4

HP Viridia Wave Viewer

This chapter provides information about the HP Viridia Wave Viewer, a clinical application run on an HP palmtop computer and used in conjunction with the HP Viridia telemetry transmitter. For environmental specifications, see Appendix A.

Topics include:

- Installation of Wave Viewer
- Exiting from Wave Viewer
- Configuration Screens
- System Setup (These functions require a password.)
- Battery Information
- Screen Saver Mode

Installation of Wave Viewer

Before installing HP Wave Viewer, the palmtop must be operational. See the palmtop user documentation for how to insert the batteries and perform a typical start-up.

To Install Wave Viewer

1. Turn the palmtop on.
2. Close any open applications until your personal information screen appears.

3. Insert the wave viewer flash disk card into the left end of the palmtop.
4. Press CTRL-ALT-DEL to reboot the system.

   The "Welcome to the HP Viridia Wave Viewer" screen will be displayed, followed by the "Communication Disrupted" screen.

   If the wave viewer does not start when the disk card is inserted, the palmtop may have insufficient memory. One (1) megabyte of memory is required to run the wave viewer.
5. To access patient waveforms, connect the palmtop to the transmiter.

Caution

Hewlett-Packard does not guarantee correct operation of the wave viewer when other applications are active on the palmtop PC. Rebooting while files or other applications are open can cause file or directory corruption.

Exiting from Wave Viewer

To use other applications on the palmtop, you must exit from the wave viewer program.

To Exit from Wave Viewer

1. Disconnect the transmitter and palmtop.
2. At the palmtop, press F10 or `Exit to DOS`.
3. Type *200* and press ENTER to start the palmtop Application Manager.

   The palmtop is now ready to launch other software applications.

Configuration Screens

The configuration screens enable you to view transmitter and wave viewer settings, and to access the Setup screens. Transmitter status information remains available even after the transmitter has been disconnected if another transmitter has not been connected. When the wave viewer is connected to a different transmitter, information for the initial transmitter will be erased. Dynamic status information is updated approximately once per second. This permits limited testing of features such as the transmitter button.

Setup Screens

Setup provides screens for configuration and test of the HP Viridia transmitter. Setup functions include changing the transmitter frequency, configuring a transmitter, and copying settings from one transmitter to another (see Chapter 6 for details). You can also access Demo Mode for use in training and practice. A Test function is available for use by service personnel. All these functions are accessed from the Main Screen and require a password for entry. To obtain the password, see your Service Representative.

Demo Mode

Demo Mode allows the wave viewer to run with an artificial ECG wave and synthetic data for SpO_2, pulse, and pleth wave for use in education and training. The patient cable defaults to a standard 5-wire cable. Although lead selection functions, only Lead II data will be displayed. All monitoring stops during Demo Mode. When you exit from Demo Mode, the system returns to the Setup Menu.

To Start Demo Mode

1. Select `Config`.

2. Select **Setup**.
3. Enter the password, followed by (ENTER).
4. Select **Demo**, then **Yes**. Be sure the palmtop is not near the transmitter.

   Or to return to realtime mode, press **No Cancel**.

To Exit (Return to Realtime Mode)

1. Select **Exit Demo**, then **Exit Setup** and **Exit Config**.

Batteries

HP supports only 1.5 volt, size AA alkaline or nickel-cadmium rechargeable batteries in the HP palmtop for use with the wave viewer application.

Under typical usage, the life cycle of fresh alkaline batteries is 2-8 weeks.

Battery Status

The wave viewer software monitors the palmtop battery voltage and informs you of the need to replace the batteries via a screen message.

You can also use the battery monitor in the "setup" program within the palmtop System Manager to predict the remaining battery capacity. When the indicator falls below the 1/4 level, fresh alkaline batteries should be installed.

Additionally, the palmtop has a self test ((ESC)-(ON)) which includes reading the battery voltage. Note that this selftest procedure necessitates rebooting of the palmtop.

For instructions on changing batteries, please refer to the HP palmtop user documentation.

Palmtop Power Save Mode

If there has been no keypress on the palmtop for 10 minutes, the palmtop will shut off automatically to conserve power. To resume operation, press ON.

Care and Cleaning

For instructions on care and cleaning of the palmtop, refer to the HP palmtop documentation.

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Inoperative Conditions

This chapter gives you additional information about telemetry inoperative conditions (INOPS). A complete summary of INOPs and alarms can be found in Chapter 3 of the *User's Guide*.

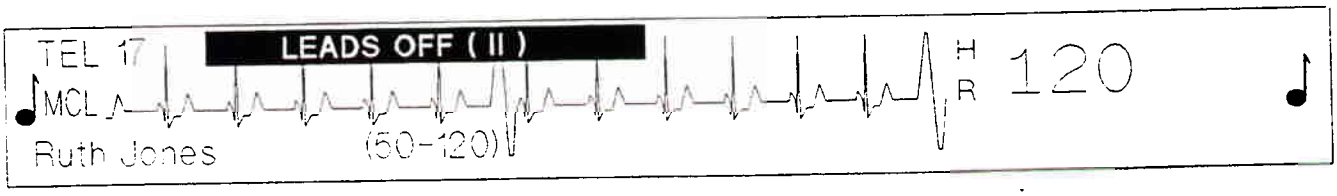
Monitoring During Inoperative Conditions (INOPS)

Inoperative conditions (INOPS) exist when the signal cannot be properly processed. INOPS automatically reset when the condition clears. Every INOP alarm is accompanied by a specific message. If the INOP results in loss of monitoring, the message is accompanied by an INOP alarm sound.

ECG-CH1 is always used for the cardiotach, but to prevent loss of monitoring during inoperative periods, the telemetry system attempts to continue monitoring by operating in one or both of these secondary modes; fallback or extended monitoring (if they are configured **On**). These modes are available only with the 5-wire lead set (HP Viridia transmitter) or 4- and 5-wire lead set (M1400A/B transmitter).

Fallback Mode without Arrhythmia Monitoring

If ECG-CH1 (the cardiotach lead) becomes inoperative due to a LEADS OFF condition, an INOP alarm and message occurs at the Central Monitor. After 10 seconds, the cardiotach switches to ECG-CH2, if operative. When ECG-CH1's INOP condition is corrected, the cardiotach switches back.



When fallback occurs, ECG-CH2 occupies the sector. An INOP message, for example `LEADS OFF II`, appears above ECG-CH2's waveform and the prompt ... `Leads swapped due to lead off` appears in the ECG Task Windows. When the condition clears, the INOP message is removed and ECG-CH1 returns to the sector.

To prevent lead selection which would terminate the fallback mode, the softkey enabling the change of lead or label (or swap) is removed.

Note

It is presumed you have selected the proper size and bandwidth for the cardiotach to perform on ECG-CH1. When fallback occurs and ECG-CH2 becomes the cardiotach lead, the monitor automatically readjusts its size and bandwidth to those selected for ECG-CH1. When the INOP condition clears, ECG-CH1 returns to the primary sector and ECG-CH2 returns to its previous settings.

Fallback does not occur if:

- configured off.
- you are monitoring with a 3-wire lead set.

If the above conditions exist, you must correct the INOP for monitoring to continue.

Fallback Mode with Arrhythmia

Arrhythmia fallback is a feature of arrhythmia monitoring and occurs even if your telemetry system is not configured for fallback.

Arrhythmia fallback occurs if your patient is arrhythmia monitored, ECG-CH1 is INOP, and ECG-CH2 is operative. After a 10 second delay, ECG-CH2 switches to the sector and arrhythmia analysis and alarms continue to be generated.

When ECG-CH1's INOP condition is corrected, it returns to the sector and arrhythmia monitoring continues as before.

Extended Monitoring Mode

If configured on, extended monitoring is available with the 5-wire lead set (HP Viridia transmitter) or 4- and 5-wire lead set (M1400A/B transmitter). Extended monitoring allows the monitor to continue monitoring if both displayed leads are INOP, either with a lead you did not select or a lead that was turned off. The delay to monitoring ECG-CH2 may be 20 seconds.

Note

When extended monitoring occurs, the operative lead takes on the size and bandwidth settings for ECG-CH1.

Extended Monitoring with the 5-wire Lead Set

Extended monitoring works with the 5-wire lead set in the following situation. If you have extended monitoring configured on and ECG-CH2 is turned off, an INOP of ECG-CH1 automatically turns ECG-CH2 on, so monitoring can continue.

For the HP Viridia transmitter or M1400A/B transmitter with lead swap off, ECG-CH2 will be assigned the label ECG.

For the M1400A/B transmitter with lead swap on, ECG-CH2 will be turned on with the configured label. For example, if you are using standard lead placement

with ECG-CH1 as Lead II and ECG-CH2 as off, if the left leg (LL) electrode fall off, ECG-CH2, Lead MCL, turns on, occupies the sector, and becomes the cardiotach lead.

When the INOP of ECG-CH1 is corrected, monitoring continues as before.

Extended Monitoring with the 4-wire Lead Set (M1400A/B transmitter)

Since the 4-wire lead set reconstructs four of its possible 6 leads, III, aVR, aVL, aVF, it may be able to continue monitoring if ECG-CH1 and B are both INOP. For example, if you are monitoring Lead II and aVR, and the left leg (LL) electrode falls off, the monitor is able to continue monitoring using Lead I, RA and LA. ECG-CH2 switches to the sector, and the message `LEADS OFF II` appears above ECG-CH2. Extended monitoring continues until the INOP condition clears.

Note

Since the right arm (RA) and right leg (RL) electrodes are necessary for *all* leads monitored by the 4-wire lead set, their loss prevents fallback or extended monitoring.

6

Configuration

Configuration Choices

How your telemetry system performs depends in large part on the configuration choices made during system installation. The following tables summarize the factory-set defaults and the alternative configuration choices that relate to clinical practice. Configuration is performed at the receiver mainframe, except for the Viridia transmitters, which are configured at the wave viewer, and all settings except frequency pertain to all receivers in the mainframe. For complete configuration information, including the impact of individual choices, see the *HP Viridia Telemetry System Installation and Configuration Guide* (M2600-90036).

M2604A Receiver Mainframe Configuration Settings

Item	Factory Default	User Choices
GENERAL ALARM PARAMETERS		
Alarm Suspend	3 Minutes	3 Minutes, Infinite
Alarm Reminder	ON	ON, OFF
GENERAL ECG PARAMETERS		
Alarm Limits	High 120 Low 50	20-250 15-245[1]
Lead Fallback	ON	ON, OFF
Extended Monitoring	ON	ON, OFF
M1400X SERIES TRANSMITERS ECG		
Bandwidth	CH1 = Monitor CH2 = Monitor	CH1 and CH2 = Monitoring, Exercise, Diagnostic, Paced, ST
Lead Selection - 4 Electrode	CH1 = II CH2 = I	CH1[2]=I, II, III, aVR, aVL, aVF CH2[2]= I, II, III, aVR, aVL, aVF,OFF
Lead Labelling - 5 Electrode	CH1 = II CH2 = OFF	CH1 = I, II, III, MCL CH2 = I, II, III, MCL, ECG, OFF
Lead Labelling - 3 Electrode	CH1 = II ECG-CH2 =OFF	CH1 = I, II, III, MCL
Lead Swap	OFF	ON, OFF
M2601X SERIES TRANSMITTERS ECG		
Bandwidth	CH1 = Monitor CH2 = Monitor	CH1= Monitor, Exercise CH2 = Monitor, Exercise

1 Low limit must be at least 5 less than the high limit.

2 ECG-CH1 and CH2 must be different lead types, and ECG-CH1 cannot be OFF.

M2604A Receiver Mainframe Configuration Settings (Cont.)

Item	Factory Default	User Choices
Lead Selection - 5 Electrode	CH1 = II CH2 = V	CH1[1] = I, II, III, aVR, aVL, aVF, MCL, V CH2[1] = I, II, III, aVR, aVL, aVF, MCL, V, OFF
Lead Labelling - 3 Electrode	CH1 = II	CH1 = I, II, III, MCL
GENERAL SpO_2 PARAMETERS		
SpO_2 Alarm Limits	High: 100 percent Low: 90 percent	High Range = 51-100 percent Low Range = 50-99 percent (increment of 1)
ST OPTION		
ST Module	Disabled	Enabled, Disabled
ST Monitoring Lead	ST1	ST1, ST1 & ST2
ST Alarm Limits	ECG-CH1 High +0.6 ECG-CH1 Low -1.0 ECG-CH2 High +0.6 ECG-CH2 Low -1.0	-9.6 to +9.8 (increment 0.2) -9.8 to +9.6 (increment 0.2) -9.6 to +9.8 (increment 0.2) -9.8 to +9.6 (increment 0.2)
ST Measurement Points * Isoelectric * J Point * ST Offset	 - 80 48 60	 -460 to +460 (increment 4) -460 to +400 (increment 4) 60 or 80
GENERAL PARAMETERS		
Transmitter Button Function	Nurse Call and Record	Nurse Call, Record, Both, Disabled
Language	English	English

1 ECG-CH1 and CH2 must be different lead types, and ECG-CH1 cannot be OFF.

For configuration of the following items, see *HP Viridia Telemetry System Installation and Configuration Guide*:

- Auto Self Test
- Self-test Strip
- SDN Unit Number
- SDN Branch Number
- Country Code
- Locale Code
- Frequencies

HP Viridia Transmitter Configuration Settings

Item	Factory Default	User Choices
Lead Selection 3-wire lead set	No	Yes, No
Automatic Shutoff (after 10 min)	Yes	No, Yes
User Change Frequency	Yes	No, Yes

For configuration of the following items, see *HP Viridia Telemetry System Installation and Configuration Guide*:

- Country Code
- Locale Code
- Frequencies

Changing the Configuration

In general, configuration changes are best made by the service department. However, occasionally you may be called on to resolve a troublesome situation. For that reason, we have included directions for two of the most commonly performed configuration procedures: (1) configuring a replacement HP Viridia transmitter to match others in the unit, and (2) changing the frequency in case of excessive interference or if you have a spare transmitter. Both these proocredures require a wave viewer. Consult the service documentation or service representative for more information.

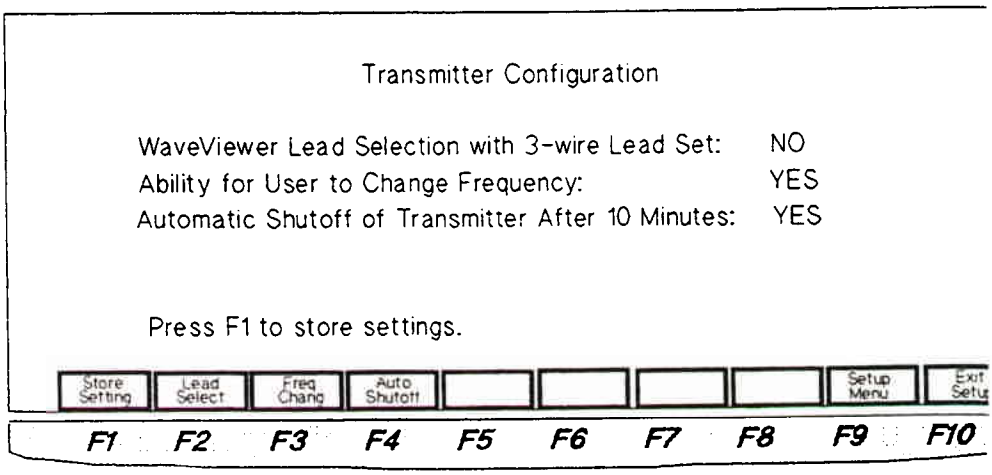
To Configure a Replacement HP Viridia Transmitter

1. Obtain a transmitter with an existing configuration you want to copy.
2. At the central monitor, obtain the frequency and check code for the replacement transmitter's associated bed.
   a. Press (Monitor Setup).
   b. Press **Telemtry Freqency**.
   c. Enter the password, followed by (ENTER).
   d. Highlight the frequency and check code for the associated bed.
3. Insert battery in replacement transmitter.
4. At the wave viewer, set frequency of replacement transmitter.

Note

Setting the frequency to one already in use can cause interference with another transmitter/receiver pair.

Check the status information screens on the wave viewer to see if the transmitter is configured to allow a frequency change. If No, call service for assistance.



a. From the wave viewer Main Screen, select **Config**.

b. Select **Setup**.

c. Enter the password, followed by ENTER.

d. Select **Chang Freq**.

e. Enter the frequency for the replacement transmitter found on the central monitor, followed by ENTER.

f. Enter the check code found on the central monitor, followed by ENTER.

g. To set the new frequency, select **Confirm**.

5. At the wave viewer, copy the configuration from the existing transmitter into the replacement transmitter.

a. Select **Setup Menu**.

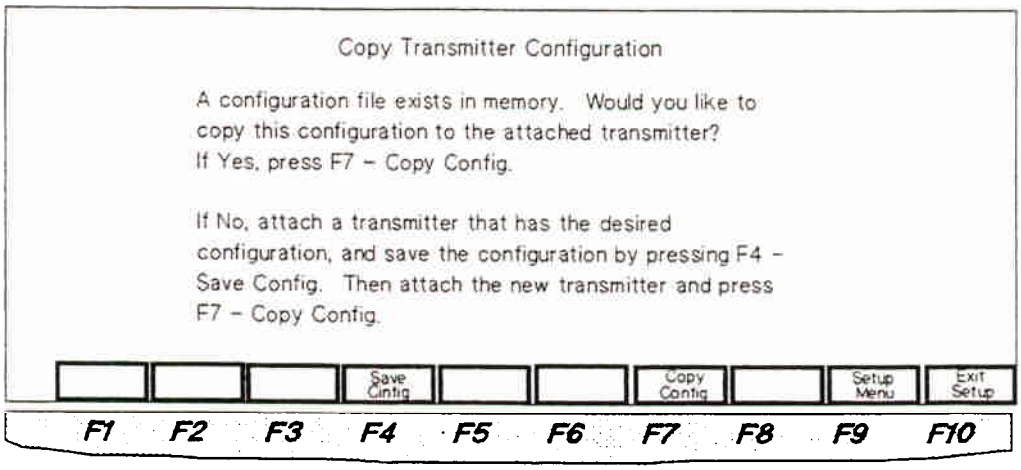
b. Select **Copy Config**.

c. Connect the transmitter with the existing configuration your want to copy.

d. Select **Save Config**.

e. Connect the replacement transmitter.

f. Select **Copy Config**.



6. At the central monitor, select **Learn Code** from the Telemetry Frequency screen (or in the Admit/Discharge window) for the highlighted bed and within 10 seconds, press (Patient Button) on the replacement transmitter to enable the system to learn the new frequency.

To Change the Frequency:

Note

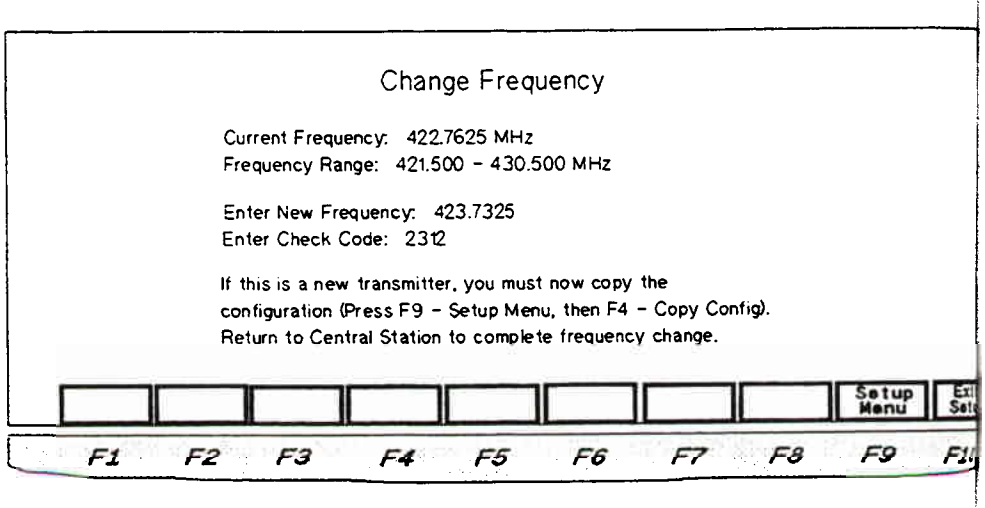
Check the status of the transmitter (from wave viewer Main Screen, select **Config**, then **Xmtr Info2**) to see if the transmitter is configured to allow a frequency change. If No, call service for assistance.

Setting the frequency to one already in use can cause interference with another transmitter/receiver pair.

1. Set the new frequency for the receiver.
   a. At the central monitor, press (Monitor Setup).
   b. Select **Telemtry Frequency**.
   c. Enter the password, followed by (ENTER).
   d. Highlight the bed/receiver.

e. Enter the new frequency for the receiver, followed by (ENTER).
f. Enter the check code, followed by (ENTER).
g. Press (Confirm).

2. Set the new frequency for the transmitter.
   a. From the wave viewer Main Screen, select **Config**.
   b. Select **Setup**.
   c. Enter the password, followed by (ENTER).
   d. Select **Chang Freq**.
   e. Enter the new frequency for the transmitter, followed by (ENTER).
   f. Enter the check code, followed by (ENTER).
   g. To set the new frequency, select **Confirm**



7

Installation and Patient Safety

Caution

Installation and setup must be performed by an HP service representative or designee.

Warning

Power modules for analog output, antennas, and palmtop personal computers (wave viewer) must not be installed or used within an 8' radius of the patient.

Installation Information

Environment

Follow the instructions below to ensure a completely safe electrical installation. The environment where the HP Viridia Telemetry System will be used should be relatively free from vibration, dust, corrosive or explosive gases, extremes of temperature, humidity, and so on. For a cabinet mounted installation, allow sufficient room at the front for operation and sufficient room at the rear for servicing with the cabinet access door open.

The HP Viridia Telemetry System operates within specifications at ambient temperatures between 0°C and 45°C. The transmitter ambient temperature specification is between 0°C and 45°C. Ambient temperatures which exceed these limits could effect the accuracy of the instrument and cause damage to the components and

circuits. Allow at least 2 inches (5 cms) clearance around the instrument (except the transmitter) for proper air circulation.

Power Source Requirements

The HP Viridia Telemetry System can be operated from an AC source of 100/120/220/240 VAC selectable ± 10%, with a frequency range of 47 - 63 Hz.

The power consumption is 110 VA maximum, 95 VA average, 81 W maximum, 72 W average with 8 receiver modules.

The transmitter operates on the specified 9 Volt battery and draws approximately 15 mA (ECG only) or 56 mA (ECG and SpO_2).

Grounding the HP Viridia Telemetry System

To protect hospital personnel, the cabinet of the HP Viridia Telemetry System receiver mainframe must be grounded. Accordingly, the system is equipped with a detachable 3-wire cable which grounds the instrument to the power line ground (protective earth) when plugged into an appropriate 3-wire receptacle. If a 3-wire receptacle is not available, consult the hospital electrician.

Warning 

Do not use a 3-wire to 2-wire adapter with this instrument.

Condensation

Make sure that during operation, the instrument is free of condensation. Condensation can form when equipment is moved from one building to another, thus being exposed to moisture and difference in temperature.

Warning 

Possible explosive hazard if used in the presence of flammable anesthetics.

Explanation of symbols

The following is an explanation of the symbols found on the HP Viridia Telemetry System:

Indicates the instrument is Type CF. (With defib protection.)

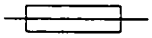
Indicates the equipment is Type B.

AC line current.

Attention, consult accompanying documents.

An electrical output.

An electrical input.



Fuse input.

Grounding system.

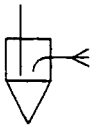
Equipotential grounding system.

Protective earth ground.

Data In.

Data In/Out.

Antenna input.



Active Antenna Combiner.

Mainframe. (For future use.)

These symbols indicate that the various instruments connected to the HP Viridia Telemetry System are either Type B and/or Type CF (with defib protection).

Type B equipment provides a particular degree of protection against electric shock particularly regarding:

- allowable leakage currents
- reliability of the protective earth connection (if present).

Type B equipment is, for example, suitable for intentional internal and external application to the patient, excluding direct cardiac application.

Type CF (with defib protection) equipment is designed to have special protection against electric shocks (particularly regarding allowable leakage currents, having an F-type isolated [Floating] applied part), and is defibrillator proof.

Maintenance Checks

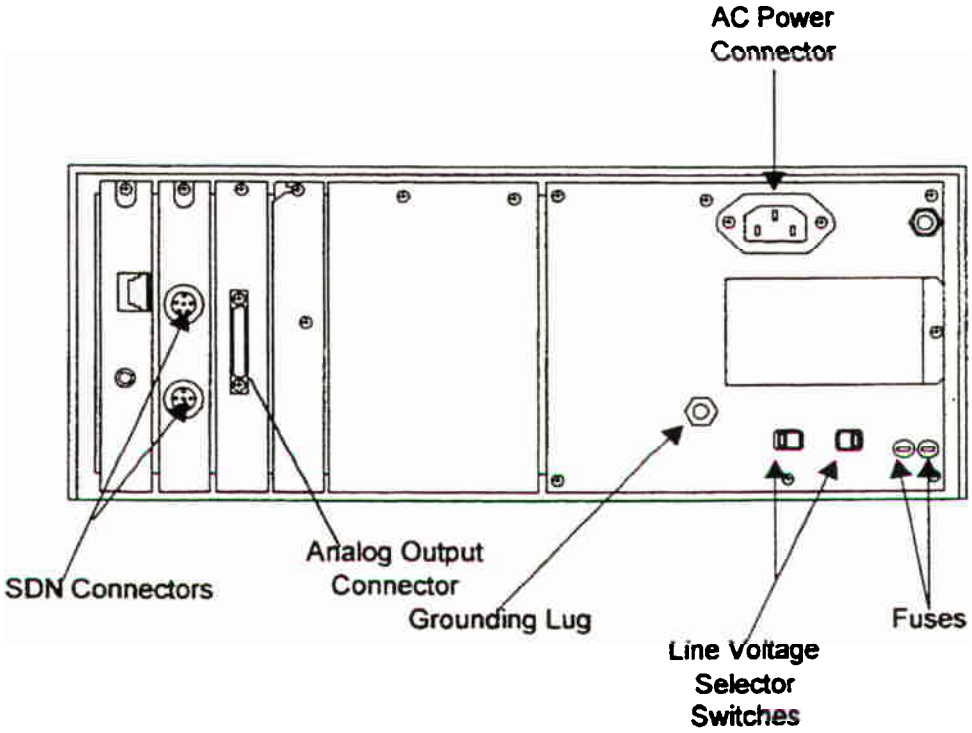
Before beginning monitoring on a patient:

- Check for any mechanical damage.
- Check all the external leads, plug-ins and accessories.
- Check all the functions of the instrument which are needed to monitor the patient.
- Ensure that the instrument is in good, working order.

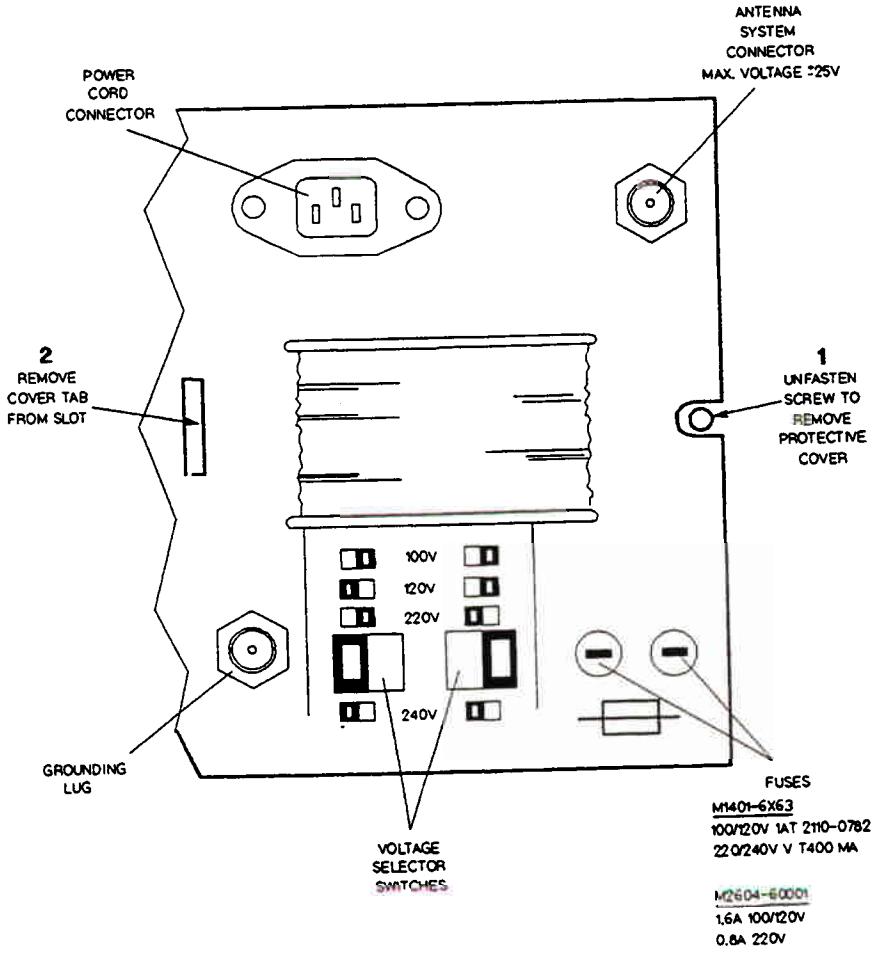
Do not use the HP Viridia Telemetry Monitoring System for any monitoring procedure on a patient if you identify features which demonstrate impaired functioning of the instrument. Contact the hospital biomedical engineer, or your HP Service Representative.

The Rear Panel of the HP Receiver Mainframe

The rear panel of the receiver mainframe is shown below. The back of the mainframe should only be removed by **qualified service personnel.**



This is an enlarged view of the right side of the rear panel:



Connectors

The connectors on the rear panel of the receiver mainframe are:

- Fuses: the 100/120V input voltage line is protected by a 1.6 AT fuse.
- Line Power Connector: this is a 3 pin connector, used to input the local line voltage. Mainframe plug is a standard IEC mains inlet receptacle.
- Antenna System Connector: this is a BNC coaxial connector.
- Digital Data Output: these are upstream and downstream connectors that connect to the HP Viridia monitoring network (SDN).
- Patient Monitor/Holter Interface (Analog Output) Option: High Density 50-pin SCSI-type to connect to output connector box.
- Grounding Lug: this is a grounding stud connector, used to equalize the grounding potential between products.

Secondary Ground Wire

A secondary ground wire is provided with this instrument to comply with IEC-601-1-1. This wire ensures against excessive chassis leakage current in the event of a single fault in the health care facility's primary grounding means.

It is recommended that the secondary ground wire be connected to a ground source separate from the primary grounding source found in the instrument's power source.

Note After servicing, be certain to reconnect the secondary ground wire.

Warning **Removal of the secondary grounding wire from the rear of the product voids the IEC approval.**

Lifting the Receiver Mainframe

The HP receiver Mainframe weighs 37 lbs. (16.9 kg). When carrying the mainframe, hold it firmly from underneath. For safety reasons, it is *strongly* recommended that at least two people lift the mainframe. One person should not attempt it.

Antenna Amplifiers

The antenna amplifiers must be operated only with the Ault transformer, and must be operated at a minimal distance of 2.43 meters (8 feet) from the patient.

For 100 - 120 Volt operation, use Model 7323-000-01922; Part Number, HP 0950-2038.

Patient Monitor/Holter Interface Option

If using the optional Patient Monitor/Holter Interface (Analog Output), the connector box must only be operated with the appropriate power supply (see table below), and must be operated at a minimum distance of 2.43 meters (8 feet) from the patient.

Power Supply for Output Connector Box

Location	Voltage	Part Number
U.S.	120V	82241-60001

Note At this time, Hewlett-Packard will make available on request, and in English only, such circuit diagrams, component part lists, descriptions, calibration

instructions or other information which will assist the user's appropriate qualified technical personnel to repair those parts of the equipment which are classified by Hewlett- Packard to be repairable.

8

Cleaning and Disinfection

Warning

To prevent fire, provide adequate ventilation and do not permit smoking when cleaning the transmitter or the receiver mainframe with a flammable liquid, such as alcohol, or sterilizing with ethylene oxide (EtO).

Disconnect line power from the receiver mainframe to prevent electrical shock and accidental turn-on.

Caution

Do not use any abrasive cleaning materials on any part or component of the HP Viridia Telemetry System.

Do not clean any part or component of the HP Viridia Telemetry System in any overly vigorous or abrasive fashion.

Using abrasive cleansers and abrasive cleaning actions will damage the components.

Cleaning the Receiver Mainframe

The receiver mainframe should be kept free of dust and dirt. You can only clean the outside of the receiver mainframe. Wipe the outside of the receiver mainframe clean by wetting a damp cloth or rag with one of the following approved cleaning agents:

- Soap and Water
- Isopropyl Alcohol
- Ethyl Alcohol

- Hydrogen Peroxide
- Dilute sodium hypochlorite (chlorine bleach), 10% solution, freshly made within the past 24 hours
- Cidex®
- Windex®
- Lysol

Make sure you rinse all cleaned surfaces with distilled water to remove any residue.

Cleaning the HP Viridia Transmitter

The transmitter can be cleaned by two methods: wiping or soaking. However, there are restrictions which apply to both methods.

Wiping the Outside of the Transmitter

The outside of the transmtiter should be kept free of dirt and dust. Wipe the outside of the transmitter clean by using a cloth dampened modestly with one of the following approved cleaning agents:

- Soap and Water
- Isopropyl Alcohol
- Ethyl Alcohol
- Hydrogen Peroxide
- Dilute sodium hypochlorite (chlorine bleach), 10% solution, freshly made within the past 24 hours
- Cidex®
- Windex®
- Lysol

Make sure you rinse all cleaned surfaces with distilled water to remove any residue.

Caution

Do not use Cidex®, Windex®, or Lysol inside of the battery compartment. These cleansers will damage the battery compartment.

Wiping the Battery Compartment

Under normal operation, the battery compartment should not become very dirty and should not require frequent cleaning. However, if you must clean the battery compartment, wipe the battery compartment clean by using a cloth dampened modestly with one of the following approved cleaning agents:

- Isopropyl Alcohol
- Ethyl Alcohol
- Hydrogen Peroxide
- Dilute sodium hypochlorite (chlorine bleach), 10% solution, freshly made within the past 24 hours

Make sure you rinse all cleaned surfaces with distilled water to remove any residue.

Caution

Do not soak the transmitter in anything other than Isopropyl Alcohol or Ethyl Alcohol.

Do not soak the transmitter any longer than five minutes.

Soaking the transmitter for longer than five minutes or in anything other than Isopropyl Alcohol or Ethyl Alcohol can severly damage the transmitter.

Soaking the Transmitter

If the transmitter should ever require soaking to clean difficult areas, you may soak the transmitter for up to five minutes in one of the following approved cleansing agents:

- Isopropyl Alcohol
- Ethyl Alcohol

Sterilization

Hewlett-Packard makes no claims concering the sterilization of the HP Viridia transmitter.

Cleaning ECG Patient Cables

The trunk cables, lead sets, and accessories that make up your HP Safety Cable System can be cleaned, disinfected, or sterilized using a variety of methods and chemicals. Please be careful not to use harsh chemicals such as Acetone.

Caution

Do not immerse or soak the trunk cable or leads.

Damage caused by soaking or by using chemicals such as those noted above will not be covered under warranty.

Cleaning

The HP cables should be cleaned by wiping with a cloth *dampened* with a solution of water and one of the cleaning agents listed below. After cleaning, wipe with a cloth *dampened* with water to remove the cleaner, then dry with a clean cloth.

Cleaners

- Ordinary alcohol-free soap (such as Ivory soap and water)
- Tincture of Green Soap
- U.S.P. Lysol Brand Disinfectant deodorizing cleaner (household, not industrial strength).
- For adhesive tape residue: Ease-Away (Wood Life Ltd., Franklin Park, IL).

Caution

Do not immerse or soak the trunk cable or leads.

Disinfecting

The HP cables can be disinfected when needed using the cold chemical disinfectants listed below. HP recommends that you disinfect only when necessary as determined by your hospital's policy, to avoid long term damage to the cables, leads, etc. HP also recommends that the items being disinfected be first cleaned using the procedure described under "Cleaning". Then, the disinfectant can be wiped onto the items using a soft cloth *dampened* with water, and dried with a clean cloth.

Disinfectants

- Cidex (Surgikos Division of Johnson & Johnson Co.)
- Wavicide-01 (Wave Energy Systems, Inc., Newtown, PA)
- Wescodyne (West Chemical Products, Inc., New York, NY)
- Vesphene II (Vestal Labs, St. Louis, MO)
- Chlorine bleach diluted with water (no stronger than 1:10)
- Hydrogen Peroxide
- Cetylcide (Cetylite Industries, Inc., Pennsauken, NJ)
- Isopropyl Alcohol 91%: Only on shielded leads, not on trunk cables.

Caution

Be *very* careful to keep these chemicals (especially solutions containing chlorine bleach) from contacting any of the metal parts such as pins, sockets, or springs. Permanent damage to the plating and underlying metal can occur.

Note

HP makes no claims regarding the efficacy of these chemicals or this method as a means for infection control. Consult your hospital's Infection Control Officer or Epidemiologist.

Sterilization

The HP cables can be sterilized when needed using Ethylene Oxide (EtO) gas. Before sterilizing, clean the items as described under "Cleaning." Be sure all safety precautions regarding aeration after EtO exposure are followed. HP recommends that you only sterilize these products when necessary as determiend by your hospital's policy, to help prevent long term damage to the cables leads, etc. Never autoclave or steam sterilize these products. Never sterilize them by pasteurization (hot water soak).

Cleaning SpO_2 Transducers

HP Adapter Cable (M1943A)

Regularly clean the adapter cable by wiping it with a cleaning solution such as isopropyl alcohol. Do not use bleaches containing Sodium Hypochlorite (for example, Clorox^{TM}).

Do not immerse the adapter cable in liquid, as this can lead to incorrect SpO_2 readings.

HP Reusable Transducers (M1191A, M1192A, M1194A)

Regularly clean the transducers as follows.

1. Remove the transducer from the patient and disconnect it from the monitor.
2. Clean the transducer in a mild detergent solution, a salt solution (1%) or one of the following solutions:

Mucasol (3%)	Buraton (pure)
Incidin (10%)	Alcohol (70%)
Cidex (pure)	Alconox (1:84)
Sporicidin (1:16)	Cetylcide (1:63)

3. Rinse the transducer in water. Wipe it with a dry cloth and then leave to dry completely.

4. Check the transducer and cable, and if you see signs of deterioration or damage, do not use for further patient monitoring.

Caution

Do not autoclave the transducers.

Do not use bleaches containing Sodium Hypochlorite (for example, Clorox™).

M1400A/B Transmitter Sterilization

This generic procedure is used for sterilizing M1400A/B transmitters and associated patient cables with ethylene oxide (EtO) gas. The sterilization and aeration process for the transmitter and patient cable has been tested for a maximum of 36 cycles[1].

Caution

To avoid equipment damage, do not autoclave the patient cable or transmitter. Do not sterilize the patient cable or transmitter with pure EtO.

Follow the manufacturer's recommended procedure for your gas sterilizer. To dissipate residual EtO, aerate the sterilizied equipment with air that has been bacterially filtered, using a mechanical aerator or combination sterilizer/aerator as follows:[1]

TIME: Eight hours.
TEMPERATURE: 130 +/- 5°F (54.4 +2.8/-2.7°C).
VENTILATION FREQUENCY: 30 air exchanges per hour.

Warning

ETHYLENE OXIDE IS HIGHLY EXPLOSIVE, TOXIC, AND A POTENTIAL OCCUPATIONAL CARCINOGENIC AND REPRODUCTIVE HAZARD. HANDLE IT WITH EXTREME CARE, FOLLOWING U.S.A. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS FOR

ETHYLENE OXIDE (29 CFR 1910.1047)[2]. PERSONNEL EXPOSURE AND/OR ROOM AIR MUST BE MONITORED PER OSHA STANDARDS.

VENT STERILIZER GAS OUTDOORS OR TO A SUITABLE, EVACUATED CONTAINER FOR REPROCESSING, DEPENDING ON STATE, PROVINCIAL, OR COUNTRY ENVIRONMENTAL REGULATIONS. DO NOT VENT STERILANT INDOORS.

VENT AERATOR EXHAUST ONLY TO THE OUTDOORS.

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[1]These values will produce EtO residual levels in the transmitter and patient cable plastic below 250 ppm, per FDA regulations for implantable devices.
Reference: U.S.A. Food and Drug Administration regulations, Part 5, Section 821.100, June 23, 1978.

[2]OSHA: Standard for acceptable levels of personnel exposure to Ethylene Oxide Gas: 1.0 ppm on an eight-hour time-weighted average basis.
Reference: U.S.A. Federal Regulations 49 FR 2574/29 CFR, Part 1910.1047, June 22, 1984; final approval 50 FR 9800/20 CFR Part 1910.1047, March 12, 1985.

Cleaning the Palmtop

For cleaning instructions for the palmtop, refer to the HP palmtop user documentation.

A

Specifications and Ordering Information

This appendix lists the system classification, and the environmental and electrical power specifications for the hardware components of the system. For complete specifications, see *HP Viridia Telemetry System Service Guide*, part number M2600-90033. For full specifications for the wave viewer, see the HP palmtop documentation.

System Classification

Class 1 Equipment: M2604A Receiver Mainframe, M1401A Receiver Mainframe.

Class 2 Equipment: 0950-2038, 0950-3221 Power Supplies.

M2601A Transmitter Battery Powered Type CF

Ordinary Equipment

The system provides Continuous Operation when in use.

Transportation & Storage Specifications

FOR ALL HARDWARE COMPONENTS OF THE HP VIRIDIA TELEMETRY SYSTEM EXCEPT WAVE VIEWER AND REUSABLE PULSE OXIMETRY TRANSDUCERS:

Operating Temperature Range: 32 to 113°F (0 to 45°C).

Storage Temperature: -40 to +158°F (-40 to +70°C).

Altitude: Operating and storage up to 15,000 ft (4570 m).

Relative Humidity: 95%

FOR WAVE VIEWER:

Operating Temperature Range: 0-50°C (32-122° Fahrenheit)

Storage Temperature with Data Retention: 0-60° Celsius (32-140° Fahrenheit)

Altitude: Operating and storage up to 15,000 ft (4570 m).

Operating and Storage Humidity: 90% relative humidity at 40° Celsius (104° Fahrenheit) maximum

FOR REUSABLE PULSE OXIMETRY SENSORS:

Operating Temperature Range: 10-37°C (50-98.6° Fahrenheit)

Storage Temperature with Data Retention: -40 to 70° Celsius (-40 to 158° Fahrenheit)

Altitude: Operating up to 15,000 ft (4570 m). Storage up to 50,000 ft (15,300 m).

Operating Humidity: 95% relative humidity at 37° Celsius (98.6° Fahrenheit) maximum

Storage Humidity: 95% relative humidity at 65° Celsius (150° Fahrenheit) maximum

Power Specifications

HP M2601A Viridia Transmitter

RF Power Output: +3 - 6 dBm (2 - 4 milliwatts) nominal.

Carrier Frequency Range: 460 to 470 MHz.

Radio Channel Spacing: 25 kHz

Defibrillator Protection: Transmitter ECG input protected against 400 joules discharge into a 50 Ohm load

Batteries: 9V Alkaline, Lithium.

Current Draw: 15 mA (ECG only), 56 mA, typical (ECG and SpO_2)

HP M1400A/B Transmitters

Unless other indicated, specifications apply to both transmitters.

RF Power Output:

HP M1400A +3 dBm (2 milliwatts) nominal.

HP M1400B +6 dBm (4 milliwatts) nominal.

Carrier Frequency Range: 406 to 512 MHz (exact frequency fixed by option), VCXO controlled.

Radio Channel Spacing: 25 kHz

Defibrillator Protection: Transmitter ECG input protected against 400 joules discharge into a 50 Ohm load

Batteries: 8.4 or 9V Alkaline, Carbon-Zinc, Lithium, Mercury, Zinc Air.

Current Draw: 4.5 mA, nominal (M1400A); 6.0 mA, nominal, (M1400B)

HP M2604A/M1401A Receiver Mainframe

Power Supply: M2604-60001, M2604-60000, M1403-60631*

*Not applicable to M2604A.

Note: See the *HP Viridia Telemetry System Service Guide* for additional information on power supplies.

Input Voltage: 100/120/220/230-240 VAC selectable +/- 10%.

Frequncy Range: 47 to 63 Hz.

Power Consumption: 110 VA maximum, 95 VA average, 81 W maximum, 72 W average with 8 receiver modules.

Controls: Front Panel: Power On/Off;
Rear Panel: Line voltage selector.

Indicators: Front Panel: Power On (indicator light and mechanical indicating lines on POWER button), Instrument Malfunction, Receiver Status (internally via LED).

Connections (rear): Antenna Input Signal connector (BNC).
Downstream SDN connector
Upstream SDN connector
Analog Out Connector
AC Power Connector (4 selectable line voltages)
Grounding Lug.

HP M2603A Receiver Module

Frequency Tuning: Programmable, synthesizer, PLL controlled.

Channel Spacing: 25 kHz.

Analog Output Option (J01)

Input Voltage: USA Power Module 0950-2038: 120VAC +/- 10%.
CE Mark Power Module 0950-3221: 100-240Vac +/- 10%.

Frequency Range: 47 - 63 Hz.

Power: CE Mark Power Module 0950-3221: 33 VA maximum.

Output Voltage: CE Mark Power Module 0950-3221: 24 VDC 0 to 1.4 A.

Output Current: CE Mark Power Module 0950-3221: 1.4 ampere DC maximum

Analog Output Gain (from output of receiver module):

High-level outputs: 500% ± 5%

Low-level outputs: 1 +7%/−6%

Inoperative Mode (INOP Condition) Output Level:

High-level output: 10.8 volts ± 1.2 volts

Low-level output: >100 megohms with respect to reference electrode

Delay from Transmitter Input to Analog Output:

40 milliseconds max.- M1400A/B Transmitter

400 milliseconds max. - HP Viridia Transmitter

Not intended for use with synchronized cardioversion due to processing delay.

Indicators: Output Connector Box; Status and Power LEDs

Connections:

Output Connector Box: Input (50-pin jack);
Input (Power Module); Output (8 pairs of 9-pin D connectors)

Analog Output Card: Output (50-pin jack)

Bedside Attenuator: Output (3-conductor phone jack)

Holter Attenuator: Output (set of 5-button connectors)

HP M1402A Receiver Module

Frequency Range: RF Carrier 406 to 512 MHz (exact frequency fixed by option), VCXO controlled.

Channel Spacing: 25 kHz.

Channel RF Bandwidth: 10 kHz.

Antenna System Specifications

HP M1408A Active Antenna Combiner

Operating Voltage: 19 - 32 VDC.

Current Requirements: 50 mA.

Average Power Consumption: approximately 1.5 Watts.

RF Gain: Antenna: 9.7 dB typical, at 465 MHz; Line: 3.5 dB typical, at 465 MHz.

Indicators:

Green LED indicates DC power/signal cable connected correctly; Red LED indicates DC power/signal cable connected incorrectly.

HP M1406A Line Amplifier

Operating Voltage: 19 - 40 VDC.

Current Requirements: 50 mA.

Average Power Consumption: about 1.1 Watts.

RF Gain: 12.5 dB typical, at 465 MHz.

HP M1407A Multiple Unit Power Supply

Input Voltage: USA Power Module 0950-2038: 120VAC +/- 10%.
CE Mark Power Module 0950-3221: 100-240VAC +/- 10%.

Frequency Range: 47 - 63 Hz.

Power: USA Power Module 0950-2038: 36 VA maximum.
CE Mark Power Module 0950-3221: 33 VA maximum.

Output Voltage: USA Power Module 0950-2038: 23 VDC nominal at 1 A.
CE Mark Power Module 0950-3221: 24 VDC 0 to 1.4 A.

Output Current: USA Power Module 0950-2038: 1 ampere DC.
CE Mark Power Module 0950-3221: 1.4 ampere DC.

Accessories Ordering Information

Accessories listed in the table below can be ordered through your Hewlett-Packard representative. See Appendix C in the *HP OmniCare Component Central Monitor User's Reference Manual* for a list of Hewlett-Packard sales offices.

Accessories - HP Viridia Transmitter

Description	HP Part Number
Battery, 9 V Lithium (box of 10)	ULBU9VLJ
Lead Set, 3-wire snap, 30 inch (U.S.)[1]	M2590A
Lead Set, 3-wire grabber, 30 inch (U.S.)[1]	M2591A
Lead Set, 5-wire snap, 30 inch (U.S.)[2]	M2592A
Lead Set, 5-wire grabber, 30 inch (U.S.)[2]	M2593A
Combiner Shield, 3-wire	M2598A
Combiner Shield, 5-wire	M2599A
Electrode Set, disposable	14445A
Pouch (50 /case)	M4501A
Pouch (200/case)	M4502A

1 Includes 3-wire Combiner Shield

2 Includes 5-wire Combiner Shield

Accessories - SpO_2 Monitoring

Description	HP Part Number
SpO_2 Transducers	
HP Reusable Transducer	
Adult finger	M1191A
Small Adult/Pediatric finger	M1192A
Adult/Pediatric ear clip	M1194A
Disposable Transducers[1]	
Adult digit (Oxisensor II™ D-25)	M1904A/B
Pediatric finger/toe (Oxisensor II™ D-20)	M1903A/B
Adapter cable	M1943A
Accessories	
Wristband	M1627A

1 Pack of 24

OXISENSOR II™ is a trademark of *NELLCOR*® Incorporated.

Disposable transducers are not available as HP parts in the USA or Canada. Contact *NELLCOR*® Incorporated for ordering information.

Accessories - M1400A/B Transmitter

Description	HP Part Number
Battery, 8.4 volt Zinc Air	1420-0340
Box of 12 Zinc Air batteries	40455
Lead Set, 3 wire snap (U.S.)	M1420A
Lead Set, 3 wire grabber (U.S.)	M1421A
Lead Set, 4 wire snap (U.S.)	M1422A
Lead Set, 4 wire grabber (U.S.)	M1423A
Lead Set, 5 wire snap (U.S.)	M1424A
Lead Set, 5 wire grabber (U.S.)	M1425A
Electrode Set, disposable	14445A
Pouch	9300-0825

B

Analog Output Option

The Analog Output Option J01 (Patient Monitor/Holter Interface) gives the HP Viridia Telemetry System the capability of providing ECG outputs to bedside monitors, Holter monitors, and other recording devices.

Warning

The Patient Monitor/Holter Interface (Analog Output) Option is intended for display and recording purposes only. The following should not be used with this option:

- **synchronized cardioversion**
- **intra-aortic balloon pump**

Inherent delays in the telemetry transmitter, receiver, and the analog output processing cause significant time lags between actual ECG occurrence and the signal required to trigger the defibrillator or intra-aortic balloon pump. Failure to adhere to this warning could cause serious injury to the patient.

Caution

To ensure correct lead labeling at the bedside monitor, the following should be used:

- correct bedside monitor cable (See the table on page B-3)
- standard lead placement
- valid lead selection at the bedside monitor (See the table on page B-5)

Not adhering to these recommendations may result in mislabeled leads or an invalid display.

Analog Output Bedside Monitor Cables

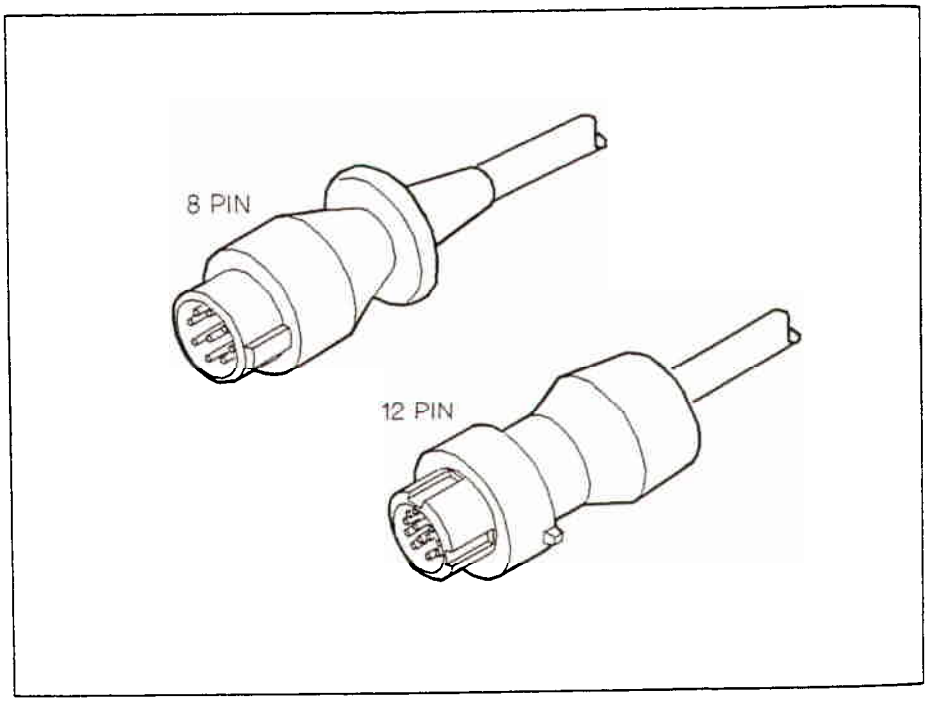
To connect the telemetry transmitter to the bedside monitor via the optional Patient Monitor/Holter Interface (Analog Output), you will need an analog output bedside monitor cable.

The end of the cable that connects to the bedside monitor will have either a small 12-pin connector or a larger 8-pin connector (See the illustration below).

The other end of the cable has a phone plug connector, and it plugs into the wallplate.

Note

When using the analog output option for the HP Viridia Telemetry System, this cable will replace the bedside monitor patient cable.



There are four different analog output bedside monitor cables. Which cable you use will depend upon whether the input connector on your bedside monitor is 8-pin or 12-pin and whether your transmitter lead set is 3-wire, 4-wire, or 5-wire.

The proper cable selection is summarized in the following table. The 3/4-wire cables can be distinguished from the 5-wire cable by the attached label (see the table on page B-5).

The lead set type also determines which are the valid leads to be selected at the bedside. Appropriate use of each cable type is illustrated on a label attached to the cable (see the table on page C-5).

The following table shows all available analog output bedside monitoring cables.

Lead set	Bedside Monitor Cable Connector	Analog Output Bedside Monitor Cable
3- or 4-wire lead set	8-pin (large)	HP78599AI-#K71
	12-pin (small)	HP78599AI-#K72
5-wire lead set	8-pin (large)	HP78599AI-#K73
	12-pin (small)	HP78599AI-#K74

Caution

To ensure correct lead labeling at the bedside monitor, it is important that you use the correct bedside monitor cable.

Note

When using the Patient Monitor/Holter Interface (Analog Output) Option with the HP 78341/2 bedside monitors, use only 4-wire lead sets. (No display can be obtained on these monitors with the 3-wire lead sets.)

Lead Placement and Selection

To ensure valid waveforms with the correct lead label, you must remember to use the following:

- standard lead placement (shown on the telemetry transmitter case and in further detail in the section "Electrode Placement" in Chapter 2)
- valid lead selection (performed at the bedside monitor)

The following table summarizes recommended lead placement and selection.

Lead set	Lead Placement	Valid Lead Selection on Bedside Monitor
4-wire	Standard	I, II, III, aVR, aVL, aVF
3-wire	Standard	II
5-wire	Standard	II,MCL

Note

MCL is not available in the following bedside monitors: HP78351, HP78352, HP78353, HP78354.

Caution

To ensure correct lead labeling at the bedside monitor, standard lead placement and valid lead selection must be used. Not adhering to these recommendations may result in mislabeled leads or an invalid display.

Using Non-standard Lead Placement

With the 3- and 5-wire lead set, you can use non-standard lead placement, but you must still use a valid lead selection at the bedside monitor.

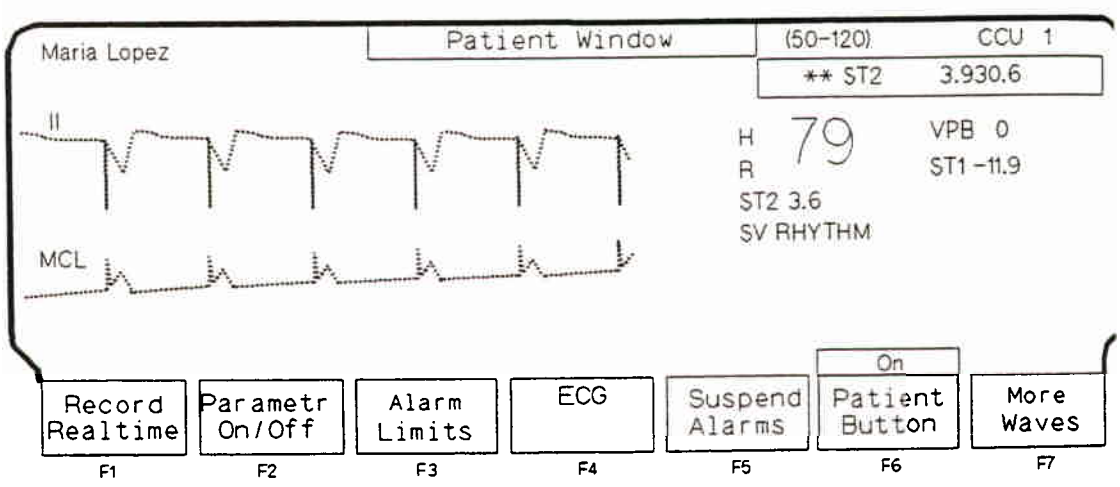
This will give you the desired waveform, but it will result in a mislabeled lead at the bedside monitor.

Controls for Telemetry Setup

To make adjustments to your patient's ECG, you will need access to either the Patient Window Task Window on the HP OmniCare Component Central Monitor or a bedside monitor.

First, go to the HP OmniCare Component Central Monitor, press (Admit/Discharge) and select a patient. If telemetry is not turned on, turn it on here. Then press (Patient Window) and make adjustments. If softkey labels for telemetry controls appear, as shown below, you make all adjustments at the central monitor. (Refer to the Telemetry chapter of the *User's Guide* for instructions in using the telemetry controls.)

If the telemetry control softkeys do not appear, you make adjustments at the bedside monitor and you will need to refer to the user's guide for your particular bedside monitor.



Functionality with Paced Waveforms

In order for paced waveforms to be processed correctly by bedside monitors using the analog outputs, the pace pulses must be artificially reconstructed and inserted into the analog output signals. The synthesized pace pulse is very narrow and may not be visible at the bedside display, depending on the type of monitor used.

Caution

To ensure proper cardiotach performance, diagnostic bandwidth (filter off) should be selected at the bedside monitor when monitoring paced patients with an M1400A/B transmitter.

For more information, see "Making Adjustments for Safe Arrhythmia Monitoring" in Chapter 5 of *HP OmniCare Component Central Monitor User's Reference Manual*.

Inoperative (INOP) Conditions

With the Patient Monitor/Holter Interface (Analog Output) Option, the following telemetry inoperative (INOP) conditions will appear as a LEADS OFF message at the **bedside monitor**.

1. LEADS OFF
2. NO SIGNAL
3. TEL CANNOT ANALYZE
4. REPLACE BATTERY
5. INTERFERENCE
6. RECEIVER MALF
7. NO RECEIVER
8. TRANSMITTER MALF
9. ECG EQUIP MALF
10. TRANSMITTER OFF
11. INVALID LEAD SET

If telemetry controls are located at the bedside monitor (see "Controls for Telemetry Setup"), these INOPS appear as a LEADS OFF message at the **Central Monitor**.

Note

See Chapter 3 in the *User's Guide* for information about the specific alerts.

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