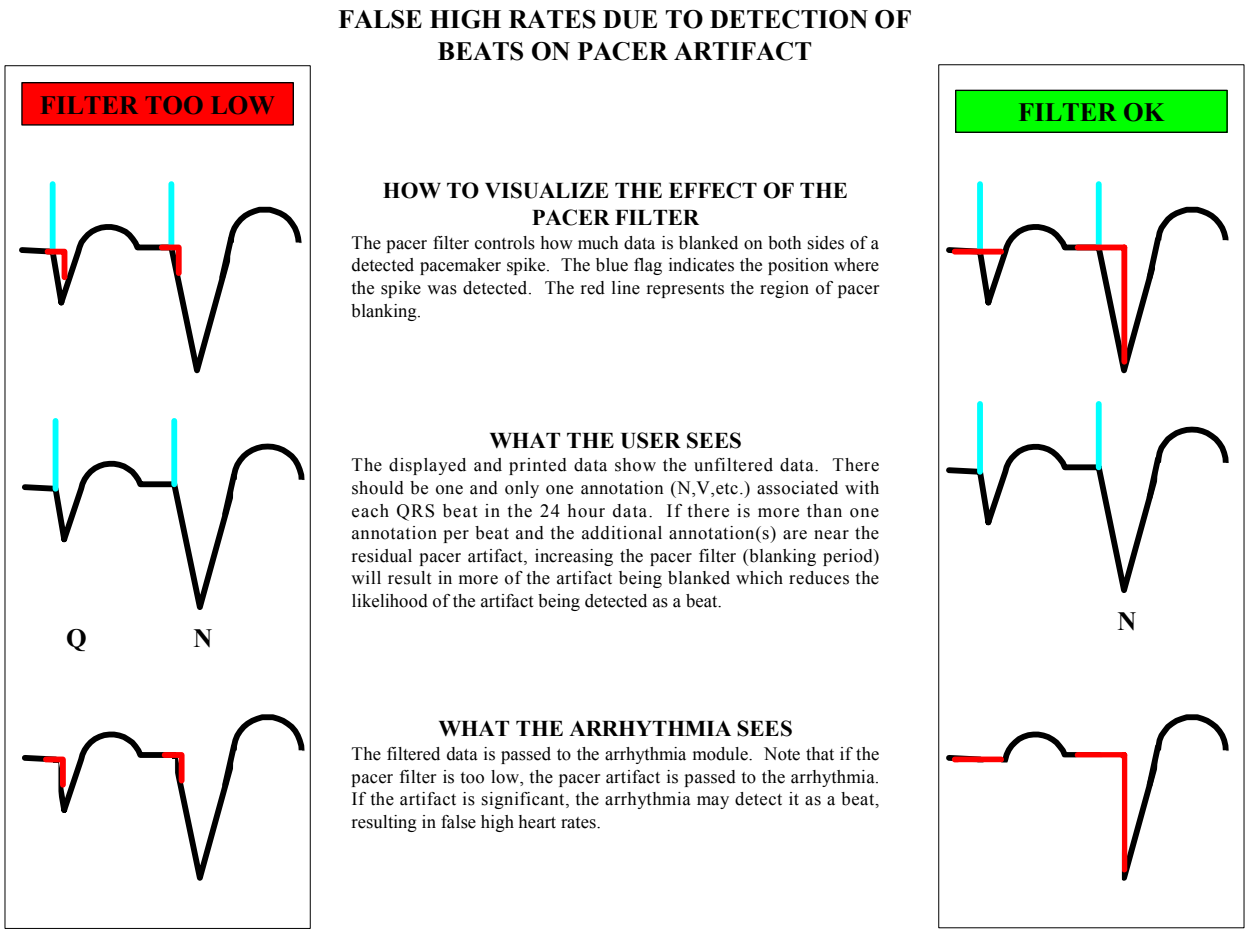


Fig. 43. False High Rates Due to Detection of Beats on Pacer Artifact

The following procedure is recommended for determining the length of the optional blanking interval:

1. Place the patient on the system.
2. After establishing a stable waveform, store the paced rhythm in the view screen.
3. Inspect the flag and measure the interval from the flag to the physiologic response (P wave or QRS), as shown in fig. 44 and fig. 45. Residual artifacts of the pacer may appear between the flag and the start of the QRS. You can use the electronic calipers to measure the interval.

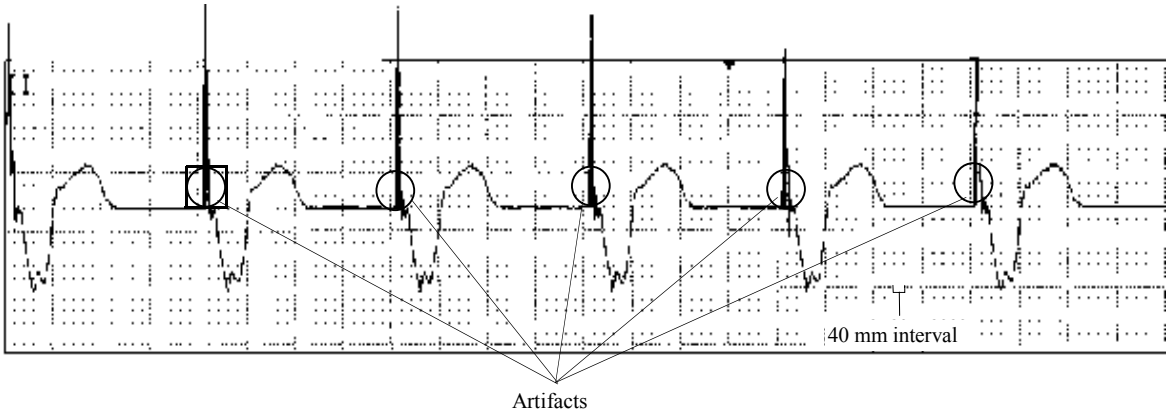


Fig. 44. Waveform Measurement - Blanking Interval

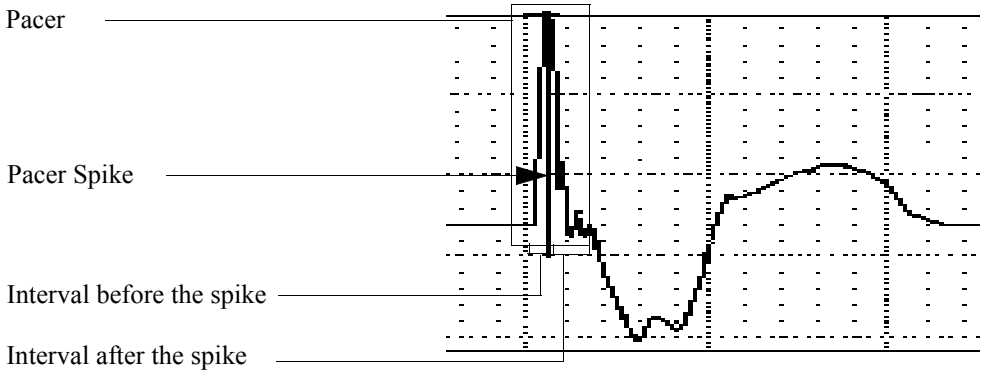


Fig. 45. Detailed Waveform

4. You can also inspect the flag and artifacts by recording the waveform on a strip or a laser printout. You can use manual calipers for the inspection. Remember the following facts:
   - Not all monitors position the pacer flag in the same place in the data in relation to the actual pacemaker spike or artifact. The flag may be in the center of the artifact, or it may precede or follow the artifact. Examine the location of the artifact and measure it accordingly.
   - Widths of the artifacts will vary. Take several measurements and use the largest interval as the desired “blanking period” setting.

Patients with Impedance-Derived Rate Response Pacemakers

This type of pacemaker emits pulses (20 Hz) for adjusting the pacemaker rate to the patient’s respiration rate. The front-end device may detect such impedance pulses as pacemaker spikes and display them in very short, regular intervals, which are superimposed on the patient’s ECG waveform. Telectronics manufactures such an impedance-based pacemaker to measure the respiration rate and adjust the pacemaker rate accordingly.

The manufacturer’s documentation states that the impedance pulse amplitude is about one-tenth of the pacing pulse amplitude. This implies the existence of an electrode configuration that will enable the transceiver to detect the pacing pulse and not the impedance pulse. See fig. 46 for an example of the “picket fence” appearance of the pulses on the ECG waveform. This is more easily noted on real-time strips or in the history.

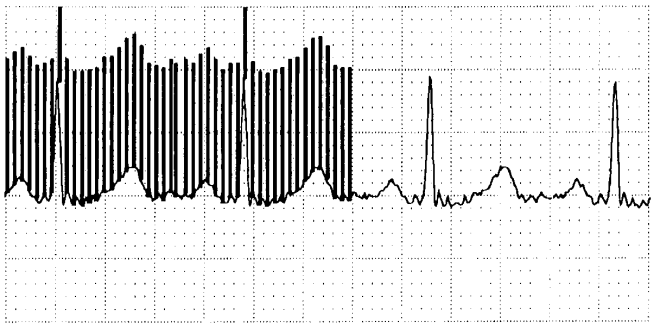


Fig. 46. Picket Fencing - Impedance-Derived Rate Response Pacemakers

Note the next four figures, where the system is accurately detecting and presenting the pacemaker flag.

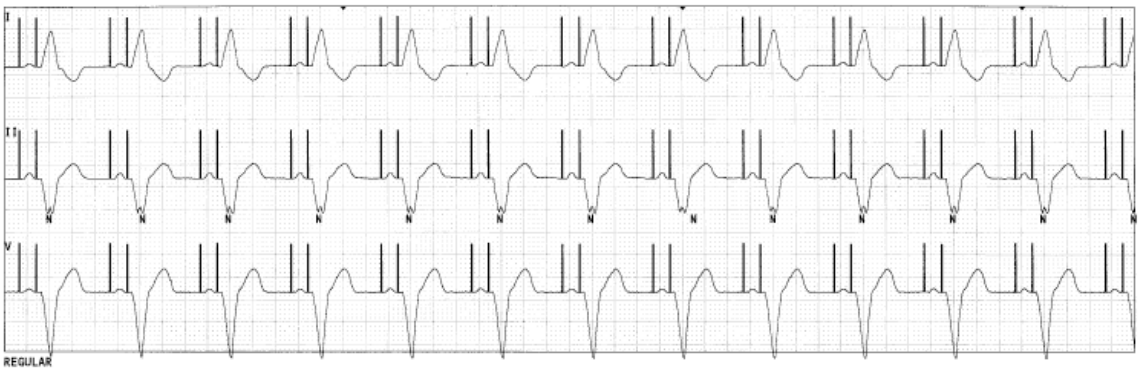
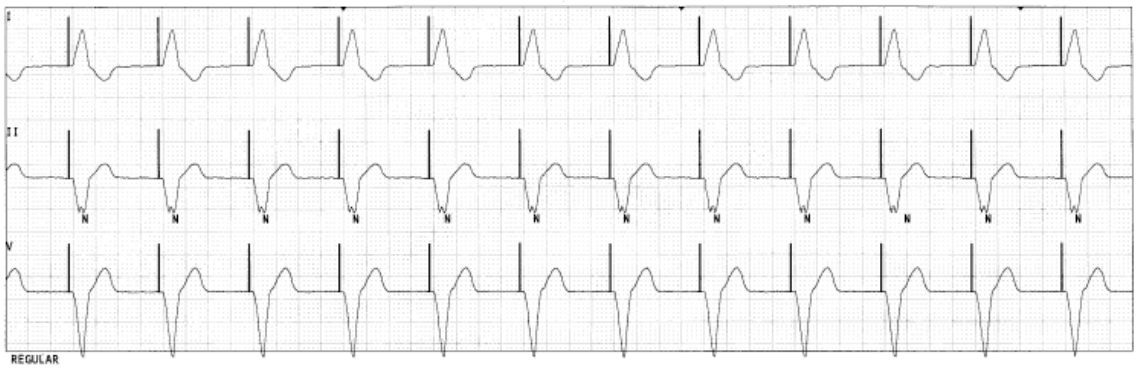


Fig. 47. Accurate Pacemaker Flag - Atrial-Ventricular Pacing



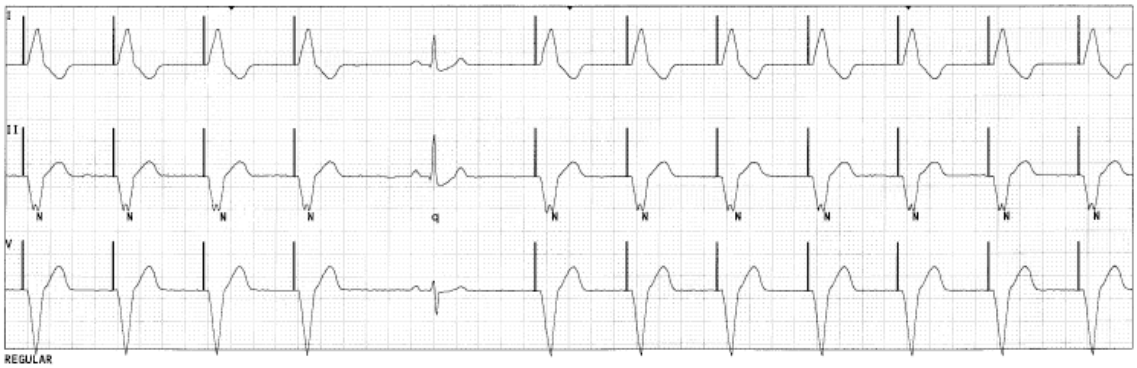


Fig. 48. Accurate Pacemaker Flag - Ventricular Pacing

Fig. 49. Accurate Pacemaker Flag - Ventricular Pacing

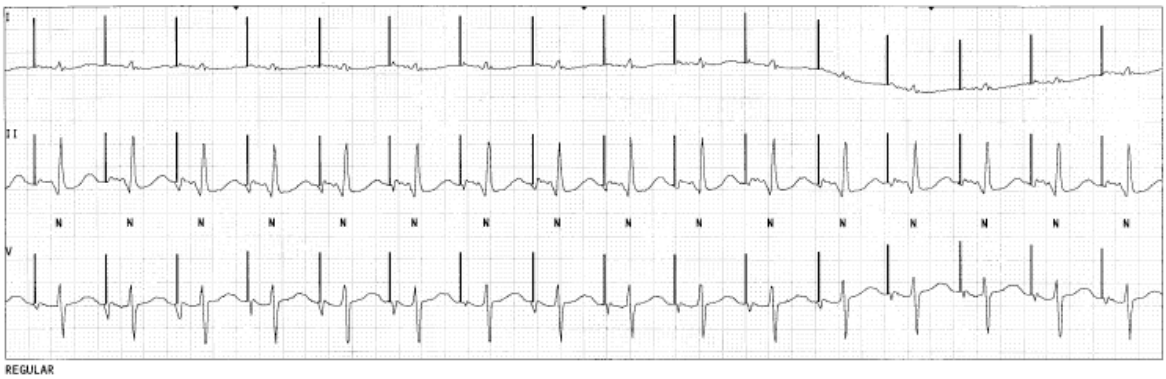


Fig. 50. Accurate Pacemaker Flag - Atrial Pacing

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ALARMS

Alarms are activated by life-threatening, medical and technical events.

WARNING: Because of the large physiologic differences among individuals, we cannot ensure that every life threatening event will trigger an alarm.
The PatientNet System cannot replace skilled nursing care and proper surveillance. Any alarm or abnormal indication displayed by this system should be reviewed by skilled clinical staff to determine if the appropriate diagnostic procedure should be initiated.

This instrument may not produce alarms from some pacemaker patients who experience cardiac arrhythmias. Maintain high-risk and pacemaker patients under close surveillance.

WARNING: When using a bedside device with the instrument transceiver (DT-7000/7001), the bedside device is the primary monitor and alarm source. Disabling alarms on the bedside device is not safe clinical practice.

Alarm Detection

Alarms are detected according to patient type as follows:

Ambulatory patients: all alarms are detected at the Central Station.

Bedside monitored patients: alarms are detected at the bedside monitor, at the Central Station, or both.

Ventilator patients: all alarms are processed at and by the ventilator unit; the Central Station only displays the alarms received from the ventilator.

Alarm Sound Indicators

The Central Station produces characteristic sounds associated with the types and levels of alarms as shown below.

Alarm Type	Pitch	Relative Speed
Medical: level 1	alternating tone	fast
Medical: level 2	single tone	medium
Medical: level 3	single tone	slow
Technical; level 1, 2, 3	single tone	slowest

Visual Alarm Indicators

Alarms are indicated visually on the Main screen in the patient information block and on the Full Disclosure screen (fig. 51).

Main Screen Patient Information Block

Alarm names are displayed in the patient block. Only the active or latched alarm *with the highest priority* is shown, but if more than one alarm is active, the alarms with the highest priority are displayed in rotation.

Full Disclosure Screen

Zoomed-Out Mode

A line under the waveform indicates an alarm. Medical alarm lines are flashing red; technical alarm lines are yellow; and turned-off alarms have white lines.

Zoomed-In Mode

Alarms are shown in the lower left corner of the wave display window (no lines appear under the waveforms). Medical alarm text is flashing red; technical alarms are yellow (some are flashing red).

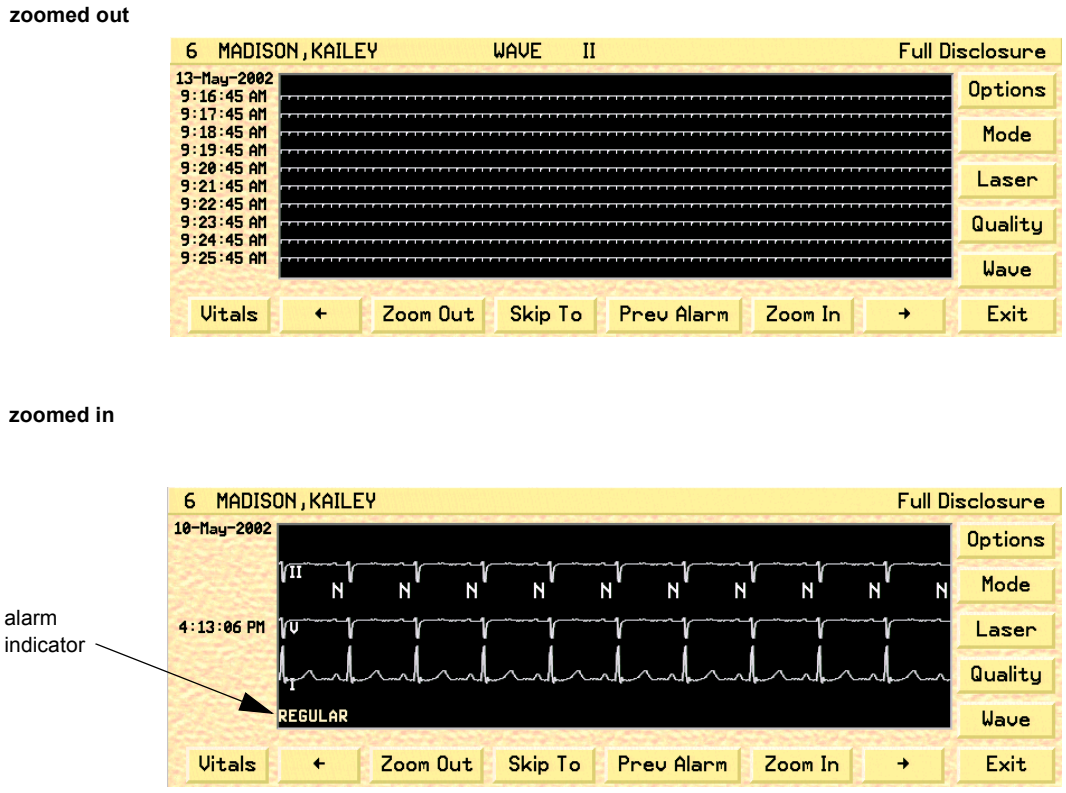

Fig. 51. Visual alarm indicators

Acknowledging Alarms

When an alarm is triggered, you can temporarily silence the tone associated with the alarm while you analyze the rhythm and notify the appropriate personnel of the patient's condition. The **Silence** button on the Main screen silences alarms for a duration preset by the system administrator. This duration may be 30, 45, 60 seconds, or 3 minutes. During this period, a silence indicator (crossed-out bell) appears in the patient block. If a new alarm occurs during the silence period, the audio for the new alarm breaks through to assure clinical notification of all alarm events. At the end of the silencing period, if an alarm that was silenced is still active, the audio alarm is again sounded.

Note: The recommended method to silence alarms is to silence the audio alarm by selecting the Silence button ONCE. This allows for clinical notification of new alarm events. Informed use of the Silence button is critical to safe and effective alarm management.

Selecting the Silence button on the Main screen twice within 5 seconds, then immediately selecting the alarm text in the patient information block, turns off **all** alarms for 3 minutes. The Alarm OFF text flashes in the patient information block, then, after 3 minutes, the alarms automatically turn on.

CAUTION: Selecting the Silence button TWICE, and the alarm text in the patient information block, renders the Alarms OFF for 3 minutes. This is <u>not</u> safe clinical practice depending on the acuity, and the monitoring needs, of the patient. This is mentioned here to prevent inadvertent cancellation of alarms.

Medical, Level 1

Most urgent alarm (flashing red, loud alternating tone).

1. Press the **Silence** button on the Main screen *once*.
2. Press the **View** button and select the alarming patient to observe the patient's real-time rhythm in available leads.
3. Notify the appropriate staff according to hospital policy and procedure.
4. If the alarm is configured for paging, analyze the rhythm and select Page or No Page as appropriate.
5. If the alarming rhythm continues, go to Step 6. If it returns to normal, click on the alarm text in the patient information block to acknowledge and clear the alarm.
6. Press the **Silence** button *twice* and then press the alarm text in the patient block. This turns off *all* alarms for 3 minutes.

   `ALARM OFF` flashes yellow for 3 minutes, then a learn takes place and the alarms automatically turn on.

If hospital policy allows, when a code is in progress and all needed staff are present in the room, all alarms can be turned off. Do this with the **Alarms** button in the Patient Setup screen.

When you turn off all alarms, the alarm text in the patient block reads `ALARM OFF` in yellow until you click on it.

Medical, Level 2

Less urgent than a medical, level 1 alarm (flashing red, single fast tone).

1. Press the **Silence** button on the Main screen *once*.
2. Press the **View** button and select the alarming patient to observe the patient's real-time rhythm in applicable leads.
3. Notify the appropriate staff according to hospital policy and procedure.
4. If the alarm is configured for paging, analyze the rhythm and select Page or No Page as appropriate.
5. If the alarming rhythm corrects to normal, go to Step 6. If the alarming rhythm continues, go to Step 7.
6. Select the alarm text in the patient information block to acknowledge and clear the alarm.
7. Press the **Silence** button *twice* and then press the alarm text in the patient block. This turns off *all* alarms for 3 minutes.

   While the alarms are off, `ALARM OFF` flashes in yellow. Then, a learn takes place and all alarms are automatically turned on again after the 3 minute time limit.

If hospital policy allows, when a medical code is in progress and all needed staff are present in the room, all alarms can be turned off. Do this with the **Alarms** button in the Patient Setup screen.

When you turn off an active alarm, the alarm text in the patient block reads "`ALARM OFF`" in yellow until you click on it.

Medical, Level 3

Less urgent than a medical, level 2 alarm (flashing red, single slow tone).

1. Press the **Silence** button on the Main screen *once*.
2. Press the **View** button and select the alarming patient to observe the patient's real-time rhythm in applicable leads.
3. Notify the appropriate staff according to hospital policy and procedure.
4. If the alarm is configured for paging, analyze the rhythm and select Page or No Page as appropriate.
5. If the alarming rhythm corrects to normal, go to Step 6. If the alarming rhythm continues, go to Step 7.
6. Press the **Silence** button as needed.
7. Press the **Silence** button *twice* and then press the alarm text in the patient block. This turns off *all* alarms for 3 minutes.

   `ALARM OFF` flashes yellow for 3 minutes, then a learn takes place and the alarms automatically turn on.

Technical, Level 3

Least urgent of all alarms (solid yellow, single slow tone).

1. Press the **Silence** button on the Main screen *once*.
2. Press the **View** button and select the alarming patient to observe the patient's real-time rhythm in applicable leads.
3. Notify the appropriate staff according to hospital policy and procedure.
4. If the alarm is configured for paging, analyze the rhythm and select Page or No Page as appropriate.
5. If the alarming rhythm corrects to normal, go to Step 6. If the alarming rhythm continues, go to Step 7.
6. Press the Silence button as needed.
7. Press the **Silence** button *twice* and then press the alarm text in the patient block. This turns off *all* alarms for 3 minutes.

   `ALARM OFF` flashes yellow for 3 minutes, then a learn takes place and the alarms automatically turn on.

Silencing Alarms

Press the **Silence** button on the Main screen *once* to silence all active alarms while you analyze the rhythm and notify the appropriate personnel of the patient's condition.

Silencing lasts for 30, 45, or 60 seconds or 3 minutes, as pre-configured by the system administrator. A crossed-out bell icon in the patient block indicates that alarm silencing is in effect.

New alarms that occur during the silence period break through the silence; this ensures clinical notification of all alarm events.

At the end of the silencing period, active alarms resume their sound.

CAUTION: The recommended method to silence alarms is to silence the audio alarm by selecting the Silence button ONCE. This allows for clinical notification of new alarm events. Informed use of the Silence button is critical to safe and effective alarm management.

You can also press the Silence button twice within 5 seconds, then immediately click on the alarm text in the patient information block to turn off *all* alarms for 3 minutes. The ALARM OFF text flashes in yellow in the patient information block, then after 3 minutes, a learn takes place and the alarms automatically turn on.

WARNING: Turning off all alarms is not a safe clinical practice, depending on the acuity and monitoring needs of the patient.

If the bedside monitor permits alarm silencing, the Central Station responds as follows:

- **Bedside alarm source:** the Central Station silences alarms for the specified bed. A crossed-out bell appears in the patient block while the silence remains in effect. Alarms are silenced for a period of time set by your facility's system administrator.
- **Central alarm source:** the Central Station *ignores* the silence indicator from the bedside monitor.

(See page 115 for alarm source information.)

Suspending Alarms from the Bedside Monitor

Some bedside monitors allow temporary suspension of all alarm processing. During such suspension the alarm text in the patient block is `ALMSUSPEND`.

Enabling Alarms

Alarms must be enabled before they can be processed. Enabled alarms are alarms set to ON or to Smart Alarms, as described below.

Fig. 52. Alarms popup

1. Press the **Alarms** button on the Patient Settings screen to display the Alarms popup (fig. 52).
2. Select **ON, OFF,** or **SMART ALARM** and then double-click or press **Post**.

   ON enables all alarms for a patient. If you select **ON**, press **Alarm Config** to make settings for individual alarm.
   Off disables sound and alarm text of all alarms for this patient; no notification of an alarming condition takes place. The system does not monitor patients whose alarms are set to **Off**.

WARNING: Do not turn alarms OFF as a substitute for Silence (see "Procedure Alarm Silence (PAS)" on page 127). Patients with alarms set to OFF are not monitored. Patient channels with silenced alarms, however, are still monitored and alarms resume, after the silence period ends, if the condition persists.

Smart Alarm

With Smart Alarm you can remove patients from monitoring temporarily for such purposes as testing or showering without having to re-enter their settings or turn off alarms.

1. Press **Alarms** on the Patient Settings screen to display the alarms popup.
2. Highlight **Smart Alarm,** then press **Post**. This brings up a popup with a list of locations the patient might be while monitoring is suspended. Default locations are shown below; this list can by changed by the system administrator.

TEST	STRESS TEST
SHOWER	G.I. LAB
X-RAY	PHY THERAPY
CATH LAB	ECHO
NUCLEAR MED	*Blank spaces*
EEG	

3. Highlight the appropriate location and double-click or press **Post**. The location appears in the patient information block (fig. 53 shows `CATH LAB` as an example). If you select a blank space, `SMART ALARM` flashes instead.

Fig. 53. Smart Alarm patient location

4. You can return the patient to monitoring either manually or automatically.

   Manually: click on the location text in the patient block. This causes the text to disappear and the re-learn to begin.
   Automatically: when the transceiver is reconnected to the patient or when the signal comes back into range, the rhythm automatically reappears on the screen. The patient information block displays the location for three minutes after the signal re-appears. After three minutes of continuous good signal, the patient is automatically taken out of Smart Alarm mode, and the system performs a re-learn. During these three minutes, only Level 1 alarms are enabled; all others are suspended.
   The Alarms field on the Patient Settings screen automatically switches to **On**.

Re-learning After Alarm State Transitions

Relearning (see “Learn and Relearn Considerations” on page 70) takes place automatically on resumption of monitoring after Smart Alarm and after alarm state transitions as shown in Table 10.

Table 10. Relearning after alarm state transitions.

From	To	Re-learn Initiated
Smart Alarm	Alarms On	Yes
Smart Alarm	Alarms Off	Yes
Smart Alarm	3 Minute Alarm Off	Yes
Smart Alarm	Smart Alarm	No
Alarms On	Alarms On	No
Alarms On	Alarms Off	No
Alarms On	3 Minute Alarm Off	Yes
Alarms On	Smart Alarm	No
Alarms Off	Alarms On	Yes
Alarms Off	Alarms Off	No
Alarms Off	3 Minute Alarm Off	Yes
Alarms Off	Smart Alarm	Yes
3 Minute Alarm Off	Alarms On	Yes
3 Minute Alarm Off	Alarms Off	Yes
3 Minute Alarm Off	3 Minute Alarm Off	N/A
3 Minute Alarm Off	Smart Alarm	Yes

CAUTION: The visual display of Learning (LEARNING) in the Patient Tile will not be seen if V-TACH occurs during a Smart Alarm condition.

Alarm Configuration

Alarm settings are made at the system-wide level and at the patient level. System-wide alarm settings apply to all alarms and are set by the system administrator.

Alarm settings are made at the patient level to tailor alarms according to individual patient needs. To configure patient alarms, you must open the Alarm Configuration screen.

To open the Alarm Configuration screen:

1. Click on the **Setup** button in the toolbar
2. Click on the **Alarm Config** button in the Application window.

Note: The Alarm Config button is enabled and disabled by your System Administrator. If this button is disabled, check with your System Administrator for details.

3. The Alarm configuration application opens.

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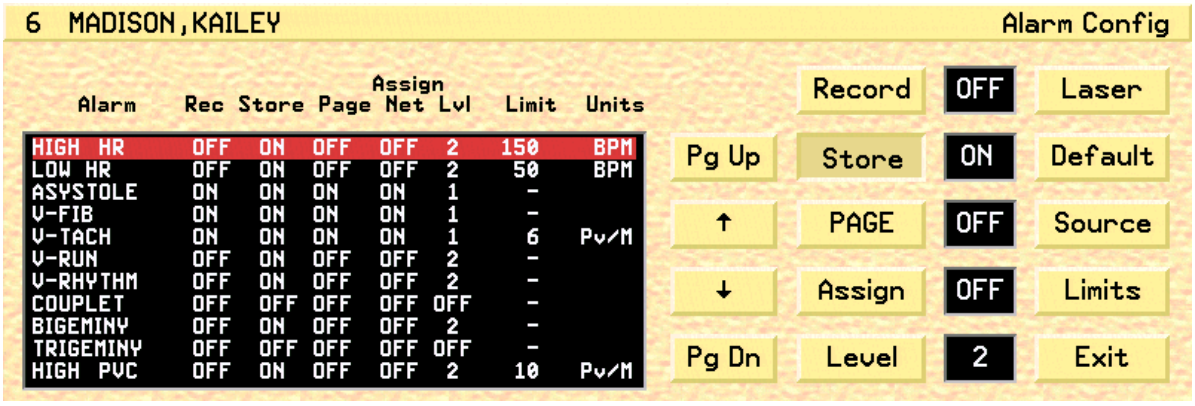

Fig. 54. Alarm configuration screen

System Alarm Configuration

The behavior of alarm indicators when the alarming event is no longer present can be configured by a system-wide “latch” setting, which can be changed by the system administrator. Consult the system administrator to determine the appropriate latch setting to use for your facility.

Patient Alarm Configuration

Automatic Printing of Alarm-Triggered Events

It may be helpful to have hard copies of alarmed events for the patient’s file. To have these events printed automatically on the recorder or laser printer, toggle the **Record** button to **On**. (The Record button is not available for ventilator patients.)

Storing an Alarm Triggered Event

You can store an alarmed event automatically by setting the system to capture the event and ten seconds before and after the event that caused the alarm. The event is stored in the patient's history file. Toggle the **Store** button to **On.**

Enable Paging for an Alarm Triggered Event

If your system has the paging option, you can have the system automatically generate a page when an event triggers an alarm. See "Paging" on page 238. Toggle the **Page** button **On.**

Assigning the Patient to a PatientNet Viewer

To permit the patient to be assigned to the PatientNet Viewer (also known as the RVS) configured to receive alarms, toggle the **Assign** button to **On.** See also "Enabling Remote Alert" on page 89.

Setting Alarm Urgency Levels

Alarms are ranked according to urgency from level 1 alarms, the most urgent, through level 3 alarms, the least urgent.

Press **Level** to select alarm level 1, 2, or 3, or **Off**. If you select **Off**, no audio or visual indications occur when an alarm is triggered.Technical alarms are typically set to level 3, but some may be set to higher levels at your discretion.

If two alarms occur at the same time, the alarm with the highest priority appears in the patient information block and sounds a tone. If two alarms of equal priority occur at the same time, they rotate in the patients information block.

Note: Asystole, V-FIB, and V-TACH alarms are always set to Level 1 and cannot be changed.

Setting Alarm Limits

You can adjust the upper and lower limits of alarms when the Alarm Source is set to Central but not to Bedside (except for High PVC alarm) or for ventilator patients. You cannot set alarm limits for technical and arrhythmia alarms (except for High PVC) since these alarms have no applicable limits.

Note: If available, you can set the limits for the V-TACH alarm. See your system administrator for details. See "Configuring the V-TACH Alarm Limits" on page 115 for additional information.

1. Press the **Alarm Config** button on the Patient Settings screen to display the Alarm Config screen.
2. Highlight an alarm with a value under Limit in the list of alarms.
3. Press the **Limits** button to display a vertical bar where you set the new limit. Note that the **Limits** button becomes **Options**.
4. Click in the vertical bar or use the arrow buttons to select the new limit, which appears in the small window above the arrow buttons. Or, press **Default** to revert to the default limit.
5. Press **Options** to return to the Alarm Config screen or **Exit.**

Configuring the V-TACH Alarm Limits

You can set the limits, PVC and HR, for calling a level 1 V-TACH alarm on the V-TACH Config screen.

Note: The changes made to the V-TACH alarm limits affect only the selected patient.

To configure the V-TACH alarm:

1. Click the **Alarm Config** button to display the Device Alarm Config screen (See Figure 55 on page 115).
2. Use the **Up** and **Down** arrows on the Alarm Config screen (fig. 55) to highlight and select the **V-TACH** alarm.

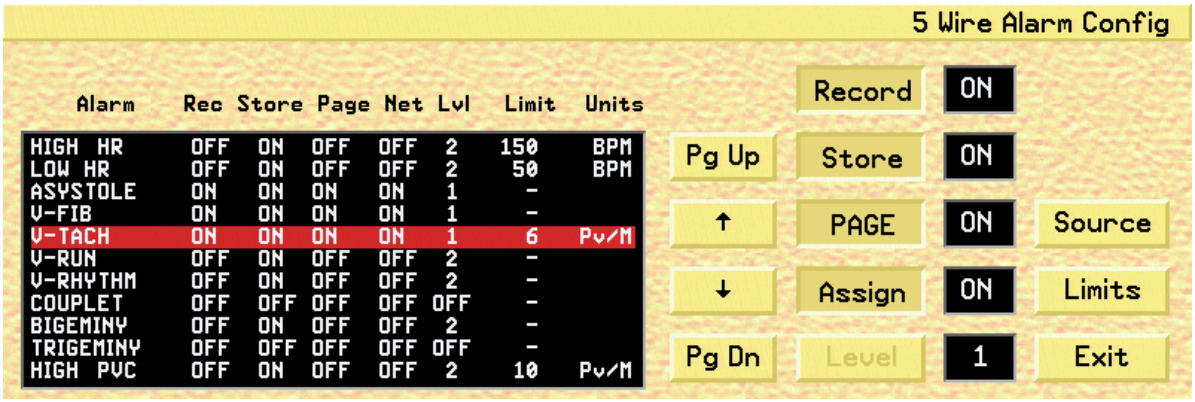

Fig. 55. Alarm Config Screen - V-TACH Configuration

3. Click the **Limits** button to display the V-TACH Config screen (fig. 56).

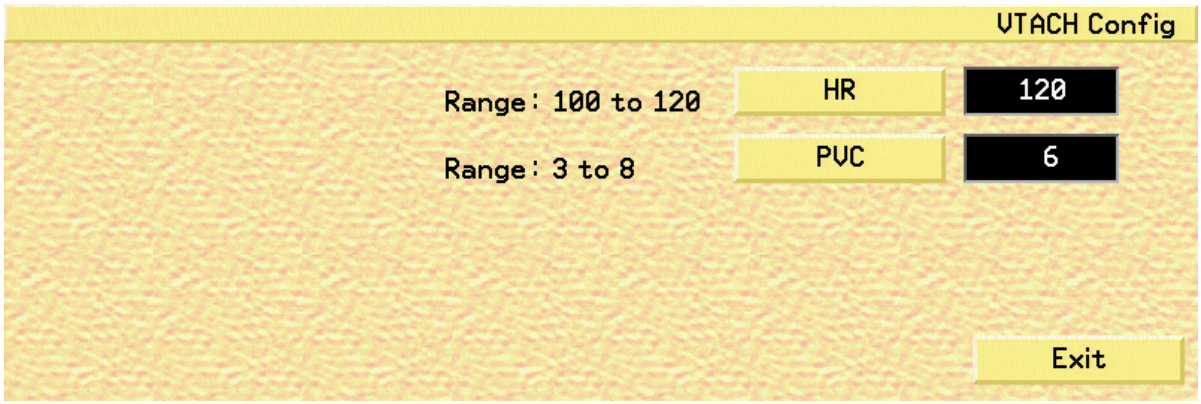

Fig. 56. V-TACH Config Screen

4. Click the **HR** button to set the HR limit (from 100 to 120 bpm), and click the **PVC** button to set the PVC limit (from 3 to 8). When each of the set limits is reached, the system will call a V-TACH alarm.
5. Click the **Exit** button on the Alarm Config screen to return to the Patient Settings screen.

Alarm Source

Alarm Source may be set to *Central* for alarm processing at the Central Station or *Bedside* for alarm processing at the bedside monitor.

Alarms for ambulatory patients are always set to central source.

Alarms for bedside monitored patients can be set to central alarm source or bedside alarm source.

Alarms for ventilator patients are always set to bedside source.

To set the alarm source, press **Source** on the Alarm Config screen to display the alarm Source popup (fig. 57), then press the **Alarm Source** button on the popup to select the appropriate source.

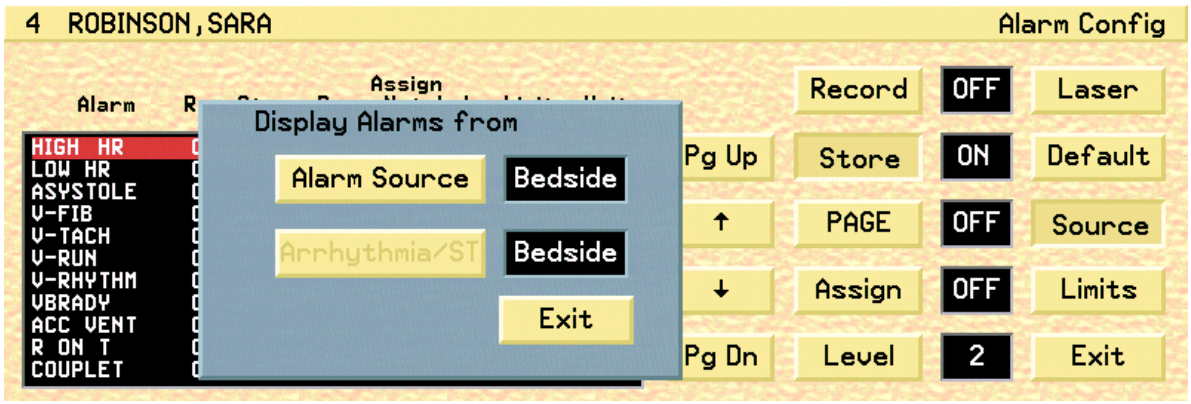

Fig. 57. Alarm Source popup

Central Alarm Source

In central alarm source, the Central Station processes all physiological alarms (arrhythmia, ST, and high and low limit alarms) and ignores physiological alarms called by the bedside monitor.

The Central Station processes all technical alarms except those listed in the Bedside Alarm Source section.

Alarm settings–medical alarm limits, paging, storing, assign to net, and recording of medical alarms–are made at the Central Station.

When arrhythmia is turned off, "AROFF" appears in the patient block.

Bedside Alarm Source

In bedside alarm source, the bedside monitor performs alarm processing on all high/low limit alarms and the Central Station displays alarms exactly as they occur on the bedside monitor.

Alarm settings must be made at the bedside monitor, except for paging, storing, assign to net, and recording, which may be made at the Central Station.

The bedside monitor processes `DEV LOWBATT`, `LEAD OFF (ECG)`, the `COMM ERR` and `NO SIGNAL` technical alarms. The Central Station processes all other technical alarms.

Note: If a bedside monitored patient's alarms are processed by the bedside monitor and not by the Central Station, the main block is a different color than the standard patient block. (see "Screen and Waveform Colors" on page 41).

Arrhythmia Alarms

All non-arrhythmia physiological alarms are processed by the bedside monitor.

If the bedside monitor is capable of arrhythmia processing, arrhythmia alarms are called by the bedside monitor and sent to the Central Station. If the bedside monitor does not perform arrhythmia processing, the Central Station processes all arrhythmia alarms.

When the bedside monitor processes arrhythmia alarms, "`BEDAR`" appears in the patient information block.

Silencing

When you press the silence button on the bedside monitor, the Central Station silences alarms for the corresponding patient channel and displays a crossed-out bell as an indicator (if the bedside unit makes silencing information available to the transceiver).

Note: The Central Station displays apnea, `CHK PATIENT`, `CHK BEDSIDE`, and `BED ALARM` alarms called by the bedside monitor regardless of the alarm source setting.

Patient-Specific Alarms

Monitored parameters differ among bedside monitored, ambulatory and ventilator patients. The tables in this section list patient-specific alarms along with their triggering conditions.

Ambulatory Patients

Table 11. Ambulatory physiological alarms

Alarm Label	Alarm	Triggering Condition
HIGH HR	high heart rate	heart rate greater than high HR limit
LOW HR	low heart rate	heart rate below the low HR limit
ASYSTOLE	asystole	no QRS detected for 3.0 sec.
V-FIB	ventricular fibrillation	Rapid disorganized ventricular impulses, no QRS
V-TACH	ventricular tachycardia	Configurable. The number of consecutive PVCs can be set equal to, and between, 3 and 8. The Heart Rate can be set equal to, and between, 100 and 120 BPM. A V-TACH alarm is triggered when the consecutive PVC count is reached AND the heart rate is greater than or equal to the set Heart Rate Value.
V-RUN	ventricular run	V-RUN is triggered when the number of consecutive PVCs is greater than 2 and less than the V-TACH configured PVC value (i.e. when the V-TACH is configured at 3 PVCs, the V-RUN alarm is never triggered).
V-RHYTHM	ventricular rhythm	V-RHYTHM is triggered when the number of consecutive PVCs is greater than or equal to the V-TACH configured PVC value, but the Heart Rate is less than the V-TACH configured heart rate value.
HIGH PVC	high PVC	PVC count > high PVC limit
PVC	PVC	single PVC
SV-TACH	supraventricular tachycardia	8 or more consecutive Supraventricular ectopic beats, HR 150 or more
COUPLET	ventricular couplet	2 consecutive PVCs
BIGEMINY	ventricular bigeminy	N-PVC-N-PVC-N-PVC sequence (N = normal beat)
TRIGEMINY	ventricular trigeminy	N-N-PVC-N-N-PVC-N-N-PVC sequence (N = normal beat)
ST ALARM	ST alarm	ST elevation/depression exceeds limits
ZERO RATE	zero heart rate	heart rate = zero on a patient set to arrhythmia OFF

Table 12. Ambulatory technical alarms

Alarm Label	Alarm	Triggering Condition
NURSE	nurse	nurse call button on the transceiver pressed
?? SOURCE	source	data received does not match configured device type
LOW BATT	low transceiver battery	battery level on the patient transceiver is below limit
MUSCLE	muscle	muscle artifact detected
NO SIGNAL	no signal	no signal received from transceiver
CHKSIGNAL	check signal	intermittent no signal detected
WRONG ID	wrong ID	Incompatible transceiver ID
EDIT	edit	number of history events has reached configured threshold
LEAD OFF	lead off	ECG electrode is disconnected or loose
CHECK LEAD	check leads	One or more of the ECG leads has a poor connection and/or is causing significant baseline wander
NO ARR	Arrhythmia unable to analyze	No good leads are available for analysis
ATT PRESENT	attendant present	called when pressed on transceiver
PA SILENCE	PAS	called when sent from transceiver

Bedside Monitored Patients

Table 13. Bedside device non-arrhythmia medical alarms

Alarm Label	Alarm	Triggering Condition
HIGH HR	high heart rate	heart rate greater than high HR limit
LOW HR	low heart rate	heart rate below the low HR limit
HI SpO_2	high SpO_2	high limit exceeded for pulse oximetry
LO SpO_2	low SpO_2	low limit exceeded for pulse oximetry
HI P_1 SYS	high systolic P_1	high limit exceeded for systolic P_1 invasive pressure
LO P_1 SYS	low systolic P_1	low limit exceeded for systolic P_1 invasive pressure
HI P_1 MN	high mean P_1	high limit exceeded for mean P_1 invasive pressure
LO P_1 MN	low mean P_1	low limit exceeded for mean P_1 invasive pressure
HI P_1 DIA	high diastolic P_1	high limit exceeded for diastolic P_1 invasive pressure
LO P_1 DIA	low diastolic P_1	low limit exceeded for diastolic P_1 invasive pressure
HI P_2 SYS	high systolic P_2	high limit exceeded for systolic P_2 invasive pressure
LO P_2 SYS	low systolic P_2	low limit exceeded for systolic P_2 invasive pressure
HI P_2 MN	high mean P_2	high limit exceeded for mean P_2 invasive pressure
LO P_2 MN	low mean P_2	low limit exceeded for mean P_2 invasive pressure
HI P_2 DIA	high diastolic P_2	high limit exceeded for diastolic P_2 invasive pressure
LO P_2 DIA	low diastolic P_2	low limit exceeded for diastolic P_2 invasive pressure

Alarm Label	Alarm	Triggering Condition
HI P_3 SYS	high systolic P_3	high limit exceeded for systolic P_3 invasive pressure
LO P_3 SYS	low systolic P_3	low limit exceeded for systolic P_3 invasive pressure
HI P_3 MN	high mean P_3	high limit exceeded for mean P_3 invasive pressure
LO P_3 MN	low mean P_3	low limit exceeded for mean P_3 invasive pressure
HI P_3 DIA	high diastolic P_3	high limit exceeded for diastolic P_3 invasive pressure
LO P_3 DIA	low diastolic P_3	low limit exceeded for diastolic P_3 invasive pressure
HI P_4 SYS	high systolic P_4	high limit exceeded for systolic P_4 invasive pressure
LO P_4 SYS	low systolic P_4	low limit exceeded for systolic P_4 invasive pressure
HI P_4 MN	high mean P_4	high limit exceeded for mean P_4 invasive pressure
LO P_4 MN	low mean P_4	low limit exceeded for mean P_4 invasive pressure
HI P_4 DIA	high diastolic P_4	high limit exceeded for diastolic P_4 invasive pressure
LO P_4 DIA	low diastolic P_4	low limit exceeded for diastolic P_4 invasive pressure
HI P_5 SYS	high systolic P_5	high limit exceeded for systolic P_5 invasive pressure
LO P_5 SYS	low systolic P_5	low limit exceeded for systolic P_5 invasive pressure
HI P_5 MN	high mean P_5	high limit exceeded for mean P_5 invasive pressure
LO P_5 MN	low mean P_5	low limit exceeded for mean P_5 invasive pressure
HI P_5 DIA	high diastolic P_5	high limit exceeded for diastolic P_5 invasive pressure
LO P_5 DIA	low diastolic P_5	low limit exceeded for diastolic P_5 invasive pressure
HI P_6 SYS	high systolic P_6	high limit exceeded for systolic P_6 invasive pressure
LO P_6 SYS	low systolic P_6	low limit exceeded for systolic P_6 invasive pressure
HI P_6 MN	high mean P_6	high limit exceeded for mean P_6 invasive pressure
LO P_6 MN	low mean P_6	low limit exceeded for mean P_6 invasive pressure
HI P_6 DIA	high diastolic P_6	high limit exceeded for diastolic P_6 invasive pressure
LO P_6 DIA	low diastolic P_6	low limit exceeded for diastolic P_6 invasive pressure
HI BP SYS	high systolic BP	high limit exceeded for systolic noninvasive pressure
LO BP SYS	low systolic BP	low limit exceeded for systolic noninvasive pressure
HI BP DIA	high diastolic BP	high limit exceeded for diastolic noninvasive pressure
LO BP DIA	low diastolic BP	low limit exceeded for diastolic noninvasive pressure
HI BP MN	high mean BP	high limit exceeded for mean noninvasive pressure
LO BP MN	low mean BP	low limit exceeded for mean noninvasive pressure
HI RESP	high respiration rate	high limit exceeded for respiration rate
LO RESP	low respiration rate	low limit exceeded for respiration rate
HI $EtCO_2$	high $EtCO_2$	high limit exceeded for the end-tidal carbon dioxide concentration in the expired air ($EtCO_2$)

Alarm Label	Alarm	Triggering Condition
LO $EtCO_2$	low $EtCO_2$	low limit exceeded for the end-tidal carbon dioxide concentration in the expired air ($EtCO_2$)
HI $InCO_2$	high $InCO_2$	high limit exceeded for the inspired carbon dioxide concentration in the inspired air ($InCO_2$)
HI T_1	high T_1	high limit exceeded for T_1 temperature
LO T_1	low T_1	low limit exceeded for T_1 temperature
HI T_2	high T_2	high limit exceeded for T_2 temperature
LO T_2	low T_2	low limit exceeded for T_2 temperature
HI DT	high ΔT	high limit exceeded for temperature difference
LO DT	low ΔT	low limit exceeded for temperature difference
APNEA ALM	apnea alarm	patient respiration stopped for predetermined period of time
CHKPATIENT	check patient	medical or technical alarm not supported by V-Link/ V-Link II/Instrument Transceiver
BED ALARM	bedside alarm	medical alarm not supported by V-Link/V-Link II/ Instrument Transceiver

Table 14. Bedside arrhythmia alarms (in Bedside Alarm Source Mode)

Note: These alarms may be called only on a bedside monitor when the Central Station is set to Bedside Alarm Source Mode. Please refer to the operator's manual for the specific bedside device for the alarm definitions.

Alarm Label	Alarm
ASYSTOLE	asystole
V-FIB	ventricular fibrillation
V-TACH	ventricular tachycardia
HIGH PVC	high PVC
PVC	PVC
SV-TACH	supraventricular tachycardia
COUPLET	ventricular couplet
BIGEMINY	ventricular bigeminy
TRIGEMINY	ventricular trigeminy
V-RHYTHM	ventricular rhythm
ST ALARM	ST alarm
ZERO RATE	zero heart rate
VBRADY	--
IRREGULAR	--
ACC VENT	--
PAUSE	--
R ON T	--
TACHY	--
BRADY	--
SALVO	--
TRIPLET	--
V-RUN	--
NO ARR	No ECG data available for Arrhythmia analysis
MISSED BEAT	--
SV-BRADY	--

Table 15. Bedside device technical alarms

Alarm Label	Alarm	Triggering Condition
SYS ERR	system error	bedside monitor device equipment failure, printer failure, or printer paper error
ECG ERR	ECG error	bedside ECG equipment failure
BP ERR	BP error	non-invasive equipment failure; uncalibrated; no pulse detected
RESP ERR	respiration error	no probe detected
P_1 ERR	P_1 error	P_1 not zeroed
P_2 ERR	P_2 error	P_2 not zeroed
P_3 ERR	P_3 error	P_3 not zeroed
P_4 ERR	P_4 error	P_4 not zeroed
P_5 ERR	P_5 error	P_5 not zeroed
P_6 ERR	P_6 error	P_6 not zeroed
SpO_2 ERR	SpO_2 error	equipment SpO_2 failure, uncalibrated
CO_2 ERR	CO_2 error	equipment CO_2 failure, uncalibrated
T_1 ERR	T_1 error	equipment T_1 failure, uncalibrated
T_2 ERR	T_2 error	equipment T_2 failure, uncalibrated
NO ECG	no ECG	ECG not detected
NO BP	no BP	BP not detected
NO P_1	no P_1	P_1 not detected
NO P_2	no P_2	P_2 not detected
NO P_3	no P_3	P_3 not detected
NO P_4	no P_4	P_4 not detected
NO P_5	no P_5	P_5 not detected
NO P_6	no P_6	P_6 not detected
NO SpO_2	no pulse oximetry	SpO_2 not detected
NO CO_2	no CO_2	CO_2 not detected
NO T_1	no T_1	temperature probe not detected
NO T_2	no T_2	temperature probe not detected
NO RESP	no respiration	respiration not detected
?? SOURCE	source	data received does not match configured device type
NURSE	nurse call	nurse call button on transceiver was pressed
LOW BATT	low transceiver battery	low battery on the V-Link/V-Link II transceiver
DEV LOWBATT	low device battery	low battery level in the bedside monitor
MUSCLE	muscle artifact	muscle artifact detected
WRONG ID	wrong ID	incompatible transceiver ID
EDIT	edit	number of history events reached the edit limit
LEAD OFF	lead off	ECG electrode disconnected or loose
NO SIGNAL	no signal	no signal received from transceiver

CHECK LEAD	check leads	One or more of the ECG leads has a poor connection and/or is causing significant baseline wander
NO ARR	Arrhythmia unable to analyze	No good leads are available for analysis
CHKSIGNAL	check signal	intermittent no signal detected
CHK BEDSIDE	check bedside	technical alarm not supported by the Central Station
CHKPATIENT	check patient	medical or technical alarm not supported by the Central Station
COMM ERR	communication error	communications CRC errors between the transceiver and bedside monitor exceeds limit
ATT PRESENT	attendant present	called when pressed on transceiver
PA SILENCE	Procedure Alarm Silence	called when sent from transceiver

Ventilator Patients Alarms

Alarm Label	Alarm Name	Triggering Condition
HI PRESS	high pressure limit	see ventilator operator's manual
LO INS PRES	low inspiration pressure	see ventilator operator's manual
LOW PEEP	Low PEEP/CPAP	see ventilator operator's manual
LOW EX VT	low exhaled tidal volume	see ventilator operator's manual
LOW EX MV	low exhaled min. volume	see ventilator operator's manual
HI RESP	high respiratory rate	see ventilator operator's manual
LoPresO_2In	low pressure O_2 inlet	see ventilator operator's manual
LoPresAirIn	low pressure inlet	see ventilator operator's manual
HI SpO_2	high SpO_2	see ventilator operator's manual
LO SpO_2	low SpO_2	see ventilator operator's manual
HIGH PULSE	high HR	see ventilator operator's manual
LOW PULSE	low HR	see ventilator operator's manual
APNEA ALM	apnea alarm	see ventilator operator's manual
EX VALVE LK	exhalation valve leak	see ventilator operator's manual
I:E RATIO	I:E ratio	see ventilator operator's manual
ALMS SILENC	alarms silenced	see ventilator operator's manual
AIRPRESSDIS	airway pressure disconnect	see ventilator operator's manual
DEV LOWBATT	low device battery	low battery level in the ventilator
SVO DUE LSP	SVO due to LSP	see ventilator operator's manual
CHK PATIENT	check patient	ventilator device alarm not supported by V-Link/ V-Link II/Instrument Transceiver is triggered
?? SOURCE	source	data from ventilator does not match selected device type
SpO_2 ERR	SpO_2 error	equipment SpO_2 failure, uncalibrated
NO SpO_2	NO SpO_2	SpO_2 not detected
APNEA VENT	apnea ventilation	see ventilator operator's manual
NURSE	nurse	remote button on the transceiver was pressed
LOW BATT	low transceiver battery	low battery level on the Instrument Transceiver
NO SIGNAL	no signal	no signal received from the transceiver
WRONG ID	wrong ID	incompatible transceiver ID
EDIT	edit	number of history events has reached its limit
ATT PRESENT	attendant present	called when pressed on transceiver

Special Alarm Handling

Muscle

When muscle artifact is detected, the alarm annotation in the full disclosure one-hour report reads “Muscle” rather than any alarm that may have occurred during the same one-minute interval. This notifies you that any alarm call during this period may have been influenced by muscle artifact.

Level 1

Asystole, V-FIB, and V-TACH alarms are set to level 1 priority and cannot be changed. The Low Heart Rate (`LOW HR`) alarm may be designated a Level 1 alarm, if desired.

Check Patient

The CHK PATIENT alarm is a “catch-all” alarm to display any alarms supported by the bedside, but not listed in the current alarm list. It is called regardless of alarm source.

Bed Alarm

The Bed Alarm is a technical alarm that is equivalent to the CHK PATIENT Alarm. It is called when an alarm occurs on a patient monitor that is not supported by the Central Station. It is called regardless of alarm source.

Check Bedside

The CHK BEDSIDE alarm is a technical alarm that is equivalent to the CHK PATIENT alarm. It is called regardless of alarm source.

Zero Rate

The ZERO RATE alarm is called on the Central Station for patients with arrhythmia set to OFF. For ambulatory patients and bedside monitored patients with heart rate source set to ECG, zero rate is called when asystole or V-FIB is detected. When a bedside monitored patient’s heart rate source is *not* set to ECG, zero rate is called when the heart rate is 20 bpm or less and the transceiver signal is good.

Nurse

The nurse alarm may be configured to level 1,2,3 and OFF. **Its priority is the same as physiological alarms**; its sound is the medical alarm sound that corresponds to the level of the nurse alarm.

Attendant Present

The instrument transceiver (DT-7000) and ambulatory transceiver (DT-4500) have the capability of sending an attendant present alarm indicator to the Central Station. Once the Central Station receives the attendant present alarm indicator, the Central Station activates the attendant present alarm and displays the text "ATT PRESENT" in the patient block. The alarm level may be configured to allow the attendant present alarm to rotate with other configured physiological alarms.

Note: Refer to "Attendant Present / Procedure Alarm Silence (PAS) Unlock Button" on page 188 for further information.

The following are examples of system alarm configurations.

1. When configured as a level 3 alarm, all level 1 and 2 alarms supersede the attendant present alarm and the attendant present alarm rotates with all physiological level 3 alarms.
2. When set to OFF the attendant present alarm is ignored.

The attendant present alarm sound has the medical alarm sound associated with the configured level of the attendant present alarm at the time the alarm was activated.

Full disclosure is annotated "ATT PRESENT" when the attendant present alarm is triggered.

Procedure Alarm Silence (PAS)

The instrument transceiver (DT-7000/DT-7001) and ambulatory transceiver (DT-4500) have the capability of sending a procedure alarm silence indicator to the Central Station. When the procedure alarm silence indicator is received at the Central Station, the central station then triggers the procedure alarm silence and displays the text "PA SILENCE" in the patient block.

Note: Refer to "Procedure Alarm Silence (PAS) Button" on page 189 for further information.

The procedure alarm silence remains active until one of the following conditions occur:

- the transceiver no longer sends the procedure alarm silence indicator to the central station
- a level 1 alarm is triggered at the central station
- the patient tile alarm text area is clicked on

Note: Alarms are set to ON after the area is clicked

The PAS alarm also performs the following functions:

- while the procedure alarm silence alarm is active, a timer is displayed in the fourth patient block configurable field denoting the procedure silence alarm time (which starts at 120 seconds) that is remaining on the transceiver

- all non-level 1 alarms are ignored while the alarm procedure silence alarm is active
- full disclosure is annotated "PA SILENCE" for the duration of the procedure alarm silence period

Technical Alarms

The following technical alarms do not support Record or Store, and can only be set to Page and Assign:

SYS ERR	LEAD OFF	NO SIGNAL	NO P1
ECG ERR	CHKSIGNAL	WRONG ID	NO P2
BP ERR	T1 ERR	EDIT	NO T1
P1 ERR	T2 ERR	NO SPO2	NO T2
P2 ERR	?? SOURCE	NO CO2	NO RESP
SPO2 ERR	LOW BATT	NO ECG	CHK BEDSIDE
CO2 ERR	MUSCLE	NO BP	COMM
P3 ERR	P4 ERR	P5 ERR	P6 ERR
NO P3	NO P4	NO P5	NO P6
CHK LEAD	NO ARR		

VIEWING CURRENT PATIENT STATUS

To observe a patient's current monitoring information, press the **View** button on the Main screen to display the View screen and select the patient. The NPB 7200 series ventilator patient View screen is different from that of bedside monitored and ambulatory patients.

The View screen also encompasses history and full disclosure, which are covered in their own chapters.

Bedside Monitored and Ambulatory Patient View Screen

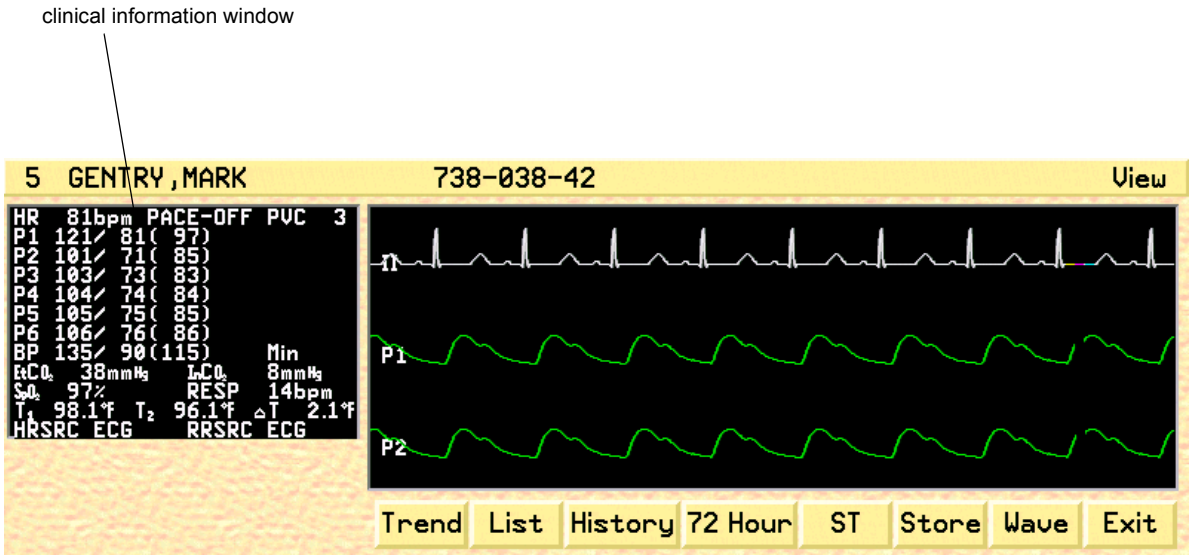

Fig. 58. Bedside Monitored View Screen

The View screens for bedside and ambulatory patients are similar except for the clinical data displayed (see table 16, "Clinical information window data," on page 131) and the ST templates – for bedside monitored patients with ST analysis enabled, digital ST data only is displayed.

Selecting Waves for Display

For bedside monitored patients, you can select any available wave for display; for ambulatory patients, you can select any ECG wave.

1. Press the **Wave** button to bring up the Display Wave popup.
2. Press the **Display** button, or touch/click directly on the waveform, to choose waves to display.
3. Press the **Position** button to select one of the waves (the selected wave designation flashes).
4. Press the **Wave** button *on the popup* to cycle through available waveforms for the label set of the selected patient.

5. Press the **Wave** button *on the View screen* to save your selections.

Ventilator Patient View Screen

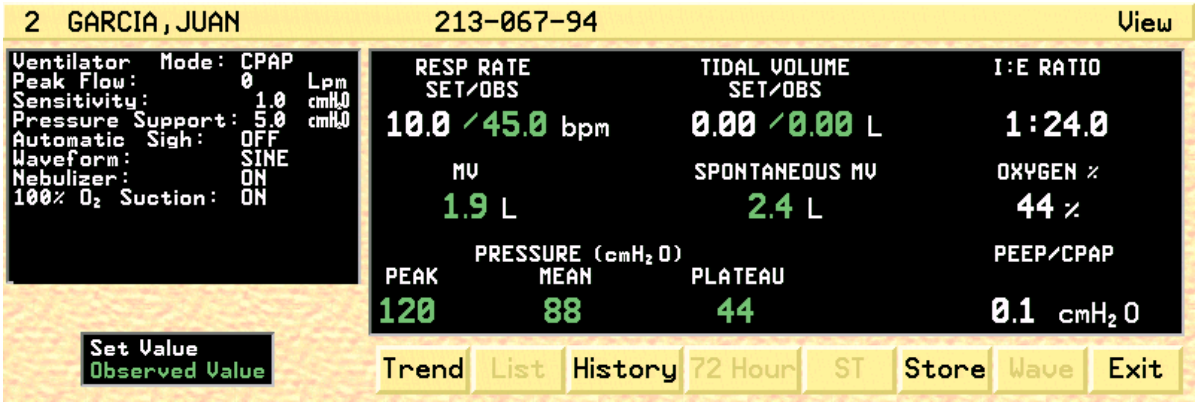

Fig. 59. Ventilator Patient View screen

The ventilator patient View screen shows real-time patient data/ventilator settings. Real-time values are displayed in blue text; current ventilator settings are displayed in black text.

Real-time data are updated every second if values have changed. Settings data are updated, at most, every 15 to 30 seconds, but only when they are changed on the ventilator.

Clinical Data

Available clinical data for each patient type is shown in Table 16.

Table 16. Clinical information window data

Patient Type	Data
ambulatory	HR, PACE-OFF, PACE%, PVC count Patient Device Type ST Level ST Slope
bedside monitored	HR, PACE-OFF, PACE%, PVC count $P_1, P_2, P_3, P_4, P_5, P_6$ BP, Elapsed Time $EtCO_2$ $InCO_2$ SpO_2 Resp $T_1, T_2, \Delta T$ HRSRC (ECG, P_1, P_2, P3, P4, P5, P6, SpO_2, or BP) BRSRC (ECG or CO_2)
ventilator	Ventilator Mode Peak Flow Sensitivity Pressure Support Automatic Sigh Waveform Nebulizer O_2 Suction

Printing

The **Record** button records and prints. If a laser printer is attached to the system it may be labeled **Laser**. If you do not have a laser printer, the record button is labeled **Strip**, and printouts are produced in strip form from the monitor. Your system administrator can change this label if necessary.

To print, click on the **Record** button. To cancel printing, click a second time.

For ventilator patients, the record button is disabled because there is no waveform.

Strip Recorder

There are three types of recording from the strip recorder: timed, continuous, and trend recording.

Timed Recording

Timed recordings print trace data starting ten seconds before and ten seconds after the print request (the number of seconds can be changed by the system administrator).

When more than one recording requests have been queued, a **Now** button appears in the upper right corner of the screen. If you want the most recent timed recording to print immediately, press **Now**. Note that this action cancels the recording currently printing.

Continuous Recording

Continuous recordings print until you stop them. During a timed recording a **Cont** button appears in the upper left corner of the screen. Press **Cont** to initiate a continuous recording. Press the **Strip/Laser** button to stop a continuous recording.

Note: If you experience a delay in requesting a continuous strip, verify that there is an interruption in the printed data.

Note: If leads are changed on the bedside device while continuous recording is in process, then the current recording will stop. You must initiate the recording again.

Trend Recording

Trend recordings print trend graphs and are covered in the Trends section. See “Printing Trend Data” on page 162 for details.

Laser Printer

The PatientNet System supports laser printers that meet the following requirements:

- the printer is a Hewlett Packard laser printer
- the printer supports Printer Control Language PCL 5 and higher
- the printer has at least 2 MB of memory

Note: We only validate laser printers that are provided by us.

The laser printer should be set to 300 dpi, so grid measurement corresponds to its actual screen size.

Laser printers print waveform data and other reports on 8 1/2 x 11 inch paper. Information on specific reports is contained in relevant sections of this manual.

Automatic Alarm Printing

You can configure the system to print alarmed events automatically when they occur. To do so, you must enable individual alarms for automatic printing as instructed below.

1. Press **Setup** on the Main screen and select the patient's waveform.
2. Press **Alarm Config** on the Patient Settings screen to display the Alarm Config screen.
3. Highlight the desired alarm and toggle **Record** to On. This alarm will now trigger automatic printouts.
4. Repeat this step for all alarms you wish to print automatically for this patient.

You can also print manually at any time.

Printing at the PatientNet Viewers

All recording requests made at a PatientNet Viewer (also known as an IRVS or RVS) are recorded at the IRVS/RVS.

All printing requests made at the IRVS/RVS are printed at the same IRVS/RVS. Full Disclosure strips can be printed at either the Central Station, PatientNet Viewer, or the Interactive-PatientNet Viewer.

Printing from the Bedside Monitor

When you request a printout from the bedside monitor and DT-7000 instrument transceiver notifies the Central Station, which generates a real-time strip for the corresponding patient channel as if the record button had been pressed.

If the alarm is set to **Record** and **Store** on the Alarm Config screen, the real-time strip is printed and stored in history.

Printing Real-time Waveform Strips For All Patients

You can print real-time waveforms for all admitted patients displayed on the Central Station at one time:

1. Press **System** on the Main screen.
2. Press **Record All** button on the Passcode screen. A real-time waveform strip is printed to the laser printer or the strip recorder for all patients on the central Station.

Canceling Printing

Laser printer: press the **System** button and then press **Cancel Laser** on the Passcode screen.

Strip recorder: click on the Strip/Laser button.

HISTORY

The PatientNet System can store up to 100 history events for each patient. All available data is stored with each history event.

For **ambulatory patients** data includes all transmitted leads and current ST templates for valid ECG leads if ST is enabled when the event is stored.

For **bedside monitored patients** data stored with history events includes:

- the three transmitted waves
- all available digital data
- current ST templates for any ECG lead if ST is enabled when the event is stored.

For **ventilator patients,** one history event is stored automatically every hour. This event contains a snapshot of all current vital statistics. Only digital data is stored, since no waveforms are transmitted.

Once an event is stored in a patient's history, you can display, magnify, measure, archive, and print the stored information.

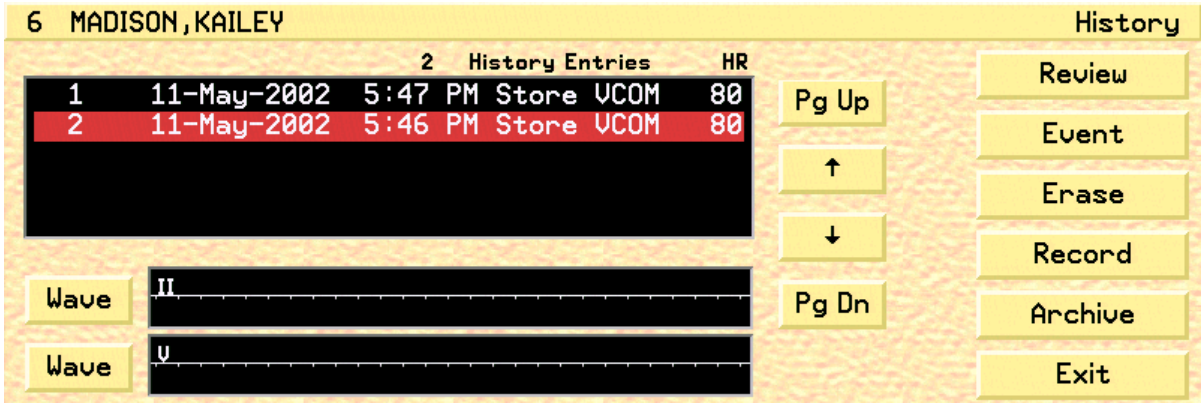

Fig. 60. History screen

Note: The Rhythm Indicator status is stored in full disclosure and history screens, as well as printed on laser strips. The beat quality percentage is calculated and displayed as a Learned Template Match (LTM) percentage. See ("Rhythm Indicator" on page 70).

Storing Events in the History File

Some events are stored automatically in a patient's history file. These include alarms if alarms are set to STORE on the Alarm Config screen, and hourly vital signs of ventilator patients.

You can also manually store events for later review and printing. All available data is stored in the history event, including received waves of data, vital statistics, ST templates (if ST is enabled), and derived ECG leads, if available.

1. Press **Store** on the View screen. This stores the event in the patient's history file along with the following:
   - date and time of the event
   - 20 seconds of waveform data (10 seconds before the event and 10 seconds after the event)
2. Press the **History** button to display the History screen. You will see the event listed in the patient's history entries as Store VCOM.
3. The two wave windows below the history entries list show a compressed view of the entire history event. Press the **Wave** buttons to cycle through available leads.
   - For ambulatory patients, lead I is displayed in the upper window and lead II in the lower window.
   - For bedside monitored patients, the first transmitted wave is displayed in the upper window and the second transmitted wave is displayed in the lower wave window.
   - The **Wave** buttons and windows are disabled for ventilator patients.

CAUTION: If two events of the same priority occur at the same time, only the first event detected is stored in history and can be printed.

Re-labeling History Events

You can change the labels of history entries on the History screen. To re-label an entry:

1. Press **Event** on the History screen. The right-hand portion of the History screen displays the re-labelling choices (fig. 61).

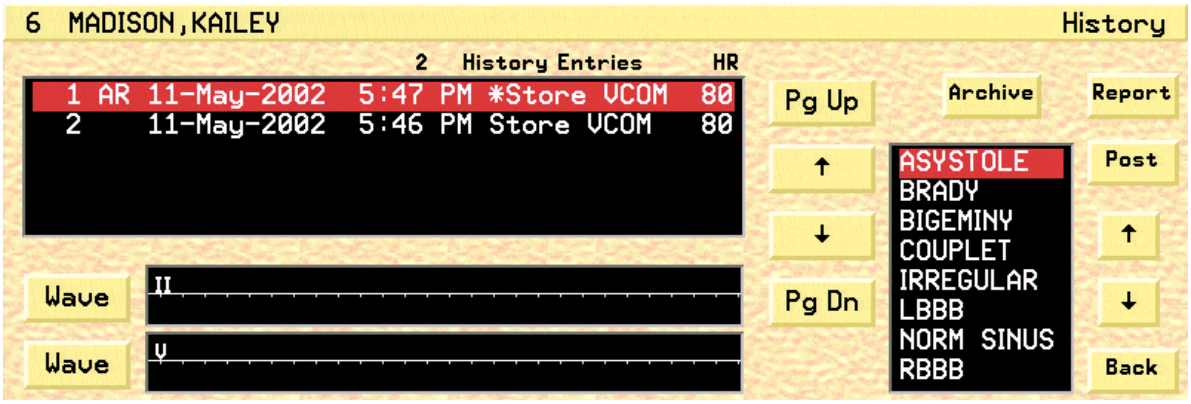

Fig. 61. Labeling History Events

2. Highlight the history event you wish to re-label in the history event blackboard.
3. Highlight the desired label in the event label blackboard.
4. Click the **Post** button to change the event label.The highlighted History entry is now re-labeled. All re-labeled History events are designated by an asterisk (*).

Note: You can also archive (page 144) and report (page 143) from this screen.

Customized Labeling for Stored Events

You can change labels on the history events with the Chart popup.

To change event labels:

1. Click the **Review** button on the History screen to display the History Event Review screen (fig. 64 on page 139).
2. Click the **Chart** button on the History Event Review screen to display the Chart popup.
3. The Operator Passcode number pad will appear (fig. 62). Enter your operator passcode to display the Chart popup (fig. 63). If you do not know your passcode, then see your system administrator.

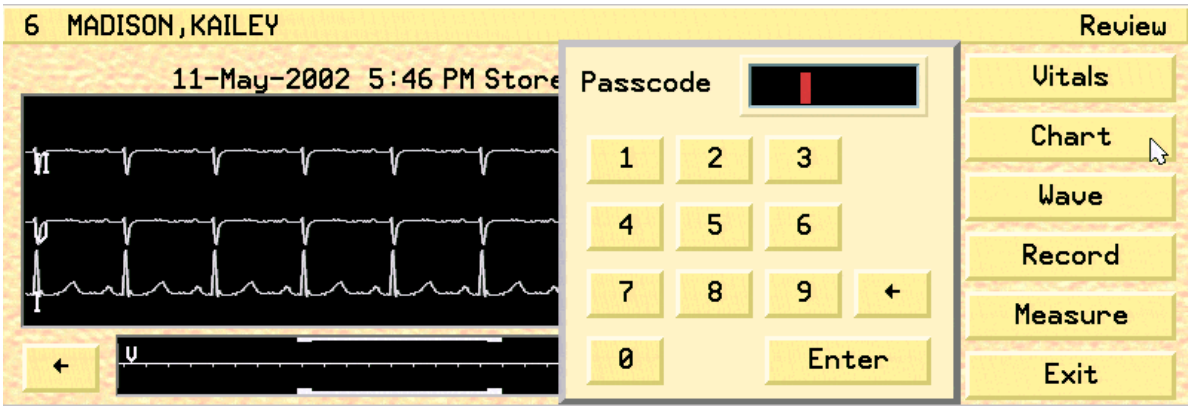

Fig. 62. Operator Passcode Popup

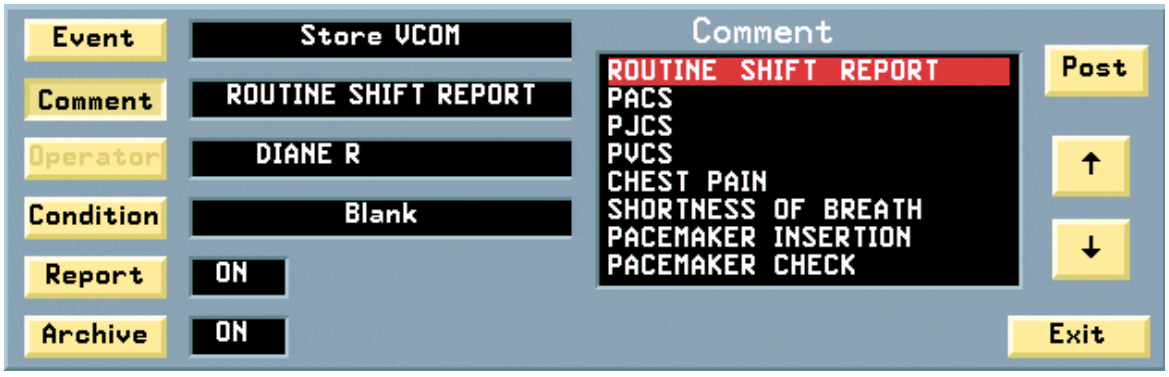

Fig. 63. History Chart Popup

4. Change the event label by clicking the **Event** button, highlighting the new label in the Event blackboard, and then clicking the Post button to save your change. An asterisk (*) appears in front of all modified events.
5. Add a comment to the history event by clicking the **Comment** button, highlighting the comment in the blackboard, and clicking the post button to save your change.
6. Click the **Condition** button to cycle through Symptomatic, Asymptomatic and Blank.

7. Click the **Report** and **Archive** buttons to tag and/or archive the event (see pages 143 and 144).
8. When you have finished making your selections, press **Exit** to save your changes and close the popup.

Reviewing Stored History Events

Bedside Monitored and Ambulatory Patients

With an event in the list highlighted, you can make more detailed observations and perform operations on the events.

1. Press the **Review** button to display the Review screen (fig. 64). The full 20-second segment of stored data appears in the small window at the bottom of the screen.

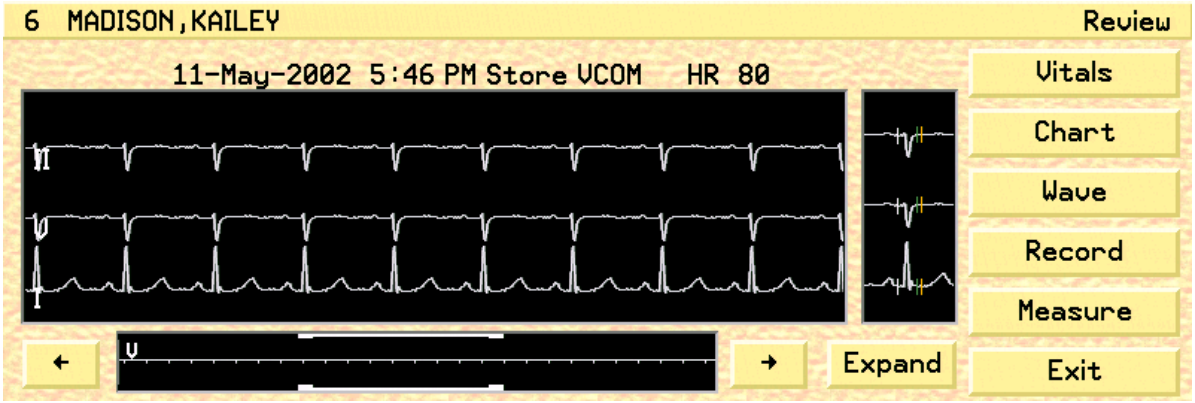

Fig. 64. History Review screen

2. The brackets in the small window indicate the segment shown in the large window. To change this segment, move the bracket location using the arrow buttons.

   If an ST template was stored with the event, it appears to the right of the large window.

Ventilator Patients

The History Review screen displayed by the **Review** button shows set and observed vital signs for ventilator patients.

Viewing Stored Vital Statistics

When an event is stored, all vital statistics associated with the event are also stored. To display these stored vital statistics, press the **Vitals** button. Press **Vitals** again to dismiss.

Magnifying History Waveforms

To magnify history event waveforms 2.5 times for more detailed examination:

1. Move the brackets on the History Review screen small window to the desired location.
2. Press the **Expand** button. The magnified segment appears. The first waveform that appears is the ECG waveform, if ECG is present.
3. Select the **Wave** button to display the other stored waveforms.

Measuring History Waveforms

You can make and save up to five history waveform measurements for later printing for bedside monitored and ambulatory patients.

Making Measurements

1. Press **Measure** on the normal or expanded view of the History Review screen
2. Use the brackets in the small window to display the appropriate wave segment in the large window.
3. Use the "mouse calipers" to make both horizontal and vertical measurements in the large window as follows: click/touch on the beginning point of the wave segment you want to measure and then on the end point. Yellow X and Y axes, and intermediate measurements appear with each click. Vertical measurements are shown in millimeters (mm), and horizontal measurements are shown in seconds (sec).

Note: When using a touchscreen display, you can touch and grab the calipers to measure waveforms.

Saving Measurements

Save the measurement by pressing as many of the caliper buttons below as appropriate. Make sure that the **Clear** button is *not* depressed before storing measurements.

R-R saves the R-R caliper measurement in seconds. Heart rates are saved only with R-R.

Q-T saves the Q-T caliper measurement in seconds.

P-R saves the P-R caliper measurement in seconds.

QRS saves the QRS caliper measurement in seconds.

ST saves the measured distance between the two horizontal calipers in millimeters (mm).

Press caliper buttons only after making a measurement with the calipers. Otherwise, the following message box appears.

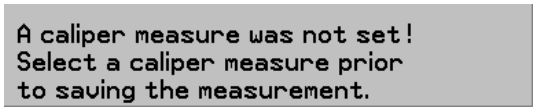

Fig. 65. Caliper message box

Printing Caliper-Annotated Waveforms

Calipers can be printed from the expanded history mode only.

1. Press **Expand** on the History Review Screen
2. Set the calipers as instructed in Making Measurements above.
3. Save the measurements as instructed in the Saving Measurements section above.
4. Press the **Back** button and then the **Record** or **Laser** button.

Deleting Measurements

To delete an individual caliper measurement:

1. Press the **Clear** button.
2. With **Clear** depressed, press the caliper button of the measurement you wish to delete. The X-Y axes disappear and the cleared caliper window reads "Blank."

Reviewing and Editing History Events

1. When reviewing the history entries (determine an interval at which time this should occur). **Archive** (save) the events you wish to keep or **Report** the events that you want to print on the tagged report. If using the DT-4500 transceivers, the impedance numbers should be greater than 185. Erase all after you have completed this step. Starting at the end of the file will allow you to see those events that have been archived.
2. If there are four or more consecutive false alarms due to wandering baseline and/or artifact, check the following:
   a. The impedance values of the electrodes (found under System in the OpenNet menu).
   b. If impedance is within normal limits, consider changing the electrode placement to better meet criteria for good placement (away from loose skin, limbs, and large muscles).
   c. If the false alarms are due to the system mislabelling a rhythm or history event, RELEARN under setup. See "Learn and Relearn Considerations" on page 70.
3. Preparation and placement of electrodes is the number one challenge in providing good signal quality and, if not provided, contributes to false alarms.

4. If the history is filling with the same correct alarms (i.e. Bigeminy or Couplet) and your policy guidelines allow, do the following:
   a. Go to Alarm Config under "Setup" and turn Store OFF for that particular alarm.
   b. Archive an example of the alarm for your shift before disabling the Store function.
   c. Remember also that turning "Level" to OFF will disable the audio and visual alarms, but will continue to go into the history as long as Store is still ON.

CAUTION: When you use the Three-Minute Alarm Off (touching silence twice and the patient information tile once), be aware that you are turning off all of the alarms for that patient for three minutes. Lethal alarms will not break through. Remember that touching silence once will silence all active alarms for the configured time period (30, 45, 60, or three minutes).

Deleting History Events

Once a patient's history file has reached its size limit (as set by the system administrator), new events trigger the Edit alarm. The oldest event is deleted when 100 events have been stored. If the oldest event is archived or is tagged as a report candidate (see pages 143 and 144), it is not deleted. It is good practice to purge events in a patient's history file that are no longer significant.

You can delete events from a history file in one of the ways shown in step 2. *You cannot delete archived events or report candidates.*

1. Highlight the appropriate event on the History screen.
2. Press the **Erase** button to display the History Erase popup and select one of the following buttons:

   Single deletes the highlighted event.

   All deletes all but archived and report candidate entries for this patient.

   Cancel removes the popup without deleting an event.

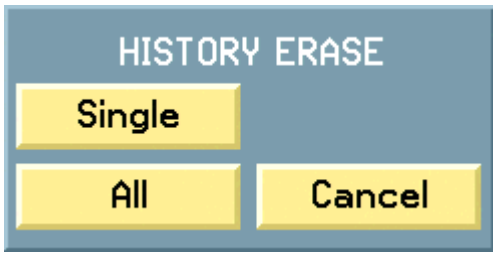

Fig. 66. History Erase Popup

Tagging Events as Report Candidates

You can designate events in a patient's history file as report candidates. This allows you to print reports of only these events.

1. Highlight the event to be marked as a report candidate.
2. Press the **Event** button on the History screen and then the **Report** button. This places an "R" to the right of the event number in the History blackboard. Press **Report** a second time to cancel the report candidate status.

   The **Report** button also appears on Chart popup (fig. 8 on page 139).

Printing Tagged Event Reports

Tagged event reports can print only on the laser printer; if you do not have a laser printer, these reports are not available. If you have a laser printer but the system is configured for strip printing, tagged event reports still print on the laser printer.

1. Press the **Laser** or **Record** button. The Print popup appears with three choices.
2. Select one of the following popup buttons:

   Tagged Events prints a report of all events tagged "R."

   Single Event (for bedside monitored and ambulatory patients only) prints only the highlighted event.

   Ventilator Data (for ventilator patients only) prints all ventilator history events.

   Cancel closes the popup without printing.

Fig. 67. Print popup

3. If you select **Tagged Events**, a second popup asks, "Do you wish to add a comment to the tagged events report?"
   a. Press **No** to print without comment.
   b. Press **Yes** to display an on-screen keyboard on which you can type two lines of text to appear on the printout. The on-screen **Enter** button toggles between line 1 and line 2.
   c. Press **Exit** on the on-screen keyboard when you have finished typing.

Archiving Events

Archived events are events that cannot be erased. You can archive the history events of all patient types.

1. Press the **History** button on the View screen.
2. Highlight the appropriate event in the history blackboard.
3. Press the **Archive** button. This places an "A" to the left of the event number in the History blackboard. To remove the "A" and make it possible to delete the event, press **Archive** again.

   The **Archive** button also appears and has the same function on the Chart popup and Events screen.

CAUTION: After 100 events are archived, the oldest events will be deleted as necessary to make room for new events.

ST History

For central source patients with ST enabled, ST episodes are stored as ST history events if the alarm is set to STORE on the Alarm Config screen.

Such stored events include:

- three 20-second waveforms
- current ST templates for each surface ECG lead along with their time stamps
- learned ST templates for each surface ECG lead along with their time stamps
- location of ST measurement points for learned and current templates

For bedside arrhythmia source patients, the ST level and slope data appear in the Vitals popup and strip or laser printouts if it is available from the bedside monitor.

Printing History Events

Printing

To print a history event, press **Record** or **Laser** on the History or History review screen. You can also print from the expanded History Review screen. To print tagged events only, see page 143.

All events in a patient's history file can be printed from either the strip chart recorder or the laser printer. Printouts of history events are as follows:

- **Strip recordings** of a history event include the top two waveforms in the History Review screen printed with 10 seconds of waveform before the event and 10 seconds of waveform after the event. The vital signs of the patient at the time of the event precede the waveform.
- **Laser printouts** include up to four waves displayed in the History Review screen. The patient's vital statistics, as well as the alarm limit which triggered the laser printout, are printed under the waveforms and Chart data, if set on the Chart popup.

If ST analysis was enabled when the event was stored, ST information is printed as shown in the next section.

ST Information Printed

- For patients with central arrhythmia processing, digital ST values and templates, level and slope are printed on all strips and laser reports if ST data is available. If ST is enabled, only 18 seconds (rather than 20) are printed on laser.
- For patients with arrhythmia processed by the bedside monitor, digital ST values are printed without ST templates, if ST data is available from the bedside monitor.
- ST digital data is printed preceding the waveform data on strip recordings and in the ST waveform templates on laser printouts.
- Ventilator patient history events are printed only on the laser printer.

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FULL DISCLOSURE

The system stores all waveforms and digital data for 24 (or 72) hours with the Full Disclosure feature. You can review and print all or a portion of this data from the Full Disclosure screen (see fig. 69 on page 148), which lets you select the time period and how you want the information displayed and printed.

Full Disclosure is available for ambulatory and bedside monitored patients but not for ventilator patients.

Select the patient and press the **24 Hr** (or **72 Hr**) button on the View screen to display the Full Disclosure screen.

Note: The 72 Hr button will be displayed if you have the 72 Hour Full Disclosure option enabled.

Disclosure Mode

Disclosure mode determines when to start and stop collection of the disclosure data. Press the **Mode** button on the Full Disclosure screen to display the Mode popup (fig. 68).

Fig. 68. Mode popup

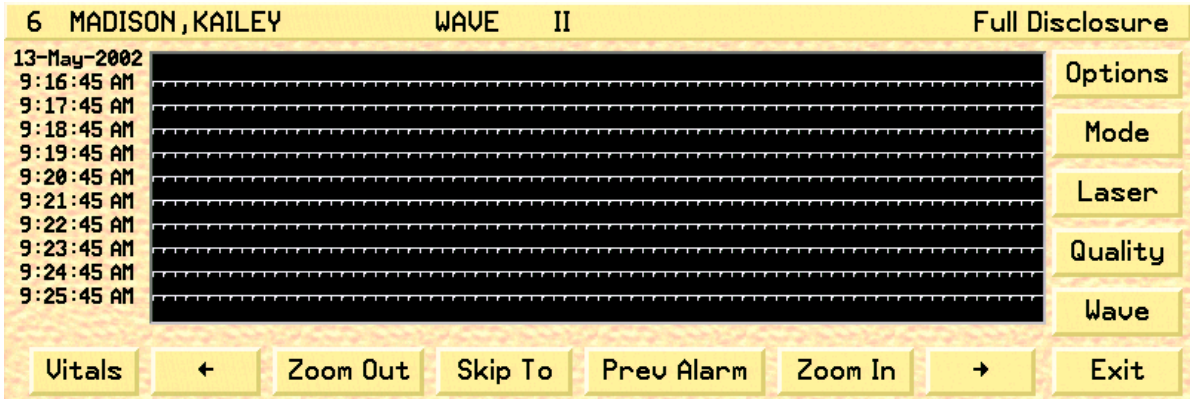
Select one of the following:

Start 1-Pass begins one 24-hour (or 72-hour) period of complete patient data recording. At the end of 24 (72) hours, the mode automatically switches to **Stop**.

Stop stops recording. Up to 24 (72) hours of previously recorded data is saved, but no new data is saved.

Continuous collects waveform data continuously with no ending point. Oldest data is overwritten.

zoomed out



zoomed in

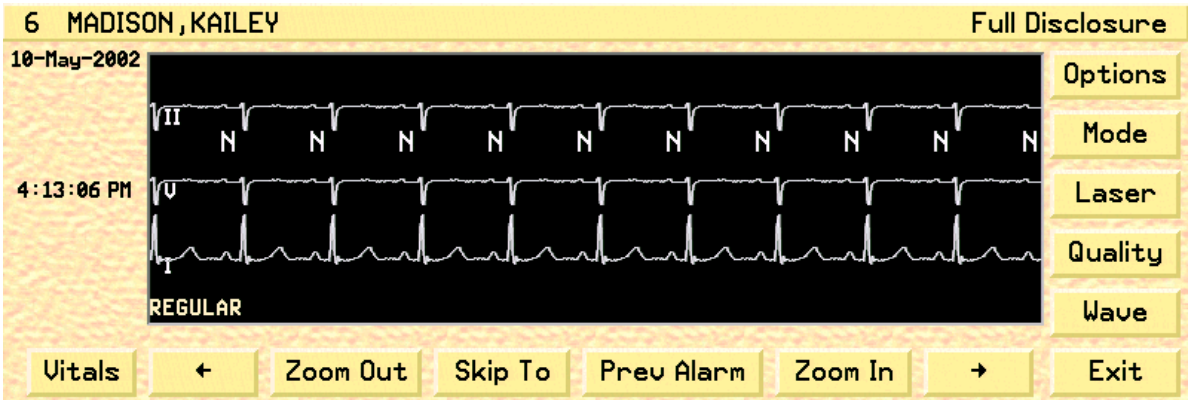


Fig. 69. Full disclosure screens

Fig. 69 shows zoomed in and zoomed out versions of waveforms on the Full Disclosure screen.

Note: There are two Zoomed Out displays in Full Disclosure. Press the Zoom Out button twice to display each Zoomed Out screen.

Zooming In and Out

Use the **Zoom Out** and **Zoom In** buttons to zoom out or in. Alarms and beat annotations are displayed differently on zoomed in and zoomed out views.

	Zoomed In	Zoomed Out
Alarms	Alarm text appears in the lower left corner of the waveform window.	Alarms are indicated by a line under the waveform. See page 106 for details on alarm indicators.
Beat Annotations	Available. See the next section.	Not available.

Note: Zoomed-In full disclosure also displays a page indicator, which shows the time that a page was sent. The Page Indicator is displayed in blue text below the Zoomed-In waveform (fig. 70).

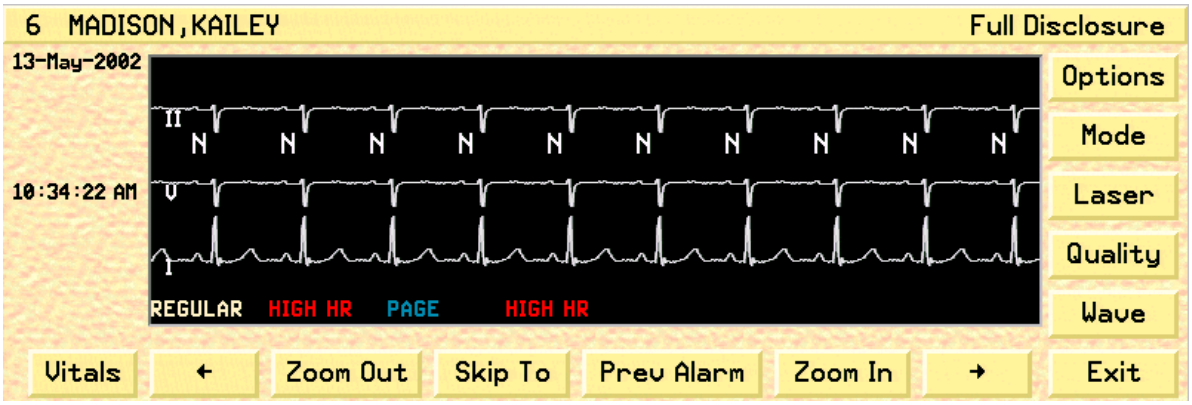


Fig. 70. Page Indicator

Beat Annotations

You can display beat call annotations on zoomed-in waveforms and laser printouts for patients set to central arrhythmia source.

1. Press the **Options** button on the Full Disclosure screen to display the Options popup (fig. 71).

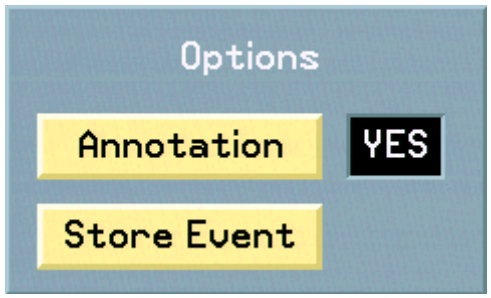


Fig. 71. Full Disclosure Options Popup

2. Toggle **Annotation** to Yes on the popup. This following beat calls appear as appropriate.

Table 17 1.05 Arrhythmia Beat Classification Labels

Beat Label	Description
N	Normal or Dominant
Q	Aberrant Normal
q	First Occurrence of Aberrant Normal
A	Premature Normal or Premature Supraventricular (SVE)
V	Premature Ventricular Ectopic (PVC)
X	Not Classified Due to Bad Samples (RF drop out) in QRS Region
?	Unknown (Noise or First Occurrence of PVC Morphology)

Selecting Waveforms for Disclosure Reports

You can select waves to appear on Disclosure reports and the 24 Hour Disclosure screen by changing the display wave format.

1. Press the **Wave** button to bring up the Wave popup (fig. 72).

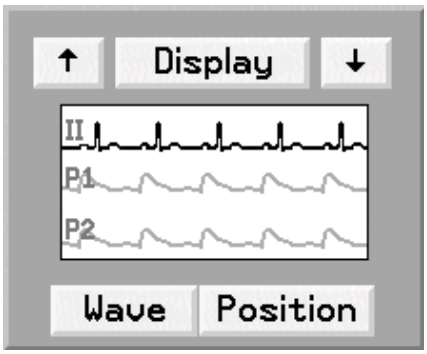


Fig. 72. Wave popup

2. Press the **Display** button to select the number of waves (one to four) to display.
3. Press the **Position** button to select one of the waves (the selected wave flashes).
4. Press the **Wave** button *on the popup* to cycle through available waveforms for the label set of the selected patient.
5. Press the **Wave** button *on the Full Disclosure screen* to save your selections.