



TeleMyo 2400R®

Transmitter/ Receiver User Manual

Icons and Symbols

The following international icons and symbols are found on the TeleMyo 2400R enclosure. Their meaning is described below.



CE Mark: This symbol indicates the approval to market this product in the European Community as certified by Notified Body #0344, KEMA.



Non Ionizing Radiation: This symbol indicates that the device generates radio frequency energy during operation.



On (for part of equipment): This symbol indicates that in this switch position the device is partially on. In the case of the TeleMyo 2400R, when the power switch is in this position only the battery charger is operational.



Attention: This icon alerts the user to important information. Carefully read and understand all sections of this document displaying this symbol.

TeleMyo 2400R Introduction

The TeleMyo 2400 is the latest generation of Noraxon telemetry products. Each transmitter can accommodate eight (8) channels of any combination of sEMG and a variety of analog signals. Multiple transmitters can be coupled together to provide additional channels. The active electrode leads use Noraxon's patented signal processing technology to provide clear, consistent, and reliable data. The TeleMyo 2400 system operates as an IEEE 802.11b wireless local area network. Communication is bi-directional using an internationally accepted direct sequence spread spectrum 2.4GHz radio channel.

The **TeleMyo 2400R Receiver option** allows the user to collect digital data and transfer regenerated analog signals into any other analog data capturing system. The TeleMyo 2400R can operate stand alone or in combination with a computer. A computer interfaces to the TeleMyo 2400R using the Receiver module's USB port. Acquired data can be streamed directly to computer memory, separately or simultaneously, with the analog data output.

TeleMyo 2400R Receiver Installation and Setup

Step #1 – UNPACK ALL ITEMS AND CHECK INVENTORY

The following items should be included with the TeleMyo 2400R **Receiver**. (see following figures)

1. TeleMyo 2400R receiver device
2. Detachable antenna
3. Detachable AC Power Cord
4. USB cable

TeleMyo 2400 Components

1. *TeleMyo 2400R Receiver*



2. *TeleMyo 2400R Receiver Antenna*



3. *AC Power Cord*



4. *USB Cable*



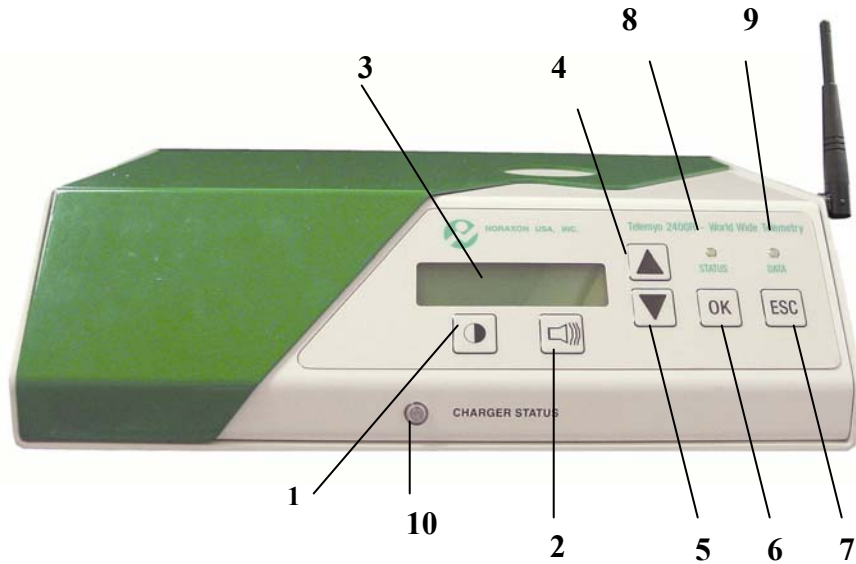
Step #2 - CONNECTING THE TELEMYO 2400R SYSTEM

1. Place the TeleMyo 2400R receiver on a level tabletop or stand adjacent to your computer and testing area.
2. The TeleMyo 2400R receiver includes a detachable power cord. Plug the mating end of the power cord into the receptacle on the rear of the instrument. Note that the opposite end of the power cord has a safety or ground terminal on its plug. It is essential to only plug the power cord into a wall outlet that has a properly grounded receptacle.
3. The TeleMyo 2400R receiver includes a detachable antenna. Plug the mating end of the antenna into the antenna receptacle located on the side of the instrument. Then tighten the nut on the antenna to ensure a good connection.
4. The unit may now be connected to any USB compatible computer system by use of the USB connector on the side of the unit.

Controls and Displays

TeleMyo 2400R Receiver

Front Panel



1. *Contrast Selection Key*
Controls the visibility of the lettering on the LCD display. Used in conjunction with the Up(4) and Down (5) Keys
2. *Audio Selection Key*
Controls the volume level of the speaker. Used in conjunction with the Up(4) and Down (5) Keys
3. *LCD Display*
The Liquid Crystal Display gives information on the settings and performance of the system. A detailed description of the selection menus that are accessible using the LCD can be found on page 9.
4. *Up Selection Key*
Controls the position of the cursor on the LCD display. Each activation of the button moves the cursor up one position. Also used to increase the speaker volume or LCD contrast.
5. *Down Selection Key*
Controls the position of the cursor on the LCD display. Each activation of the button moves the cursor down one position. Also used to decrease the speaker volume or LCD contrast.
6. *OK Control Key*
Selects the desired setting or function on the LCD menu display. In most cases, when this button is pressed, the screen returns to the main menu.
7. *ESC Control Key*
Closes the LCD submenu and returns the user to the main menu. When pressed, any altered settings will be reset to their previous or default positions.
8. *Data Indicator*
The Data LED light flashes when the Receiver is receiving or transmitting data.

9. *Status Indicator*

The Status Indicator LED light blinks at two different rates.

Slow – A network has been established between the Receiver and the Transmitter.

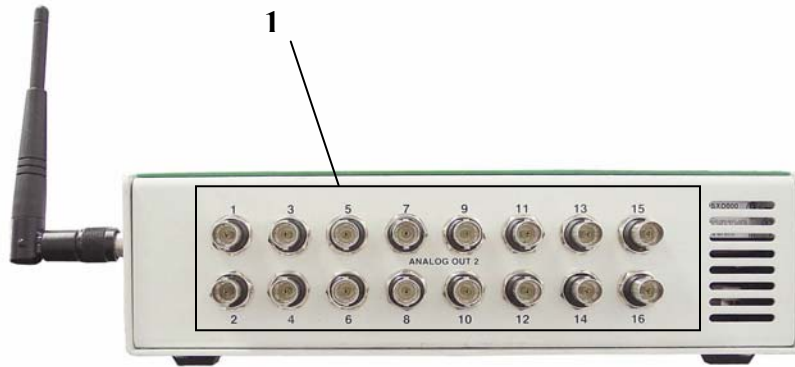
Fast – The Power for the unit is on, the initial self-test of system has passed and the Receiver is now scanning for a Transmitter.

10. *Battery Charger Status Indicator*

The battery status indicator has two different colors.

Green - The indicator flashes green as the battery charger initially tests the battery before charging. The indicator will next glow steady green as the battery begins to receive a rapid charge. When the battery is fully charged the indicator will extinguish.

Red – When operating only under battery power the indicator will glow red when the battery charge is low.

Rear Panel*1. 16 Analog Output BNC Connectors*

Analog signals from each channel can be individually acquired by connecting a standard BNC cable to any of the Analog Output BNC Connectors located on the back of the system. The output voltage, in this case, is scaled to +/- 5Volts.

Right Side Panel1. *Fuse Holder*

The fuse holder is the enclosure that holds the two fuses. Instructions on how to replace a blown fuse and the type of fuse that can be used can be found on page 21.

2. *Power ON/Recharge Switch*

Whenever the 2400 Receiver is plugged into a wall socket the unit is always in an “On” state. Moving the On/Recharge Switch to the ‘ | ‘ position puts the system in measurement mode. In this mode, it is possible to establish a communication link to the transmitter and perform recordings. When the Switch is in the opposite position the radio is off, however, the receiver battery can be charged. If the system is always plugged into a wall socket, the battery will simply stay fully charged until needed.



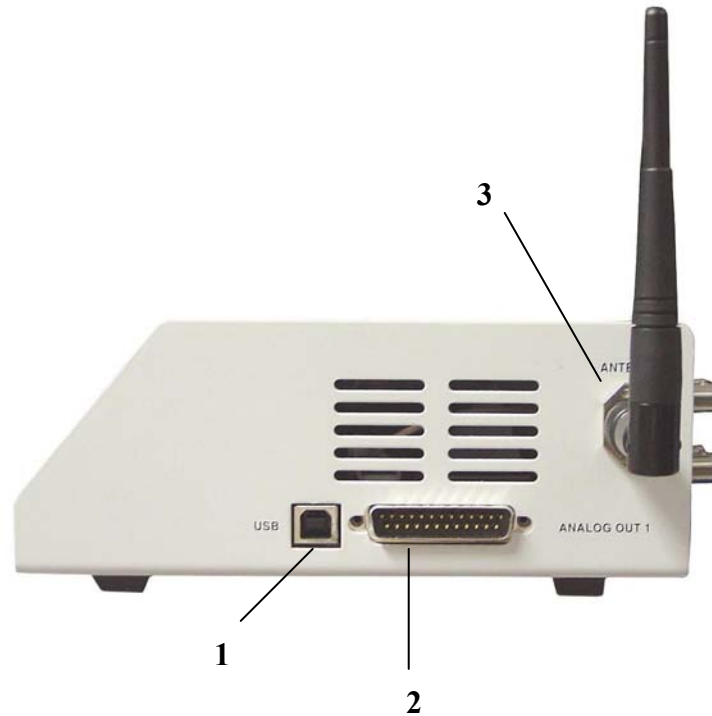
This switch will not disconnect device from AC power.

3. *Power Cord Inlet*

Slot for the AC power cable to be connected. The power cord inlet is the mains disconnect device. Read the section on AC power cables, located in the Connection/ Disconnection section of this manual, for specifications on replacement power cables.

4. *EMG Test Signal*

Connector which provides an isolated 2 millivolt 70 Hz sinusoid test signal. The test signal can be applied to any transmitter active EMG lead to verify proper lead operation.

Left Side Panel*1. USB Port*

The USB (Universal Serial Bus) port provides a connection to any standard USB cable.

2. Analog Output Connector

The Analog Output 25-Pin DSUB Connector provides a quick output to various systems.

3. Antenna Connector

The antenna connects to the Receiver via this connector. Be sure the nut on the antenna is tight in order to ensure proper connection.

TeleMyo 2400R Operating States and Sequence of Operations

The TeleMyo 2400R receiver has three operating states, setup, standby and measure. In the setup state, the data collection parameters of the receiver and transmitters can be set prior to beginning the next measurement. In the standby state, the status of the receiver-transmitter radio link and the condition of the transmitter batteries can be monitored. In the measure state, the receiver is actively processing the acquired data coming from either one or two transmitters. During this time the radio link status and transmitter battery condition information are not available. Whenever the TeleMyo 2400R leaves the measure state it automatically reenters the standby state.

The standby and measure state are described first

Establishing the Standby State Manually

In the stand alone configuration (no USB connection to a computer), the TeleMyo 2400R receiver can be placed in the standby state by means of the front panel keypad.

1. Turn the Power Switch on the Receiver to the On or ' | ' position and wait until the Receiver's display panel reads:

```

  TELEMYO II
  START<-   SETUP
  
```

2. Use either the Up or Down "Arrow" Control key to point the cursor (<-) to the "START" menu option as shown above. Next press the "OK" Control key. The TeleMyo 2400R will advance into the standby state. The following status display will appear.

```

  A: --- LINK B: ---
  --%           --%
  
```

The status display contains useful information about the 'A' and 'B' transmitters which can be interpreted as follows:

The top line indicates the state of the communication link between the receiver and each transmitter (A and/or B). In the situation shown above there is no radio link between either transmitter. Both the 'A' transmitter and the 'B' transmitter display '---' adjacent to the 'A:' and 'B:' labels meaning there is no link between the receiver and either transmitter.

Next turn on transmitter A. (If you only have one transmitter it is 'A'). Wait briefly and you should see the status display update to the following:

```

  A: 8CH LINK B: ---
  86%           --%
  
```

In the updated status display shown above, next to the 'A:' label appears the message '8CH' meaning that a link to an 8 channel transmitter has been made. On the line immediately below appears a percentage (86%). This number indicates the quality of the radio link.

This display is updated with new information every 2 seconds. You should monitor the radio link quality prior to initiating a measurement. A very low percentage (under 20%) indicates a potentially unreliable radio link.



If the label ‘A:’ or ‘B:’ begins to flash, this indicates that the battery charge for the ‘A’ or ‘B’ transmitter is low. The transmitter should be recharged before continuing.

The reported radio quality percentage will fall with increasing distance between the transmitters and receiver. Also any intervening obstacles (walls, trees, fences, etc) will reduce the signal quality. Whenever the TeleMyo 2400 system is set up in a new area, it is advisable to check the radio quality by moving the transmitter into all intended areas of use. This will serve to identify locations with reduced reception.

Establishing the Measure State

In the measure state the TeleMyo 2400R makes 8 or 16 telemetric signals available at both the BNC analog output connectors, located on the back panel of the receiver and the 25-pin DSUB connector located on the left side of the receiver.

The TeleMyo 2400R can enter the measurement state only from standby. When the standby state is successfully achieved one of the following two status displays will appear, depending on whether one (A only) or two (both A and B) transmitters are active.

**A: 8CH LINK B: ---
100% --%**

**A: 8CH LINK B: 8CH
100% 98%**



Even if a ‘B’ transmitter is active, the measure state cannot be initiated unless the ‘A’ transmitter is active.

To initiate a measurement press the ‘OK’ key on the front panel. The TeleMyo 2400R display will change to the following:

**MEASUREMENT
ACTIVE**

The TeleMyo 2400R will remain in the measure state until the ‘ESC’ key is pressed. It will then return to the standby state. To resume measurements at any time simply press the ‘OK’ key. Analog outputs are available only when the system is in the measure condition. All channels are static (non changing) in any other operating state.



If a problem develops (transmitter battery runs low, is accidentally shut off or radio reception otherwise fails) the MEASUREMENT ACTIVE message will flash. Stop the measurement and examine the status display to identify the problem.

Do not touch or move the antenna while the unit is transmitting or receiving.

Do not operate the radio or attempt to transmit data unless the antenna is connected; failure to properly connect the antenna may damage the radio.

Establishing the Setup State

The setup state can be established at any point in time by repeatedly pressing the ‘**ESC**’ key. This will sequence the TeleMyo 2400R from either the standby or measure state back to the starting menu shown below.

TELEMYO II
START<- SETUP

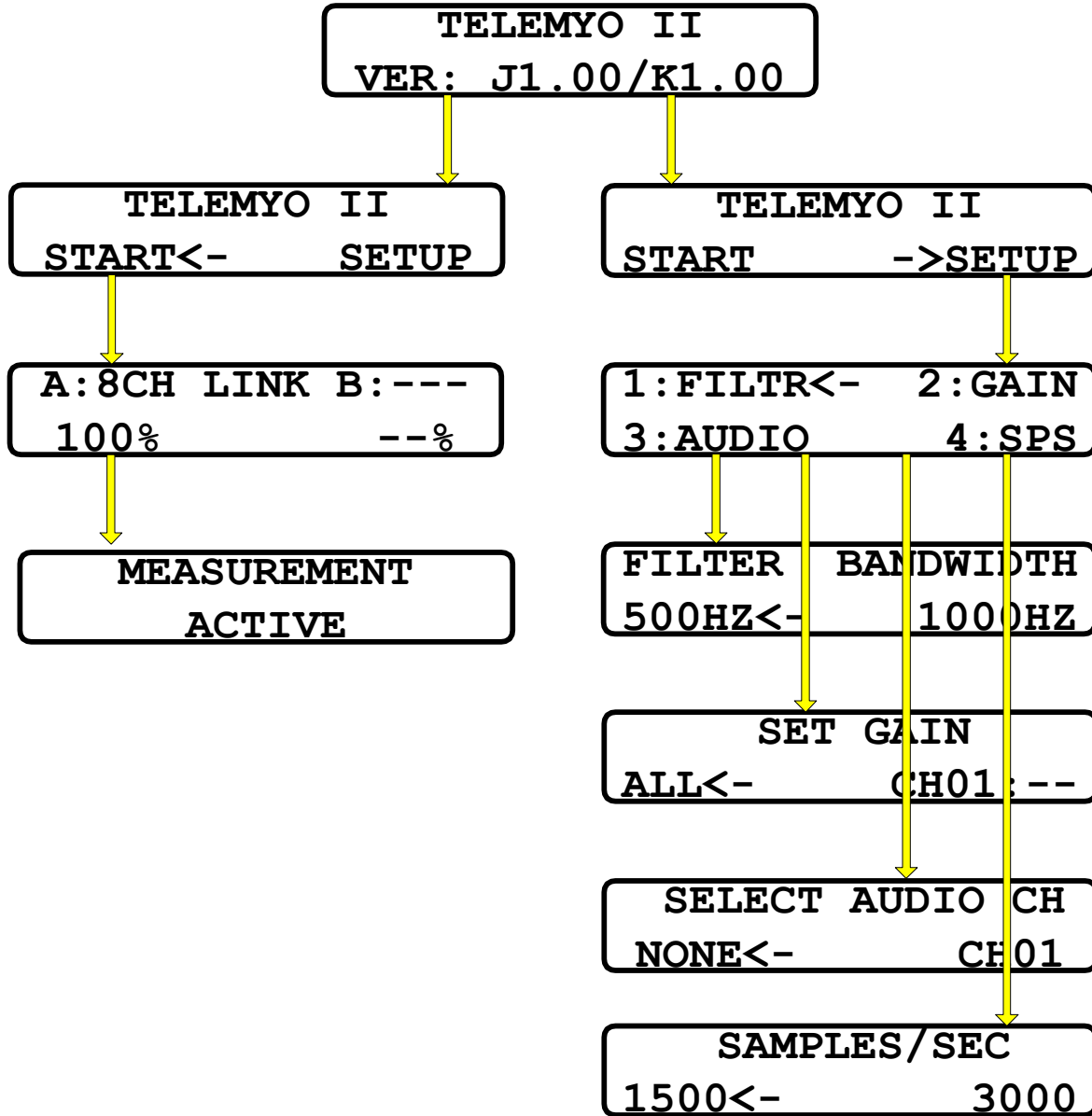
Use either the Up or Down “Arrow” Control key to point the cursor (<-) to the “**SETUP**” menu option. Next press the “**OK**” Control key. The TeleMyo 2400R will advance into the setup state. The following menu display will appear when the setup state is entered.

1 : FILTR<- 2 : GAIN
3 : AUDIO 4 : SPS

How to make changes to the four operational parameters specified in the setup submenu are described in the next section.

TeleMyo 2400R User Interface

The TeleMyo 2400 operational parameters can be manually configured using the keypad and display menus. Two choices: SETUP or START are available at all times from the main menu. Depending on the main menu item elected, (indicated by the cursor <-), either the SETUP or START submenu is made available. The SETUP submenu offers four additional choices. (The START submenu leads to the standby and measurement states). An overview of the menu sequence is shown in the following illustration.



Navigation through the TeleMyo 2400 menu system is accomplished using the front panel keypad. Control key actions are summarized as shown.



Controls Cursor Movement
(<- = Cursor)



Selects Indicated Item



Cancels or Exits Selection

1. Filter Menu

The filter menu allows the user to optimize the TeleMyo 2400 for use with either Surface EMG (sEMG) or Fine Wire EMG. This is accomplished by changing the Bandwidth Filter, which keeps the system's overall electrical noise to a minimum. The bandwidth of the EMG channels can be adjusted for either sEMG signals (500Hz upper limit) or for Fine Wire EMG (1000Hz upper limit). This is accomplished by selecting choice number one from the main setup submenu. When selected, the following will be visible in the display window.

FILTER BANDWIDTH
500HZ<- 1000HZ



Press the "Up" or "Down" control button to place the cursor at the desired frequency setting.



Press the "OK" control button to select the frequency (and return to the SETUP submenu).



Press the "ESC" control button to return to the SETUP submenu without changing the setting.



The filter bandwidth setting affects all EMG channels as a group. It is not possible to individually set the bandwidth for each channel.

Any change made remains in effect until the system is turned off, at which point the choice returns to the 500Hz setting on power up.

When entering this choice, the cursor (<-) points to the currently active setting.

In order to activate the 1000 Hz filter bandwidth, the sample rate must first be set to 3000 Hz (see page 14).

2. Gain

Different gain (amplification) settings are sometimes desirable to accommodate either very small or very large signals. The gain of any input signal channel of the TeleMyo 2400 can be adjusted in multiples of the baseline gain. Selectable multiples are x1, x2, x4, and x10. For EMG channels (1-16), the baseline gain level is 500 (54dB). Gain adjustment is accomplished by selecting choice two from the SETUP submenu and results in the following display.

```

  SET GAIN
ALL<-  CH01 : --
  
```



Press the “Up” or “Down” control button to place the cursor at the desired channel.



Press the “OK” control button until the desired gain multiplier appears at the selected channel.



Press the “ESC” control button to return to the SETUP menu.



The ALL selection permits convenient gain adjustment of every channel at once.

Any change made remains in effect until reprogrammed either through the keypad or from the PC. The system defaults to the x1 gain setting when first powered up.

When advancing the cursor through the channels, the current gain multiplier for that channel is displayed.

The gain selection multipliers are Off or (--), x1, x2, x4 and x10. The (--) setting means that the channel is not in use.

The standard (x1) gain for all EMG channels (CH01 – CH16) is 500.

3. Audio

The EMG signal occurring on any channel can be directed to the output of a speaker. In some instances subtle frequency changes in the EMG signal can be more readily assessed audibly rather than visually. Audio channel control is accomplished by selecting choice three from the SETUP submenu and results in the following display.

SELECT AUDIO CH
NONE<- **CH01**



Press the “Up” or “Down” control button to place the cursor at the desired channel.



Press the “OK” control button to activate audio for selected channel.



Press the “ESC” control button to return to the SETUP submenu.



Press this button along with the up arrow key to increase the volume. (Press this button with the down arrow key to decrease the volume.)



Any change made remains in effect until reprogrammed either through the keypad or from the PC. The system defaults to a selection of NONE when powered up.

When entering the choice, the cursor points to the currently active audio channel.

Select choice “NONE” to disable the audio.

4. Sample Rate (SPS)

The TeleMyo 2400R allows for changes in the sampling rate or frequency. The available sampling rates are 1500Hz or 3000Hz (Samples per Second). The selected sampling rate affects all EMG channels. From the Setup submenu select the fourth option: SPS. The following choices will appear in the display panel.



Press the “Up” or “Down” control button to place the cursor at the desired sample rate.



Press the “OK” control button to select the desired sample rate and return to the SETUP menu.



Press the “ESC” control button to return to the SETUP menu and restore default setting.



Any change made remains in effect until reprogrammed either through the keypad or from the PC. The system defaults to the 1500 Hz sample rate on power up.

When entering the choice, the cursor points to the currently active sample rate.

The 3000 Hz sample rate must be selected first in order to activate the 1000 Hz bandwidth cutoff filter selection. (see page 11)

Radio Considerations

The TeleMyo 2400 radio system operates in the 2400 MHz ISM (Industrial, Scientific and Medical) radio band reserved for use in most countries of the world. The radio transfers data digitally using the IEEE802.11b standard (commonly referred to as WiFi). This is the same protocol used by many wireless computer network systems. Other devices operating in this frequency band include computer networks, microwave ovens, cordless phone sets and Bluetooth enabled devices.

Despite all this competing radio activity the TeleMyo 2400 system is able to discern its particular information from all the surrounding radio traffic. Reliable transmission depends on good signal quality. Signal quality will fall with extended distances between the transmitter and the TeleMyo 2400R receiver. Obstructions (walls, metal structures, trees, etc.) between the transmitter and receiver will also lower the signal quality.

As the signal quality decreases the radio transmission is automatically modified to ensure reliable data flow. This can mean either slowing down the rate of data delivery or else re-transmitting any data that was improperly received.

While the TeleMyo 2400 is quite immune to interference, it does transmit a deliberate radio signal that could effect nearby sensitive equipment. Users should always be aware of this possibility. In a similar manner, although the energy level of the radio is considered harmless to human beings it is still prudent to minimize exposure.

Finally, although available worldwide, each country places certain restrictions on the operation of radios in the 2400 MHz ISM band. These restrictions include allowable transmitter power levels and broadcast frequencies.



Never operate the TeleMyo 2400 receiver within 1 meter of any critical medical device.

Do not operate the receiver unless the antenna is connected. If the antenna is not connected, the radio may be damaged.

Do not change or modify the receiver antenna. This can increase the output power level beyond what a certain country may allow.

Never change the radio channel setting without first contacting Noraxon. Operation on unapproved radio frequencies is not allowed.

Charging the battery

The AC power cord enables the TeleMyo 2400R to continuously charge the receiver's internal battery.

To connect power to the TeleMyo 2400R receiver:

1. Turn the power switch on the receiver to the 'Charge' position.
2. Plug the AC power cord into the power cord inlet located on the side of the receiver.
3. Using the male plug of the power cord, connect the cable to a live wall outlet.

Before the battery can be used, it must first be charged. Leave the receiver plugged in for at least six hours for the battery to completely charge. When fully charged, the battery will run for approximately 3 hours before needing to be recharged. The 2400R may be used while the battery is being charged, via the AC power cord. If the AC power cord is left in for periods longer than six hours, the system will continue to "trickle" charge the batteries so that the batteries will continuously charge as needed.



It is safe to leave the 2400R unit plugged into the wall outlet at all times.

The battery charger is matched to the internal 6 volt battery. Use only a Noraxon supplied battery for a replacement.

The opposite end of the power cord has a safety or ground terminal on its plug. It is essential to only plug the power cord into a wall outlet that has a properly grounded receptacle at all times to ensure safe operation and full compliance with the relevant standards. When the integrity of the external protective conductor in the installation or its arrangement is in doubt, the receiver must be operated from its internal battery.

TeleMyo 2400 Cable and Accessory Connection/Disconnection

1. AC Power Cable

The AC Power Cable is used to recharge the battery in the TeleMyo 2400R receiver. It is very important to follow the instructions as they are written in the “Charging the Battery” section of this manual in order to ensure personal safety.

2. DB-25 Analog Output Connector and Cable

This connector is available for general use with shielded cables supplied by Noraxon or other manufacturers. Use of a shielded cable is required to preserve electromagnetic compatibility. All outputs vary between +/- 5 volts. The DB-25 connector pin assignments are as follows:

<i>pin</i>	<i>upper row signals</i>	<i>pin</i>	<i>lower row signals</i>
1	EMG lead 9	14	EMG lead 6
2	EMG lead 13	15	EMG lead 3
3	EMG lead 10	16	EMG lead 7
4	EMG lead 14	17	EMG lead 4
5	EMG lead 11	18	EMG lead 8
6	EMG lead 15	19	signal common
7	EMG lead 12	20	signal common
8	EMG lead 16	21	signal common
9	signal common	22	n/c
10	signal common	23	n/c
11	EMG lead 1	24	n/c
12	EMG lead 5	25	n/c
13	EMG lead 2	shell	TeleMyo 2400R enclosure



This connector comes supplied with a protective cover. Leave this cover in place if the connector is not used.

To avoid a potential electric shock, neither the user nor the patient should ever touch the exposed connector. Also, the user should never touch the receiver and patient simultaneously.

4. BNC Analog Output Connectors and Cables

The 16 numbered BNC connectors provide individual access to any one of the 16 analog outputs. All outputs vary between +/- 5 volts and are identical to the same signals on the DB-25 connector.



All cables that are attached to the TeleMyo 2400 system are only intended for connection to equipment that comply with IEC 60601-1 and Noraxon guidelines.

5. USB Cable

The TeleMyo 2400R requires a USB cable for attachment to its side panel USB connector. The USB cable may be freely connected or disconnected at any time without damage to the instrument or PC. However, software problems can arise if the USB cable is disconnected while active communication is taking place between the TeleMyo 2400R and the computer.



Beware that loss of all data acquired in a recording is possible if the USB cable is inadvertently disconnected before an active data recording is completed.

Do not use both the keypad and the PC to change the settings on the TeleMyo 2400R. This system has been designed to accept the data coming from the first source entered when it is turned on. Entering settings from two sources will “unsynchronize” the TeleMyo 2400R. Either use the keypad or the PC to change the settings, but not both at the same time. Always reboot (cycle the power off/on) the TeleMyo 2400R when switching from USB to Manual or vice versa.

Maintenance

Except for occasional battery replacement the TeleMyo 2400R is designed to be maintenance free. With normal use the receiver battery will operate properly through at least 300 charge/discharge cycles. The receiver battery is not user serviceable. Only qualified technical personnel may perform this maintenance. A plug-in replacement battery is available from Noraxon. Detailed instructions are provided with the replacement battery. Alternately the receiver can be sent to Noraxon for servicing.



Only use a replacement battery available from Noraxon. Use of an unauthorized battery may create a safety hazard.

Replacement of battery must be performed by qualified technical personnel only.

Care should be exercised not to place or stack objects (especially liquids) on top of the TeleMyo 2400R case.

Fuse Replacement

The TeleMyo 2400R has two replaceable fuses located in the appliance inlet. To replace these fuses follow the instructions below.

1. Turn off and unplug the power cord from the wall
2. Pry open the fuse compartment door by inserting a standard screwdriver into the slot at the top of the appliance inlet.
3. Note the orientation of the fuse holder and position of the fuses in the holder.
4. Replace the spent fuses with 5x20mm, 1 Amp, 250Volt fuses
5. Insert the fuse holder into the appliance inlet and close the access door



Repeated fuse failure indicates an electrical fault. The unit should be returned to Noraxon for diagnosis.

Cleaning

The instrument case and cables can be wiped down with a damp cloth using a mild soap or detergent and water. Isopropyl alcohol can be safely used to remove tape or other adhesive residues from the cables. Before cleaning any portion of the system, the instrument should be unplugged from the wall power outlet.

Specifications

Power Requirements:

- Receiver – 6 V rechargeable lead acid battery
- Battery charger that operate on 100-240 VAC 50-60 Hz

Battery Life:

- Receiver – 3 hours (can be used continuously when plugged into an outlet)

Output Power & Transmission Frequency (depending on country):

- Up to 100 mW (depending on antenna and country allowance)
- DSSS 2412-2462 MHz on (up to) 11 unique radio channels

Transmission Range:

- Up to 300 feet (100 meters) in open view
- Antenna options maximize range in specific environments

Dimensions:

- Receiver: 7 ½" L x 10 ½" W x 2 ½" H; 7 lb.

Hardware Filters:

- No notch (50/60 Hz) filters are used
- All sEMG channels have 1st order high pass filters set to 10 Hz +/- 10% cutoff
- All channels have 8th order Butterworth/Bessels low pass anti-alias filters set to either 500 Hz or 1000 Hz +/- 2 % cutoff

EMG Channels:

- Baseline noise < 1 uV rms
- Input Impedance > 100 MegOhm
- CMR > 100 dB
- Range +/- 3.5 mV
- Base gain 500

Analog Outputs (Receiver version only):

- 16 BNC connectors and DB25 connector
- All outputs +/- 5 V max

USB Port (Receiver version only):

- Standard B type connector

Transmitter Data Acquisition System:

- 12 bit resolution
- Input range +/- 5 V (full scale)
- Noise < 2 LSB
- 8 channels per transmitter
- All channels have individual gain settings
- sEMG channel hardware gains (500) x1, x2, x4, x10
- non sEMG hardware gains x1, x2, x4, x10
- Sample rates 1500 or 3000 samples/second/channel

Technical Description

General

The TeleMyo 2400R is an electromyography (EMG) instrument available as a 4,8,12, or 16 channel system. This device has been manufactured specifically for sEMG applications and is not intended for use with evoked response equipment. Its design complies with international standard IEC 60601-1, *The International Standard for Medical Electrical Equipment* and IEC60601-2-40, *Particular requirements for the safety of electromyographs and evoked response equipment*. This device also complies with part 15 of the Federal Communication Commission (FCC) Declaration of Conformity Statement. As a result, operation is subject to the following two conditions:

1. The device may not cause harmful interference.
2. The device must accept any interference received, including interference that may cause undesired operation.

Equipment Installation and Restricted Use

The instrument can be charged from all conventional alternating current power sources (i.e. 100-240 VAC 50/60Hz) without modification. A power cord matched to the local service configuration is needed and is included with the unit. The power cord requires an IEC320 style connector for the instrument end. The opposite end of the power cord must terminate with a grounded AC plug. Electrically the TeleMyo 2400R is a Class I and internally powered device. The instrument is not protected against the ingress of water and carries no IPX rating (i.e. ordinary equipment).

Restricted Usage

The TeleMyo 2400R is not intended for use in the following situations:

1. In the presence of flammable anesthetizing agents or substances.
2. In the presence of strong magnetic fields such as those produced by MRI (Magnetic Resonance Imaging) equipment.
3. In the presence of heavy electrical machinery such as near large motors, elevators, compressors, and the like.
4. Within one-meter proximity of critical medical devices.
5. When the antenna is very close or touching any exposed parts of the body, especially the face or eyes, while transmitting.

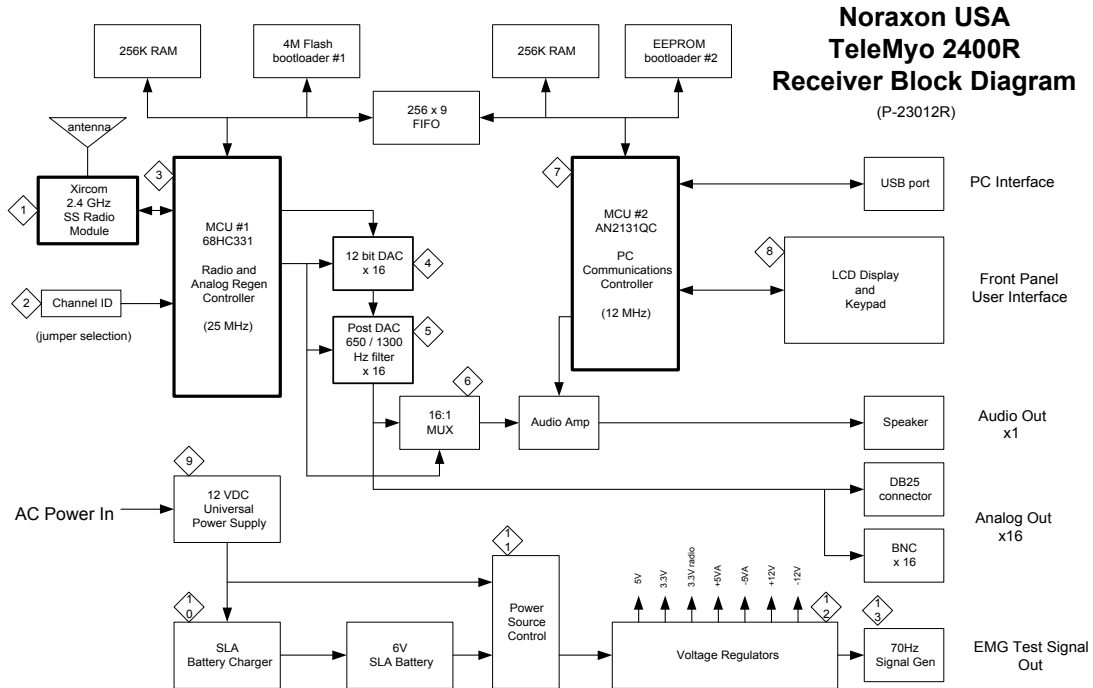
Fuses and Fuse Replacement

The TeleMyo 2400R has two externally accessible fuses. If needed, replace with 1A 250VAC fast-acting fuses. The fuse holder is accessed by opening a small door on the power inlet module. (Be sure to unplug the power cord first!) Opening the door can be accomplished by inserting a standard screwdriver into the small slot at the top of the power inlet module just above the red rectangle. Using the screwdriver, gently pry open the door to expose the red fuse holder. Slide out the fuse holder, remove the spent fuse, and replace as needed.

The fuse holder is designed to accept both English and metric style fuses. Note the position of the old fuse upon its removal and ensure that the replacement fuse is installed in the same position.

Diagrams

A block diagram of the TeleMyo 2400R receiver and associated block descriptions are provided in the following pages.



TeleMyo 2400R Receiver Block Diagram Descriptions

1. Self contained direct sequence spread spectrum radio module operating in the 2.4 GHz band. The module is programmed to respond only to transmissions corresponding to its **Channel id**. Data packets are sent/received using 'wireless network' protocols (802.11b).
2. In general a radio system consists of a receiver and one or more transmitters. The jumper selectable **Channel id** (0x0 to 0xb or 11 combinations) is used to define a matching 'channel identification' for each transmitter-receiver set. Thus up to 11 wireless networks (TeleMyo) can co-exist in the same vicinity without interference. Each network consists of paired transmitter and receiver radios operating on 1 of the 11 possible approved radio channels between 2.412 and 2.462 GHz.
3. Microcontroller used to coordinate radio data packet reception, storage of sampled data into buffer memory, analog signal regeneration and transfer of radio packet data to the communications controller for USB transmission. Radio data packets are received every 10 milliseconds/transmitter. Each packet consists of 8 channels of sampled data acquired over the proceeding 10 millisecond interval. Packets flow continuously at 100 packets/sec from each transmitter.
4. Sixteen channels of 12 bit digital to analog converter (DAC). Regeneration frequencies of 1500 or 3000 sample/second/channel match the incoming sample data stream coming from the transmitters.
5. Tenth order switched capacitor filters clocked at 64x the bandpass frequency (i.e. 42KHz or 83 KHz). Thus cutoffs of 650Hz and 1300Hz are selectable under program control. These filters are required to smooth out the DAC staircase signal that step changes at 1500 or 3000 transitions/second/channel. The reconstruction filters are set to 650Hz and 1300Hz so as not to interfere with the cutoffs of the 500Hz and 1000Hz anti-alias filters operating in the TeleMyo 2400 transmitters.

6. Analog signal multiplexer to select 1 out of 16 regenerated analog signals. This selected signal is sent to an audio amplifier and speaker to provide an audio rendition of the selected signal. Used for troubleshooting or to discern the frequency content of a signal spectrum audibly.
7. Microcontroller used to stream acquired data over the USB port as well as configure the TeleMyo system for operation using the front panel controls.
8. LCD is a 2x16 character display used to indicate device status and menu selections. Keypad allows access to menu items and selection of operating parameters (sample rates, cutoff frequencies, channel gains, etc.)
9. Medical grade universal (100-240 VAC 50-60Hz) power supply provides 12VDC. Power supply is used to continuously charge the internal 6V battery and operate the device when line power is available.
10. Sealed lead acid (SLA) battery charger provides preconditioning charge, fast charge and maintenance (trickle) charge to the internal 6V battery.
11. Circuitry to select either 12VDC power from power supply (when active) or from 6V SLA battery when unplugged from the wall. Delivers power to downstream voltage regulators.
12. Voltage regulators derived from the DC power source and used to power the various digital and analog portions of the overall circuitry.
13. A simple 1 mVpp 70 Hz sinusoidal signal source available for testing the input channels (active EMG leads) of the TeleMyo 2400 transmitters.

Schematics and Parts List

Noraxon will make available (on request) circuit diagrams, components parts lists, and calibration instructions to assist qualified technical personnel in the service and maintenance of the TeleMyo 2400R. Please contact Noraxon World Headquarters USA at:

Noraxon USA, Inc.
13430 N. Scottsdale Road Suite 104
Scottsdale, AZ 85254

Toll Free: (800) 364-8985 (US/Canada Only)
Phone: (480) 443-3413
Fax: (480) 443-4327

Send all technical support questions to: support@noraxon.com.

European users should contact the following European Authorized Representative:

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Contact: Ingrid Konrad
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Transport and Storage

The TeleMyo 2400R is capable of transport and storage in environmental conditions within the following ranges:

Ambient Temperature: -40 degrees C to +70 degrees C
Relative Humidity: 10% to 100%
Atmospheric Pressure: 500hPa to 1060hPa

Disposal

The TeleMyo 2400 batteries and printed circuit boards contain hazardous materials. Follow your local governing ordinances for the disposal or recycling of equipment and electrodes.