



TeleMyo DTS<sup>®</sup>

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## User Manual V1.2

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## Distinguishing Features

The TeleMyo DTS system is an evolutionary telemetric multi-channel cable free surface electromyographic (sEMG) system with these major features:

- Low power sEMG sensors (transmitters) that operate without cable attachments to a hub device or central instrument.
- Enhanced freedom of movement through elimination of cable restrictions and entanglement hazards.
- Inter-operability with auxiliary sensors to synchronize sEMG with real time kinematic data.
- Flexibility via options to expand the number of data channels and/or wireless transmission range.
- Designed for integration with multipurpose data acquisition systems.

## Usage

The TeleMyo DTS system is intended for use in assessing muscle function by means of measuring muscle bio-potential signals. Conventional sEMG systems use cable connections to each muscle site thereby restricting natural movement due to numerous tethers. The small size and low weight of the DTS EMG sensors allow for movements to be performed in complete freedom. This enhanced freedom of motion is useful in clinical and scientific applications and is particularly well suited for pathologic gait analysis, stroke rehabilitation or muscular performance in dynamic sports.

The low invasive nature and high safety of the TeleMyo DTS system allow use on patients or subjects who tolerate the adhesive electrode and conductive gel typically used for sEMG detection. Except for consideration of patients, subjects or operators who have implanted pacemakers, the TeleMyo DTS system can be used free of risk.

The TeleMyo DTS system when coupled with analysis software such as Noraxon's MyoResearch XP allows sEMG measurements to be converted into usable reports of muscle function. The combined TeleMyo DTS instrumentation and software are offered for use by clinicians (Physical Therapists) or researchers in movement science. Repeated measurements for a particular patient condition or movement study can be designed by the more advanced operator and saved as a protocol. Through the use of protocols, the actual sEMG measurements and report generation is automated and can be accomplished by individuals of lesser knowledge.

Application areas for the TeleMyo DTS system include physical therapy, prosthesis assessment, post operative surgical outcome assessment, ergonomic studies and sports performance. Patients and subjects consist of stroke victims, cerebral palsy children (especially gait), surgical patients (post operative), workers (workplace ergonomics) and athletes (sports performance).

## Summary of Use

To use the TeleMyo DTS system, two pre-gelled disposable electrodes for each channel are applied to each muscle site of interest. A DTS EMG module is attached to the pair of surface electrodes using snap connectors. If required by the exam, ancillary kinematic sensors can be applied.

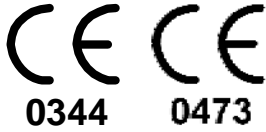
A menu driven user interface on the TeleMyo DTS receiver permits the channel makeup (number and type of sensors) to be specified prior to initiating a measurement. The system retains these settings allowing the same measurement configuration to be used repeatedly until changed.

The TeleMyo DTS system can be used by physicians, physical therapists and trained technicians.

For detailed instructions please carefully read the contents of this manual.

## Icons and Symbols

The following international icons and symbols are found on the TeleMyo DTS enclosures. 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 or #0473 AMTAC.



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



**Charging Voltage:** This symbol indicates that the charging circuit requires a 5V DC voltage supply.



**USB Symbol:** This symbol indicates the location of the USB port.



**Type B Applied Part:** This symbol indicates that the sensor is a Type B applied part.

The following international icons and symbols are found in this document. Their meaning is described below.



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

## Introduction

The TeleMyo™ Direct Transmission System (DTS) for EMG and other biomechanical sensors directly transmits data from the electrode or sensor site to a belt worn receiver. This direct transmission concept greatly simplifies the arrangement of EMG measurements by eliminating the need to arrange cable connections between the EMG electrodes and EMG amplifier. The small light weight probes are also beneficial for small subjects like children and small animals. The Belt Receiver can operate in 3 modes:

- Direct connection to any PC via USB connection (transmission range 10m)
- Wireless retransmission of signals in real time to any Noraxon USB receiver (transmission range up to 100m)
- Data logging to a Compact Flash Memory card

This unique concept gives you flexibility to operate the DTS system without limitations. The compatibility to Noraxon's USB receiver systems, operated via WiFi based retransmission of data, allows you to integrate up to 8 additional stationary analog input signals (isokinetics, force plates, etc.) and optional analog output of all signals (to e.g. connect signals to 3D kinematic systems). The DTS system can operate any configuration between 4 and 32 channels (2 Systems). The default system is equipped with EMG preamplifiers but can be upgraded with other biomechanical sensors like goniometers, Inclometers, foot switches, and accelerometers. A wireless synchronization system can be used to accurately synchronize the TeleMyo DTS System to other biomechanical devices.



The TeleMyo DTS produces results that are informative, not diagnostic. Results must be interpreted by qualified persons.



Connection of a PATIENT to High Frequency surgical equipment and to an ELECTROMYOGRAPH or EVOKED RESPONSE EQUIPMENT simultaneously may result in burns at the site of the ELECTRICAL STIMULATOR or BIOPOTENTIAL INPUT PART electrodes and possible damage to the ELECTRICAL STIMULATOR or biological amplifiers.



Avoid accidental contact between connected but unapplied DTS Snaps and other conductive parts including those connected to protective earth.

## Radiation Exposure Information Regarding Use of DTS Sensors

Each DTS sensor contains a radio frequency transmitter. The radiated power emitted from each individual DTS sensor is very low. To put this in perspective, at full power each DTS sensor transmits at less than 0.1% of the power of a typical active cell phone. Radiation exposure from a single DTS sensor is thus extremely low.

The DTS sensors are designed to operate at two different power levels in order to keep the already very low levels of radiation exposure to an absolute minimum. The DTS sensors activate their higher power level only during periods of actual data collection. During idle times (at setup and in between actual measurements) the DTS sensors reduce their radiated power to an even lower level (less than 0.01% of the power of a typical active cell phone).

The effects of non ionizing radiation on biological tissue are still being studied and published 'safe levels' of exposure are subject to review. Today cell phone usage is widespread and declared 'safe' although the long term cumulative effect of cell phone usage has yet to be determined. In contrast, the DTS sensors operate at power levels 1000 to 10,000 lower than typical cell phones while limiting exposure to a single episode over a brief time interval.

Because there can be multiple DTS sensors applied in intimate contact with the body, their sum total collective radiation effect may be questioned. Based on comparative power levels a full complement of 16 DTS sensors emit a combined (distributed) radiation level still several orders of magnitude lower than that of a typical cell phone, which radiates all of its energy from one focal point (next to the person's head).

At present Noraxon identifies no restrictions on use and placement of the DTS sensors on any portion of the human body. The DTS sensors operate at radio frequencies known to effect older style pacemakers. Because the effects are not known at this time Noraxon advises against using the DTS system on anyone with an implanted pacemaker.

In summary it is prudent to keep in mind that due to biological diversity certain individuals may have higher sensitivity to radiated emissions. Although it has never been known to occur, the use of the DTS system should be stopped if the person being monitored reports any unusual sensations.



**The TeleMyo DTS is not intended for use with a patient who has a pacemaker.**

## Technical Specifications

### ***TeleMyo DTS Specifications***

#### ***Power Requirements***

- Replaceable Li-ion rechargeable battery, operation time more than 8 hours after fully charged

#### ***Belt Receiver Output & Transmission Frequency (Depending on country)***

- Up to 100 mW (depending on antenna and country allowance)
- WiFi DSSS 2412-2464 MHz on (up to) 11 selectable radio channels
- Belt Receiver Re-Transmission range: up to 100 meters in line-of-sight recordings

#### ***DTS Probe Output & Transmission Frequency***

- Transmission range: 10m
- Output power: 4mW
- DSSS 2400-2472 MHz on 5 selectable radio channels

#### ***EMG Sensor Data Acquisition System***

- 16-bit resolution
- Sample rates 1,500 (for 16-channels) or 3,000 samples/second/channel (for 8 Channels)
- Selectable low pass filter 500, 1000, 1500 Hz

#### ***EMG Sensor PreAmps***

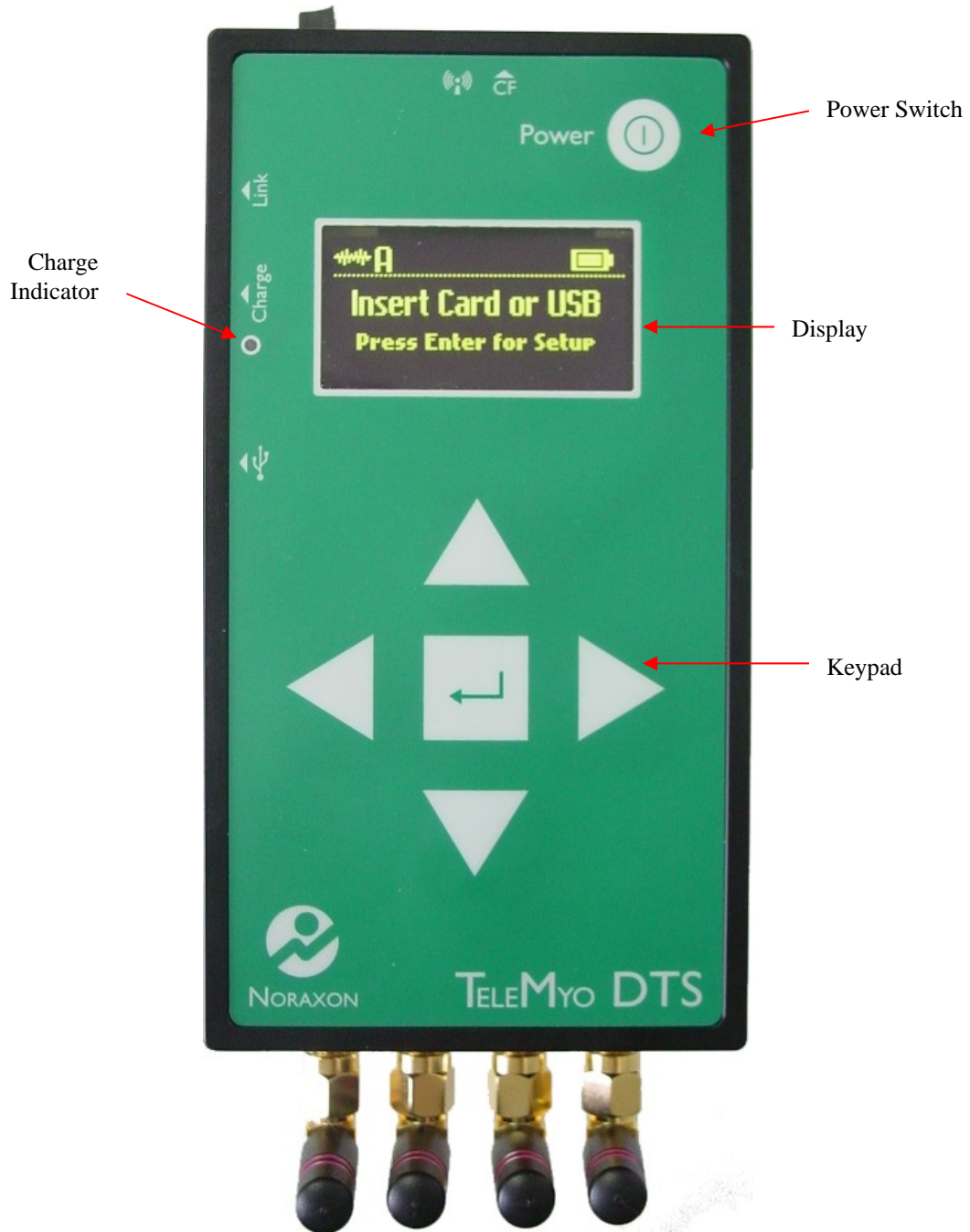
- No notch (50/60 Hz) filters are used
- 1st order high-pass filters set to 10 Hz +/-10% cutoff
- Baseline noise < 1 uV RMS
- Input impedance > 100 Mohm
- CMR > 100 dB
- Input range +/- 3.5 mV
- Base gain 400
- Snap-style or Pinch-style terminal electrode connections
- Rechargeable Lithium Polymer battery

#### ***Dimensions***

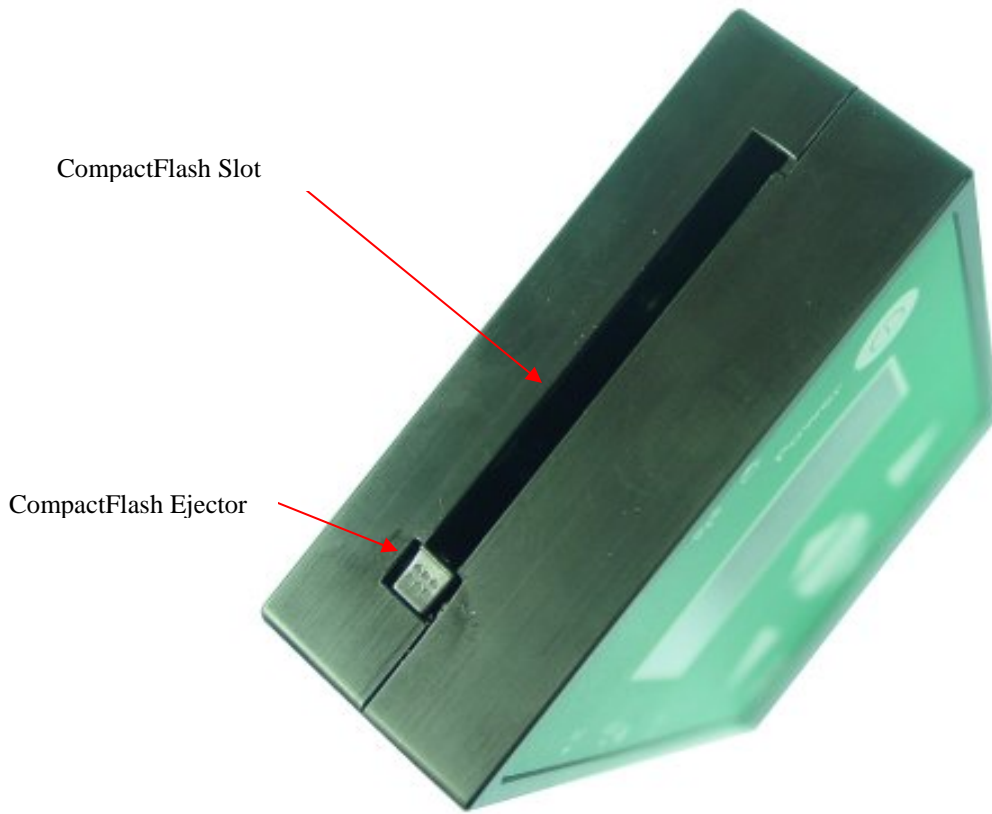
- EMG Probes Dimensions: 1.34" L x 0.95" W x 0.55" H (3.4 cm x 2.4 cm x 1.4 cm)
- EMG Probes: Weight: Less than 14 g.
- DTS Belt Receiver Dimensions: 12.6 cm L x 6.75 cm W x 2.38 cm H
- DTS Belt Receiver Weight: Less than 185 g.

**Product Photos**

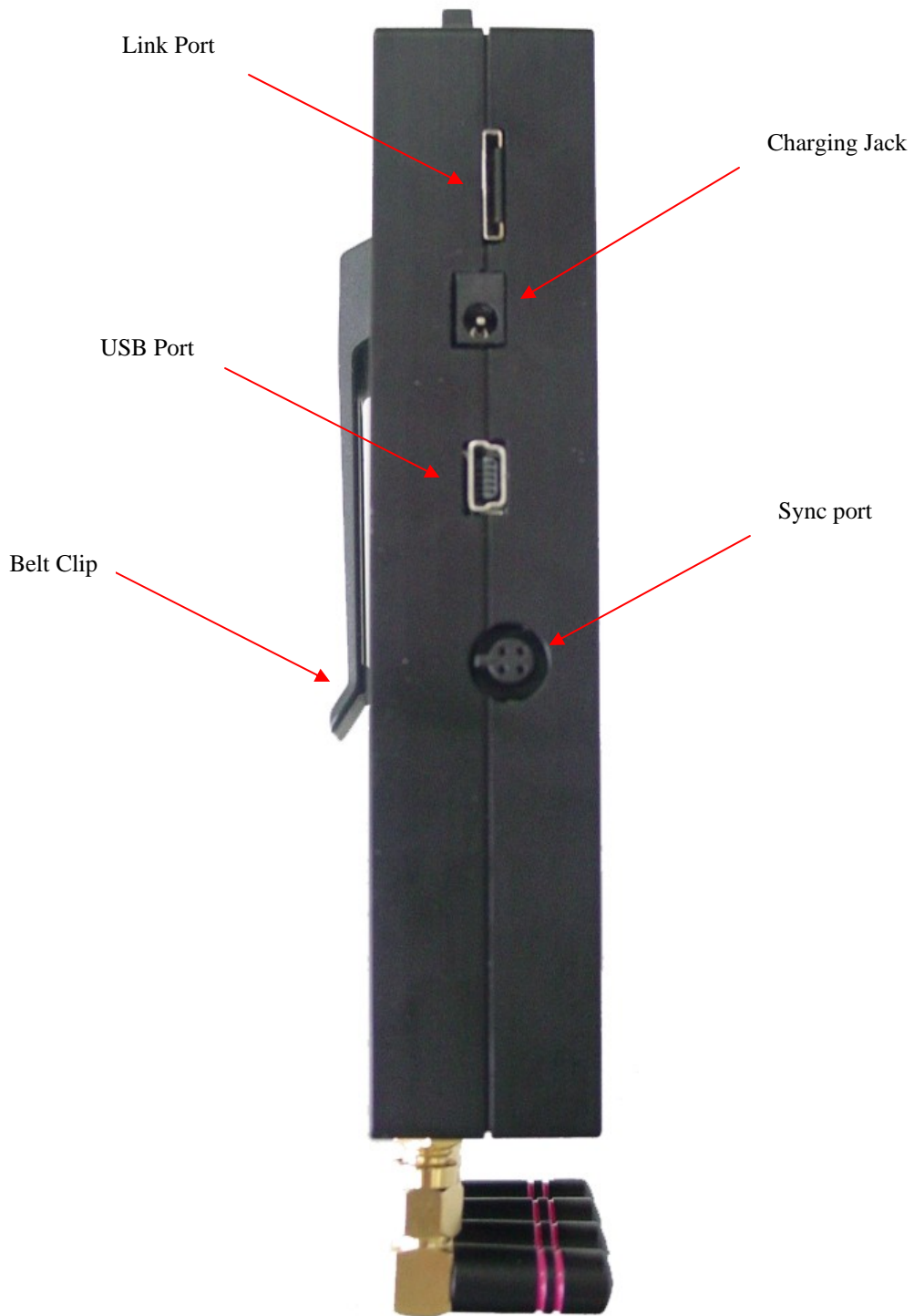
**Belt Receiver Front**



## Belt Receiver Top

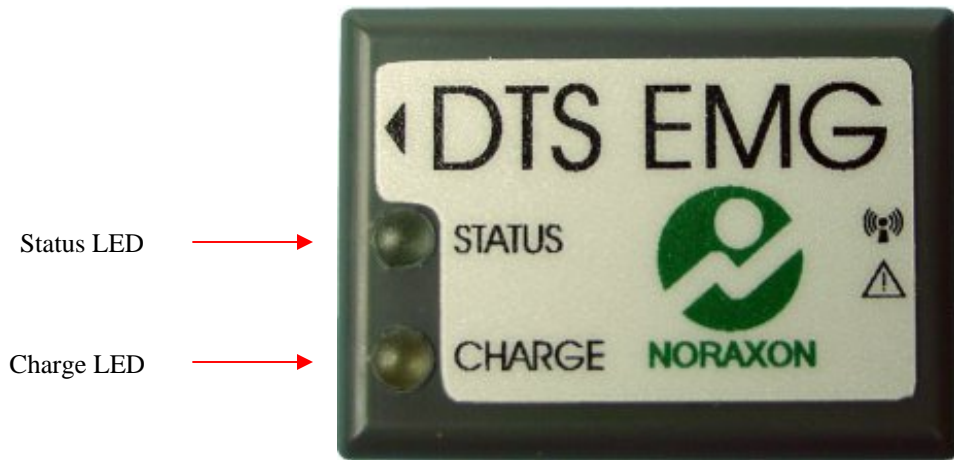


## Belt Receiver Side

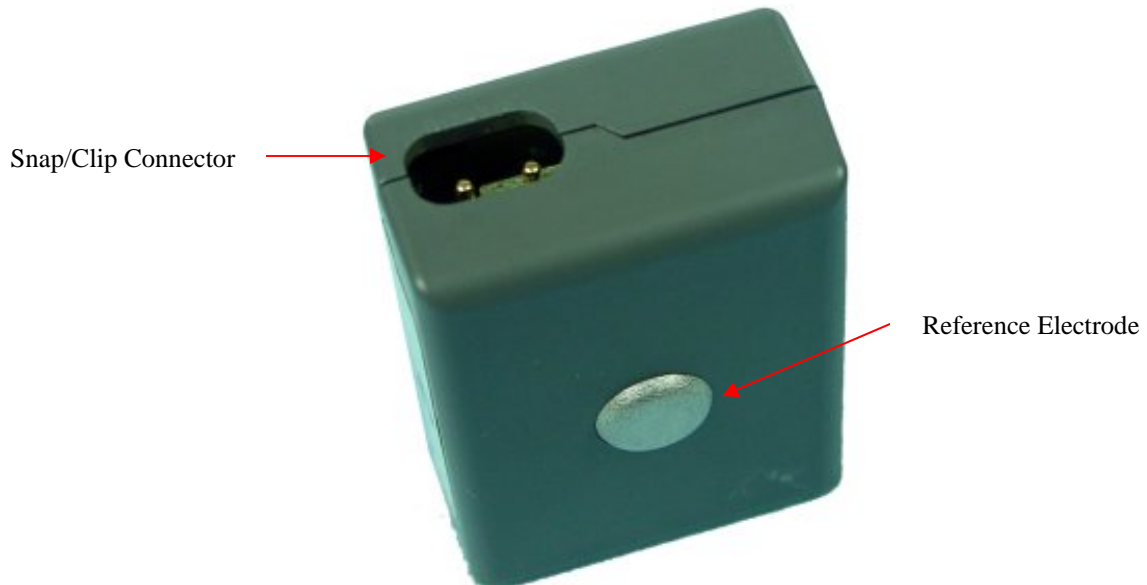


Only connect Noraxon approved devices to the Link Port, Sync Port and Charging Jack.

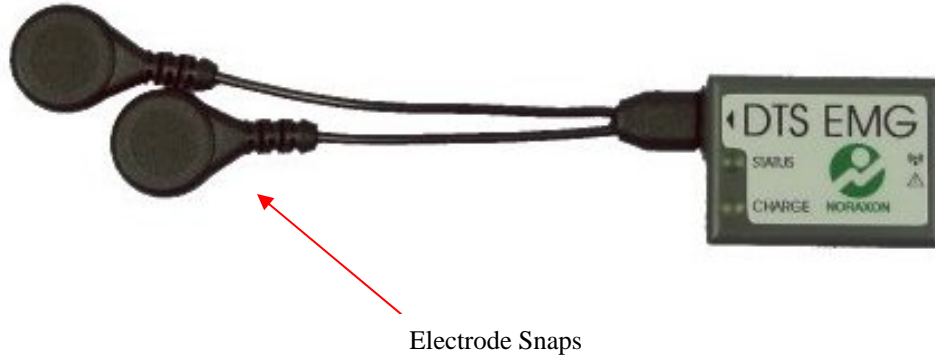
### EMG Sensor Top



### EMG Sensor Side



### EMG Sensor with Snaps



### EMG Sensor Charger



## Installation and Setup

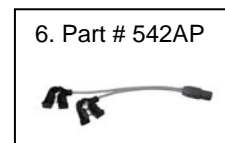
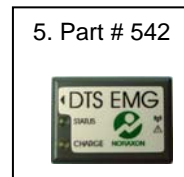
### Unpacking the System

**UNPACK ALL ITEMS, CHECK INVENTORY AND INSPECT BEFORE PROCEEDING**

The TeleMyo DTS is shipped with the following standard items:

#### Standard

1. 1 – TeleMyo DTS Belt Receiver (Part #580)
2. 1 – TeleMyo DTS Belt Receiver Pouch (Part #580E)
3. 1 – TeleMyo DTS Belt Receiver Charger 5V Supply (Part #580B)
4. 1 – TeleMyo DTS User Manual (This document) (Part #580D)
5. 4-16 – TeleMyo DTS EMG Sensor (Part # 542)
6. 4-16 – TeleMyo DTS EMG Lead Wires (Part #542AP)
7. 1-2 – TeleMyo DTS EMG Charger (Part # 543)
8. 1-2 – TeleMyo DTS EMG Charger 5V Power Supply (Part # 543B)
9. 1 – USB A to mini-B 1m Filtered Cable (Part # CBL17)
10. 1 – CompactFlash WiFi Card (Part # 290B)



## Setting Up the TeleMyo DTS

### DTS EMG Sensors

The EMG Sensors require minimal attention on the part of the user. Because there are multiple DTS EMG Sensors, each sensor has a number label (1-16) which provides a simplified means of identifying one sensor from another. This number also serves as the channel number for the EMG signal. In addition, each sensor is also identified by a unique 4 character serial number consisting of a mix of digits 0-9 and the letters A through F. This serial number appears on each DTS EMG Sensor (adjacent to its charging contacts). Normally the serial number is only used when setting up the DTS system for the first time or when reassigning channel numbers. Use of the sensor serial numbers is described later in this section.

### EMG Sensor Status

The sensor's green STATUS indicator provides a means of communicating its operational state. In the idle state the STATUS indicator will flash at a low, once per second rate. When the sensor is actively measuring an EMG signal the STATUS indicator will flash recognizably faster. At 3000 samples/sec the flash rate is even higher than at 1500 samples/sec. If the STATUS indicator is not flashing at all, the EMG Sensor must be placed in a powered charger station to be reactivated. This could be due to a depleted sensor battery or if the sensor has been deliberately placed in a special shut down mode.

### EMG Sensor Attachment

For proper operation the EMG Sensor must be applied to the measurement site so that the reference electrode pad on the bottom side is in direct contact with bare skin. The skin area in contact with the reference pad generally does not require any special preparation prior to applying the sensor. (Some skin preparation for the reference pad site may be beneficial if the EMG signal exhibits a wandering baseline.)

The EMG Sensors can be secured in place using Noraxon supplied double sided adhesive tape and/or elastic straps. Straps are recommended if very dynamic movements are expected.



**Do not depend on the wire connection to the disposable electrodes as a means to secure the EMG sensor.**

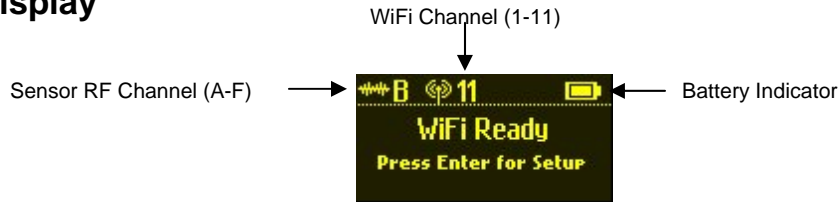
The EMG Sensor allows for interchangeable terminal lead wires for attachment to disposable electrodes. The two lead wires are offset with one longer than the other by an amount equal to the standard 2 cm spacing for surface EMG electrodes. The 2-pin lead wire connector can be inserted either way into the EMG Sensor to facilitate attachment to the surface electrodes.

Both snap (or button) style and pinch (or clip) style wire terminations are available. Noraxon also offers longer lead wires for special needs as well as adapters for fine wire electrodes.

## DTS Belt Receiver

The TeleMyo DTS may require some setup before it can be used. The setup involves setting RF channels as well as “pairing” the TeleMyo DTS Belt Receiver with its associated EMG Sensors and other optional sensors. When purchased as a package this setup may already have been performed by a Noraxon technician.







## DTS Display



## Setting the WiFi Channel

The WiFi Channel is the channel used for communication with the PC or 2400R G2 Receiver when using the WiFi card.

NOTE: For a list of frequencies used see Appendix A.

|   |   |
|---|---|
| <p>1) Turn on the TeleMyo DTS Belt Receiver.</p>    | <p>2) Press Enter to get the Main Setup screen.</p>    |
| <p>3) Select “Setup WiFi” and press Enter.</p>   | <p>4) Use the Left and Right arrow keys to set the WiFi RF Channel. It is a good idea to select a channel that is unused by other WiFi networks in the area.</p>  |
| <p>5) Press the Down arrow key to select “Save” and press Enter. The card will be reloaded automatically.</p>  | <p>Enter Button</p>    |

**NOTE: If the WiFi Channel you select overlaps with the Sensor RF channel you will receive a warning message. Noraxon recommends that you press any key to cancel and select a different WiFi Channel that does not overlap. For more information, see Appendix C for a chart listing recommended combinations of Sensor RF and WiFi channels.**








**Warning**  
 WiFi & Sensor RF Channels overlap!  
 (See manual Appendix C)  
 Press Enter to Save or any other key to Cancel

## Setting the Sensor RF Channel

The Sensor RF Channel is the frequency set used for communication between the Belt Receiver and the EMG Sensors.

NOTE: For a list of frequencies used see Appendix B.

**Enter Button** 







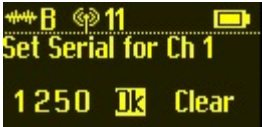


|  |   |
|--|---|
| <p>1) Turn on the TeleMyo DTS Belt Receiver.</p>    | <p>2) Press Enter to get the Main Setup screen.</p>                   |
| <p>3) Select "Setup Sensors" and press Enter.</p>   | <p>4) Select "Set RF Channel" and press Enter.</p>                    |
| <p>5) Adjust the RF Channel using the Left and Right arrow keys.</p>    | <p>6) Using the Down arrow key, select "Save" and Press Enter.</p>  |
| <p><b>NOTE: If the RF channel you select overlaps with the WiFi frequency you will receive a warning message. Noraxon recommends that you press any key to cancel and select a different RF Channel that does not overlap. For more information, see Appendix C for a chart listing recommended combinations of Sensor RF and WiFi channels.</b></p> |    |

## Pairing EMG Sensors and Other Sensors with the TeleMyo DTS

Before a measurement can be started the TeleMyo DTS must be informed which sensors it will be using. This is accomplished by assigning sensor serial numbers to each available channel.



Serial number on DTS Probe

|   |   |
|---|---|
| <p>1) Turn on the TeleMyo DTS Belt Receiver</p>    | <p>2) Press Enter to get the Main Setup screen.</p>   |
| <p>3) Select "Setup Sensors" and press Enter.</p>    | <p>4) Select "Assign Sensors" and press Enter.</p>    |
| <p>5) Select the Channel Number you would like to change and press Enter.</p>                      | <p>6) Use the Up and Down arrow keys to change the selected digit. Use the Left and Right arrow keys to select the digit you want to change.</p>  |
| <p>7) Select "OK" and press Enter when finished.</p>   | <p>8) Repeat steps 5-7 for each Channel you want to change.</p>   |
| <p>9) When finished, scroll to the bottom of the channel list, select "Save" and press Enter.</p>  | <p>Enter Button </p>   |





**NOTE:** After the sensor channel assignments are set up the settings are stored in the Belt Receiver. Most users will not need to change these settings unless they purchase additional EMG Sensors or sensors.

## Setting the Time and Date





The TeleMyo DTS Belt Receiver contains a real-time clock to keep track of the current Time and Date. The clock is used primarily to create timestamps for datalogging sessions.

**Enter Button** 

### To set the Time:

|  |   |
|--|---|
| <p>1) Turn on the TeleMyo DTS Belt Receiver.</p>  | <p>2) Press Enter to get the Main Setup screen.</p>   |
| <p>3) Select Set Time and press Enter</p>         | <p>4) Use the Left and Right arrow keys to adjust the Hours, Minutes and Seconds. Use the Up and Down arrow keys to navigate between the fields. Select Save and press Enter when finished.</p>  |

### To set the Date:

|  |  |
|--|--|
| <p>1) Turn on the TeleMyo DTS Belt Receiver.</p>  | <p>2) Press Enter to get the Main Setup screen.</p>    |
| <p>3) Select Set Date and press Enter.</p>        | <p>4) Use the Left and Right arrow keys to adjust the Hours, Minutes and Seconds. Use the Up and Down arrow keys to navigate between the fields. Select Save and press Enter when finished.</p>  |

## Connecting the TeleMyo DTS to the PC

The TeleMyo DTS can connect to the PC via multiple methods. The first method is via the USB cable. In this mode the TeleMyo DTS can be used in a short-range scenario; less than 10 meters (30ft). The second mode provides a longer-range connection via a CompactFlash WiFi card. Using the WiFi card the user may connect the DTS system to any of Noraxon's G2 receivers:

- 1) TeleMyo 2400R G2 Analog Output Receiver (Part #291)
- 2) TeleMyo 2400R G2 Mini Receiver (Part# 292)
- 3) TeleMyo PC Interface (Part# 293)

Please refer to the appropriate receiver manual for instructions to connect your receiver to the PC.

## Using the CompactFlash WiFi card

The CompactFlash WiFi card is the primary transport for sending data to the PC. To start a measurement with the WiFi card:

- 1) Insert the WiFi card into the TeleMyo DTS Belt Receiver.
- 2) If necessary, set the WiFi channel to the desired channel (See Setting the WiFi channel on page 11)
- 3) Set up the receiver or PC Interface with the desired WiFi channel.
- 4) Attach the TeleMyo DTS Belt Receiver to the patient's belt.
- 5) Start a measurement as specified in the manual for the receiver used.

## Using the USB port (MyoResearch XP Required)

NOTE: Range will be limited in this configuration

- 1) Insert the USB cable into the USB Port of the TeleMyo DTS Belt Receiver.
- 2) Insert the USB cable into the PC.
- 3) Configure MyoResearch XP for USB and start a measurement.

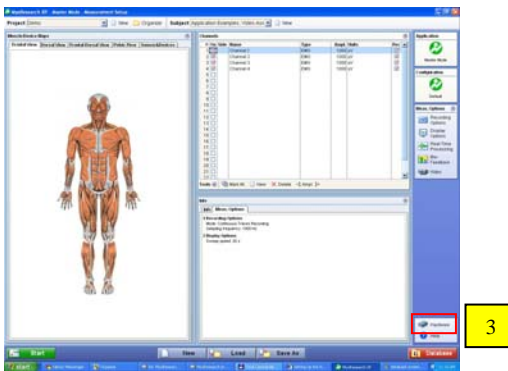
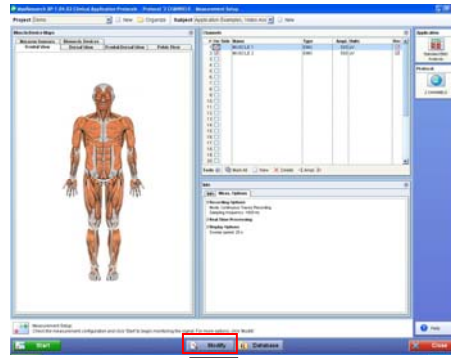
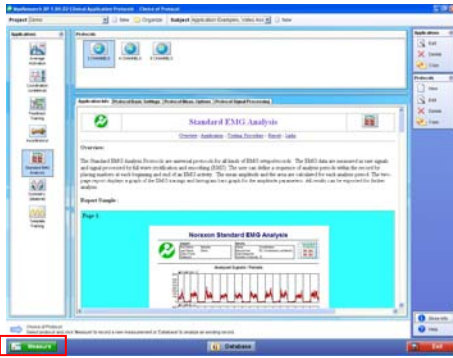


Do not connect the Belt Receiver to a PC while it is worn by the patient.

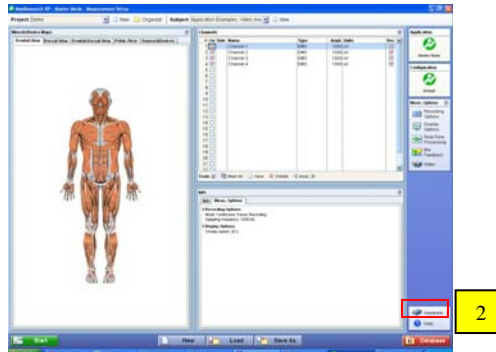
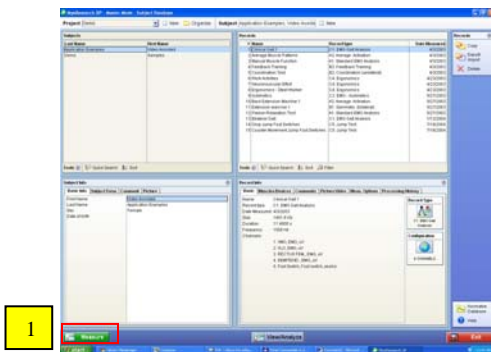
## Setting up MyoResearch XP for the TeleMyo DTS

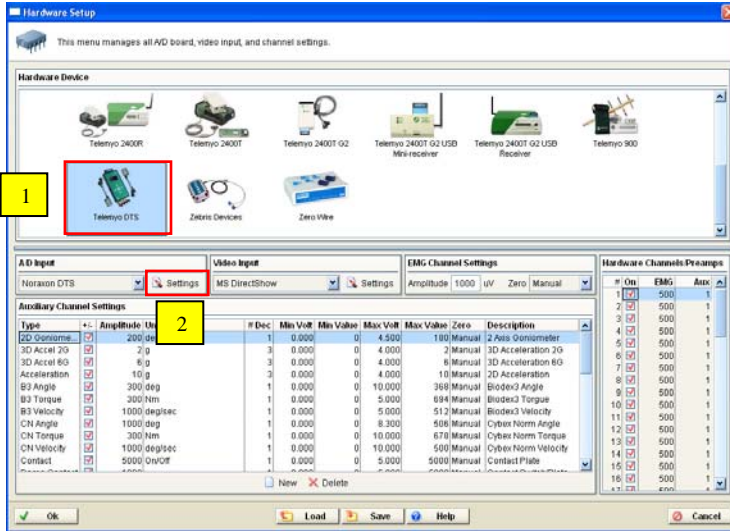
Before measuring data in MyoResearch XP, the TeleMyo DTS must be selected in the Hardware Setup Menu. The steps to get to the Hardware Setup Screen are slightly different for the Application Protocols icon and the Master icon. Separate instructions are given below for each program icon.

### Applications Protocol Icon or Clinical Application Protocols Icon:

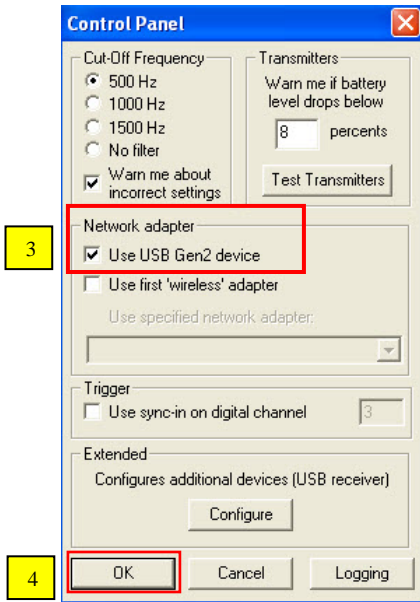


### Master, Basic or Data Acquisition Edition Icon:





- 1) In the Hardware Setup screen, select the “TeleMyo DTS” icon.
- 2) In the A/D Input box, click “Settings”.

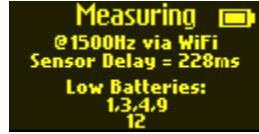


- 3) In the Control Panel, select “Use USB Gen2 device”. (Use this option for any of the G2 Receivers and when connecting the DTS Belt Receiver directly to the PC via USB.)
- 4) Click OK on the Control Panel window.
- 5) Click OK on the Hardware Setup screen.

After you click OK on the Hardware Setup Screen, you will return to the Measurement Setup Screen. Select the desired channels and other settings. (Please refer to the MyoResearch XP Manual for additional information.)

## Sensor Low Battery Indicator

If any sensors are reporting low batteries during a measurement, the channel numbers will be displayed on the screen along with a “Low Batteries” warning.









## Enabling Channels for Measurement

### Enabling Channels in MRXP

When measuring with MyoResearch XP, you must select only the channels that you want to measure. If you select a channel that is assigned to a sensor that is not available, the measurement will not start. You will receive a message that “Not all sensors have responded.” A sensor will be unavailable if it is out of radio range, the battery is dead, or if it is charging.

### Enabling Channels when using the Datalogger or a 2400R Receiver







When measuring with a 2400R G2 Analog Output Receiver in Panel Mode or the datalogger, MyoResearch XP is not available to enable the required channels for measurement. To enable channels for measurement in these cases the user enables/disables them in the Belt Receiver.

|  |   |
|--|---|
| <p>1) Press Enter to get the Main Menu.</p>   | <p>2) Select Setup Sensors and press Enter.</p>   |
| <p>3) Select Enable Channels and press Enter.</p>   | <p>4) For each channel, use the Left/Right keys to enable/disable measurement for the current channel.</p>  |
| <p>5) Select Save at the bottom of the list and press Enter. The settings will be saved in memory until you change them again.</p>  | <p>Enter Button </p>   |

## Setting the Sensor Delay

The DTS sensors have a selectable delay buffer. Each sensor buffers (stores) older data in case the belt receiver does not receive it. If data is lost due to RF interference, the belt receiver can request a data packet be resent. A longer delay allows a longer time for data to get through under poor conditions. However, it results in extra delay that may not be desirable for biofeedback situations. The current sensor delay is displayed on the belt receiver during each measurement. The Sensor Delay is configurable via the belt receiver Sensor Setup menu.

To set the delay:

|  |  |
|--|--|
| <p>1) Press Enter to get the Main Menu.</p>         | <p>2) Select Setup Sensors and press Enter.</p>    |
| <p>3) Select Set Sensor Delay and press Enter.</p>  | <p>4) Use the Left/Right keys to set the desired delay. If a longer delay is not a problem, set the delay to the highest setting for optimum data integrity.</p>  |
| <p>5) Select Save and press Enter.</p>            | <p>Enter Button </p>  |

**NOTE: The delay is less at a sampling rate of 3000Hz because data is being sent twice as fast than at 1500Hz. This has the effect of filling the delay buffer twice as fast.**

## Effect of Sensor Delay on 2400R G2 Analog Outputs

The 2400R G2 Analog Output Receiver also has a configurable Analog Output Delay. This delay **adds** to the DTS Sensor Delay.



For example, if you set the DTS Sensor delay to 312ms and the 2400R Analog Output delay to 100ms, the total delay will be 412ms. The total delay is measured from the time sample is taken at the sensor to the time that sample appears at the output of the 2400R G2 receiver.

**NOTE: It is recommended to set the 2400R G2 Analog Output Delay to 100ms or more when used with the TeleMyo DTS. Using a setting of 50ms may result in extra data loss.**

## Performing a Measurement using the Data Logger

The TeleMyo DTS has the ability to record data directly to a CompactFlash memory card. This allows users to make recordings in areas where a PC is not present.

To make a recording using the data logger:






|  |   |
|--|---|
| <p>1) Insert a CompactFlash memory card into the CompactFlash slot of the Belt Receiver.</p>   | <p>2) The Data Logger mode will be automatically activated.</p>   |
| <p>3) Make sure the desired EMG Sensors are not in the charger and press the Right arrow key to start a measurement.</p>  | <p>4) When finished, press the Left arrow key to stop the measurement. The recording will be saved to the memory card as TMXXXX.dat, where XXXX is an auto-assigned number. This file can later be imported into MyoResearch XP for analysis.</p> |

## Datalogger Measurement Setup

The Sampling Rate and Low Pass Filter cutoff can be set before beginning the datalogger measurement.

**Enter Button** 

To set up the datalogger measurement:

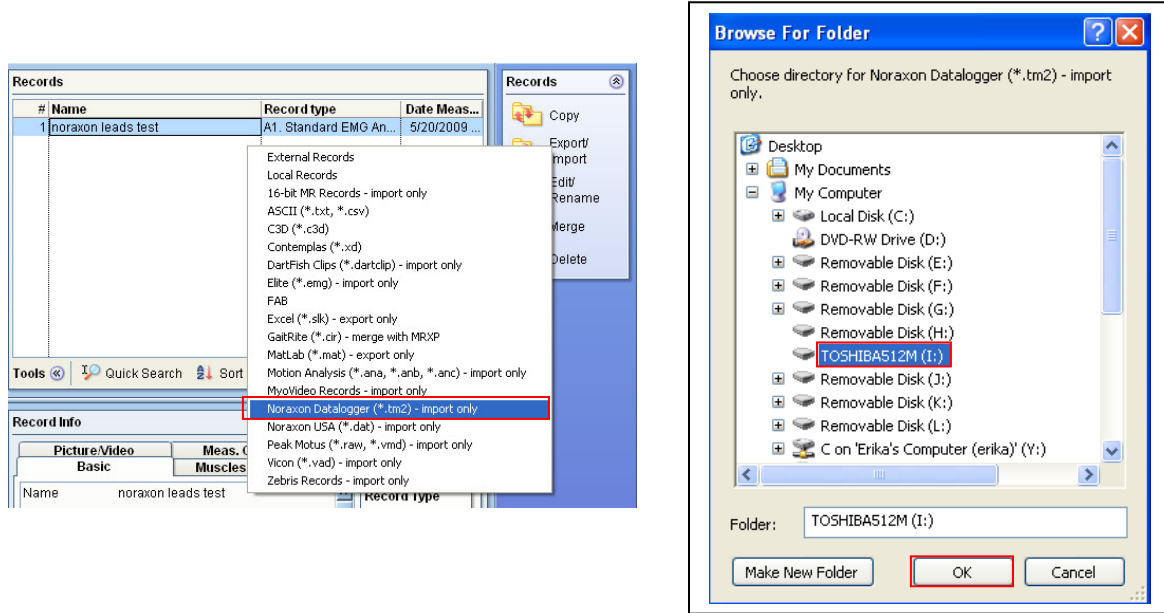
|   |  |
|---|--|
| <p>1) Insert a CompactFlash memory card into the CompactFlash slot of the Belt Receiver.</p>  | <p>2) The Data Logger mode will be automatically activated.</p>  |
| <p>3) Press Enter to get the Main Menu.</p>                                        | <p>4) Select Meas. Setup and press Enter.</p>                    |
| <p>5) Set the Sampling Rate and Filter using the Up/Down and Left/Right keys.</p>  | <p>6) Select Save and press Enter.</p>                           |

## Importing the Data Logger Files into MyoResearch XP

Connect a memory card reader to the PC and insert the memory card.

Open MyoResearch XP and in the Database Screen, select the appropriate Project and Subject, then click in the “Records” panel.

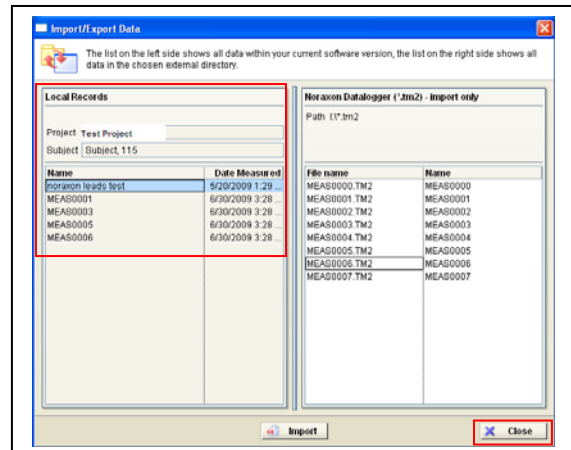
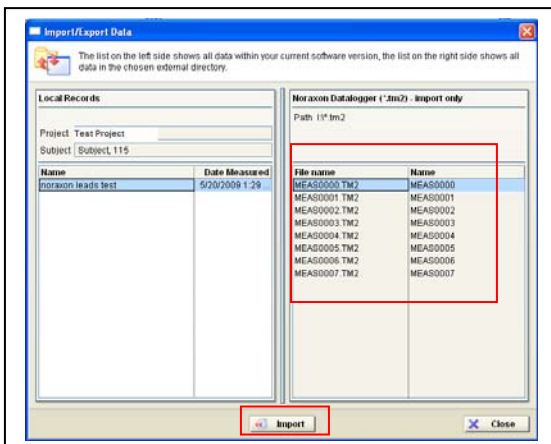
In the “Records” menu (located on the upper right-side of the screen), click on “Export/Import” and select “Noraxon Datalogger (\*.tm2) – import only.” Choose the drive letter of the CompactFlash Card and Click Ok.



Select the records in the right panel that you want to import. You can select several by holding down the Shift or Ctrl keys while you select the records.

Click “Import” and the Datalogger records will appear in the left panel.

When all the desired records are imported, click “Close”.



After you click “Close”, you will return to the Database screen. In the Records panel, the Datalogger records will have the Record type “Imported”.

You can now view and analyze the data as you would if you collected the data using MyoResearch XP.

| # | Name               | Record type            | Date Meas...  |
|---|--------------------|------------------------|---------------|
| 1 | noraxon leads test | A1. Standard EMG An... | 5/20/2009 ... |
| 2 | MEAS0001           | Imported               | 6/30/2009 ..  |
| 3 | MEAS0003           | Imported               | 6/30/2009 ..  |
| 4 | MEAS0005           | Imported               | 6/30/2009 ..  |
| 5 | MEAS0006           | Imported               | 6/30/2009 ..  |

### Charging the TeleMyo DTS Belt Receiver

The TeleMyo DTS includes an internal battery pack and charging circuit. The battery may be charged with the included TeleMyo DTS Belt Receiver Charger Supply (Part no. 580B.)

The Charger will also be active when the TeleMyo DTS Belt Receiver is connected to a PC via the USB cable.



The TeleMyo DTS must only be charged using the TeleMyo DTS Charger Power Supply (Part no. 580B.) Please consult with a Noraxon technician before using a different power supply.

NOTE: Do not attempt to charge the Belt Receiver when it is worn by any person.

To charge the battery:

1) Insert the Charger Power Supply plug into the charging jack on the left side of the TeleMyo DTS Belt Receiver.



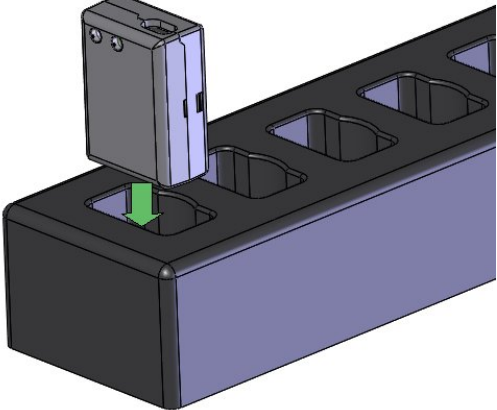
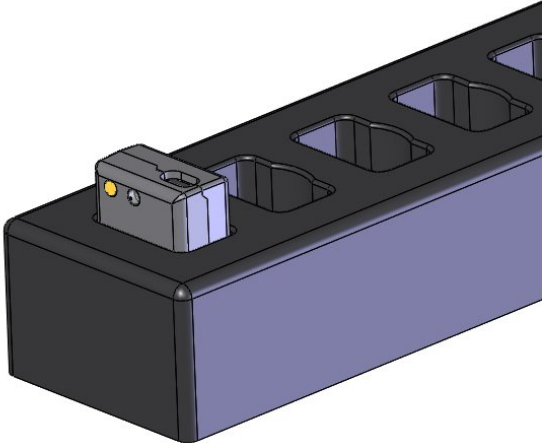
2) Plug the Charger Power Supply into an available mains (wall) outlet.

The amber charging light next to the charging jack will be illuminated during charging. When the charger is finished, the light will turn off.

## Charging the TeleMyo DTS EMG Sensors

The TeleMyo DTS EMG Sensors may be charged using the TeleMyo DTS EMG Charger (Part# 543.)

To charge the EMG Sensors:

|   |  |
|---|--|
| <p><b>1)</b> Insert the EMG Charger Power Supply (Part# 543B) into the charger jack on the TeleMyo DTS EMG Charger.</p>   | <p><b>2)</b> Insert the EMG Sensor(s) into the DTS EMG Charger.</p>  A 3D perspective diagram of the TeleMyo DTS EMG Charger. The charger is a dark grey rectangular device with a power supply jack on the left side. A grey power supply unit is being inserted into this jack. A green arrow points downwards from the top of the power supply unit into the jack, indicating the direction of insertion. The charger has several rectangular slots on its top surface for inserting EMG sensors. |
| <p><b>3)</b> The amber Charge LED on the EMG Sensor will illuminate while charging. The LED will be extinguished when the charging cycle is complete.</p>  A 3D perspective diagram of the TeleMyo DTS EMG Charger, similar to the one in the previous step. The grey power supply unit is now fully inserted into the jack. The sensor unit, which is a small grey rectangular component, is now seated in the first of the rectangular slots on the top surface of the charger. A small amber LED is visible on the side of the sensor unit. |  |

## Technical Description

### General

The TeleMyo DTS is a 4 to 16 channel, portable electromyography device. It is designed in compliance with international standard IEC60601-2-40, Particular *requirements for the safety of electromyographs and evoked response equipment*. The DTS EMG Sensors are classified as Type B applied parts. Because the EMG Sensors are Type B, the TeleMyo DTS may not be used with stimulation (E-Stim) devices. Each EMG Sensor contains an integral 16 bit analog to digital conversion system. Communication with a computer system is provided by means of WiFi or a USB Cable. The TeleMyo DTS is designed for continuous operation. The instrument is powered by an internal battery and is considered Internally Powered Equipment.

### Restricted Use

The instrument is not protected against the ingress of water and carries no IPX rating (i.e. is Ordinary equipment)

The TeleMyo DTS 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 occurs in the vicinity of MRI (magnetic resonance imaging) equipment.
3. In the presence of heavy electrical machinery such as near large motors, elevators, compressors and the like.
4. Attached to a patient with a pacemaker.



**The TeleMyo DTS is not intended for use with a patient who has a pacemaker.**

### Disposal of Equipment and Batteries

The TeleMyo DTS Belt Receiver contains Li-Ion batteries which may be hazardous if disposed of incorrectly. In addition the DTS EMG Sensors contain Li-Polymer batteries which may be hazardous if disposed of incorrectly. Please check with the governing authorities in your location before disposing of the TeleMyo DTS and its contents.

### Radio Considerations

The TeleMyo DTS 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 both the WiFi standard and a proprietary wireless sensor protocol. Other devices operating in this frequency band include computer networks, microwave ovens, cordless phone sets and other WiFi enabled devices.

Despite all this competing radio activity the TeleMyo DTS 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 TeleMyo DTS and the PC. Obstructions (walls, metal structures, trees, etc.) between the TeleMyo DTS and PC will also lower the signal quality.

While the TeleMyo DTS 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 DTS within 1 meter of any critical medical device.**

### ***Use of Disposable Electrodes***

While the TeleMyo DTS can operate with reusable electrodes, it is most commonly used with disposable surface electrodes. Any good quality silver/silver chloride electrode is acceptable. Noraxon provides several types of quality disposable electrodes for a wide variety of sEMG applications. It is recommended that any electrodes used with the TeleMyo DTS satisfy the requirements for standard ANSI/AAMI EC12-1991 Disposable ECG electrodes.



**Because disposable electrodes have a shelf life, it is important not to use expired parts. Bulk disposable electrodes come packaged in a sealed container or bag. The expiration date can be found printed on the package container. After the sealed bulk container is opened, the remaining electrodes should be used before their gel begins to dry out. Always keep the remaining electrodes in their bulk package until they are used. Avoid using electrodes that are randomly found lying outside of their bulk packaging as their expiration date is uncertain and their gel has been exposed to accelerated drying.**

**Be aware that when disposable electrodes are removed, some individuals may notice a faint red skin discoloration over the site previously occupied by the electrode. This skin discoloration is typically benign and temporary and may be due to a mild allergic reaction to the adhesive or simply be a slight abrasion caused by peeling away the tape. It will usually disappear within 24 hours.**

Noraxon discourages any attempt to reuse a disposable electrode, even if it is simply pulled off to slightly reposition the electrode's muscle placement. Noraxon strongly recommends against the use of dried out electrodes that are re-wetted with electrode gel.

#### **Electrode Application Guidelines and Facts**

1. If the subject has a fair amount of hair at the electrode application site, the hair should be clipped. Shaving is not necessary and may irritate the skin.

2. The electrode application site should be clean and dry. The preferred method of cleaning is with soap and water plus drying the skin with a dry cloth. Dry skin contributes to good electrode adhesion and good trace quality.
3. Cleaning with isopropyl alcohol should be avoided or limited to situations where electrode adhesion is an issue (diaphoresis, excessively oily or lotion covered skin), since it may dehydrate the skin thereby causing skin impedance to increase. If alcohol is used, allow it to dry prior to electrode application.
4. Attach the lead wire to the electrode prior to placing the electrode on the skin. This will eliminate the potential for discomfort if snap lead wires are pressed onto the electrode after the electrode has been applied.
5. Electrode application sites should be abraded to lower the skin impedance. Abrasion patches can be found on most electrodes. Simply draw the abrasion patch several times over the skin of the intended application site.
6. Electrodes are the weak link in the EMG measurement chain. Lack of proper attention to electrode quality or site preparation is by far the most common cause of inferior recordings.
7. It may take up to 5 minutes for disposable electrodes to fully stabilize electrically once applied to the skin. If extremely critical or precise measurements are intended, the electrodes should be applied several minutes in advance of the recording.



**When attaching EMG leads, prevent lead snaps that are not yet attached to electrodes from coming into accidental contact with other conductive objects. This will avoid a potential shock hazard. A simple way to ensure this with disposable electrodes is to first attach electrodes to all snaps, unpeel the adhesive cover and apply the electrodes to the patient.**

## Maintenance

The only routine maintenance recommended for the TeleMyo DTS is to clean the bottom of the EMG sensor periodically. (See the Cleaning section below.) Because the batteries are Li-Ion, there is no battery maintenance required. It is good practice to completely drain the Belt Receiver battery every 20-30 recharges to ensure the “fuel gauge” in the battery reports accurate charge levels.



**The TeleMyo DTS battery packs are not user replaceable. Only qualified technical personnel may perform the maintenance.**

**There are no user serviceable parts in the TeleMyo DTS. Service and repair is to be performed only by Noraxon or its authorized agent.**

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

## Cleaning

The TeleMyo DTS instrument case can be wiped down with a damp cloth using a mild soap or detergent and water. Before cleaning any portion of the system, the instrument should be unplugged from the wall power outlet and powered off.



**Warning: Only use a damp cloth with mild soap and water or isopropyl alcohol to clean the bottom of the EMG Sensors.**



**Warning: Do not immerse EMG Sensors in any water or liquid.**

### *Cleaning, Disinfecting & Sterilization of EMG Sensors*

For sanitary purposes, it is advisable to clean the bottom of the EMG Sensors on a regular basis. The EMG Sensors can be cleaned with a solution of mild soap and water or isopropyl alcohol.

The EMG Sensors are not constructed to withstand repeated application of any disinfectant solution. Likewise the EMG Sensors are not warranted against exposure to any of the conventional forms of sterilization. Users wishing to utilize this equipment in a sterile environment, such as an operating theater, should consult Noraxon for other options.

### *Sterilizing Electrodes*

Noraxon provides high quality disposable surface electrodes for single use applications. Different types of electrodes: fine wire, needle, vaginal, rectal, or esophageal probes are available from other reputable manufacturers. Consult the product documentation for each specific manufacturer on the advisability and proper means to sterilize reusable electrodes.

## **Environmental Conditions for Storage and Transport**

The environmental requirements for storage and transport are as follows:

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

## ***Radio Regulatory Statements***

### **FCC Statement**

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device contains up to 4 modules with FCC ID: R8KUGWG4USHN33A.


### **Industry Canada Statement**

This product contains Unigen WirelessUSB module Canadian Cert No IC: 5125A-UGWG4US

**EMC Tables**

| <b>Guidance and manufacturer's declaration – electromagnetic emissions</b>  |                   |  |
|---|-------------------|--|
| The TeleMyo DTS is intended for use in electromagnetic environment specified below. The customer or the user of the TeleMyo DTS should assure that it is used in such an environment. |                   |  |
| <b>Emissions Test</b>   | <b>Compliance</b> | <b>Electromagnetic environment - guidance</b>  |
| RF emissions<br>CISPR 11  | Group 2           | The TeleMyo DTS must emit electromagnetic energy in order to perform its intended function. Nearby electronic equipment may be affected.   |
| RF emissions<br>CISPR 11  | Class A           | The TeleMyo DTS is suitable for use in all establishments other than domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. |
| Harmonic Emissions<br>IEC 61000-3-2   | Not applicable    |  |
| Voltage fluctuations/<br>flicker emissions<br>IEC 61000-3-3   | Not applicable    |  |

| <b>Guidance and manufacturer's declaration – electromagnetic immunity</b>   |   |  |   |
|---|---|--|---|
| The TeleMyo DTS is intended for use in electromagnetic environment specified below. The customer or the user of the TeleMyo DTS should assure that it is used in such an environment. |   |  |   |
| <b>Immunity Test</b>  | <b>IEC 60601 test level</b>   | <b>Compliance level</b>  | <b>Electromagnetic environment - guidance</b>   |
| Electrostatic discharge (ESD)<br>IEC 64000-4-2  | ±6 kV contact<br>± 8 kV air   | ±6 kV contact<br>±6 kV air   | The TeleMyo DTS should remain in its protective carrying pouch at all times.  |
| Electrical fast transient/burst<br>IEC 61000-4-4  | ±2kV for power supply lines<br>±1kV for input/output lines  | ±2kV for power supply lines<br>Not applicable  | For battery charging mains power quality should be that of a typical commercial or hospital environment.                                  |
| Surge<br>IEC 61000-4-5  | ±1kV differential mode<br>±2kV common mode  | ±1kV differential mode<br>±2kV common mode   | For battery charging mains power quality should be that of a typical commercial or hospital environment.                                  |
| Voltage dips, short interruptions and voltage variations on power supply input lines<br>IEC 61000-4-11  | <5 % $U_T$<br>(>95 % dip in $U_T$ )<br>for 0,5 cycle<br><br>40 % $U_T$<br>(60 % dip in $U_T$ )<br>for 5 cycles<br><br>70 % $U_T$<br>(30 % dip in $U_T$ )<br>For 25 cycles<br><br><5 % $U_T$<br>(>95 % dip in $U_T$ )<br>For 5 sec | Not applicable to operation<br><br>Not applicable to operation<br><br>Not applicable to operation<br><br>Not applicable to operation | For battery charging mains power quality should be that of a typical commercial or hospital environment.                                  |
| Power frequency (50/60 Hz) magnetic field<br>IEC 61000-4-8  | 3 A/m   | 3 A/m  | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. |
| NOTE $U_T$ is the a.c. mains voltage prior to application of the test level.  |   |  |   |

| Guidance and manufacturer's declaration – electromagnetic immunity   |  |                          |  |
|--|--|--------------------------|--|
| The TeleMyo DTS is intended for use in electromagnetic environment specified below. The customer or the user of the TeleMyo DTS should assure that it is used in such an environment.  |  |                          |  |
| Immunity Test  | IEC 60601 test level   | Compliance level         | Electromagnetic environment - guidance   |
| <p>Conducted RF<br/>IEC 61000-4-6<br/>(Charging System)</p> <p>Radiated RF<br/>IEC 61000-4-3</p>   | <p>3 Vrms<br/>150 kHz to 80 MHz</p> <p>3 V/m<br/>80 MHz to 2,5 GHz</p> | <p>3Vrms</p> <p>3V/m</p> | <p>Portable and mobile RF communications equipment should be used no closer to any part of the TeleMyo DTS, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p><b>Recommended separation distance</b></p> $d = 1.2\sqrt{P}$ <p><math>d = 1.2\sqrt{P}</math> 80 MHz to 800 MHz</p> <p><math>d = 2.3\sqrt{P}</math> 800 MHz to 2,5 GHz</p> <p>where <math>P</math> is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and <math>d</math> is the recommended separation distance in metres (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,<sup>a</sup> should be less than the compliance level in each frequency range.<sup>b</sup></p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p>  |
| NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.  |  |                          |  |
| NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.   |  |                          |  |
| <p><sup>a</sup> Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the TeleMyo DTS is used exceeds the applicable RF compliance level above, the TeleMyo DTS should be observed to verify normal operation. If abnormal operation is observed, additional measures may be necessary, such as reorienting or relocating the TeleMyo DTS.</p> |  |                          |  |
| <p><sup>b</sup> Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</p>   |  |                          |  |

| Recommended separation distances between portable and mobile RF communications equipment and the TeleMyo DTS  |  |                   |                    |
|---|--|-------------------|--------------------|
| The TeleMyo DTS is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the TeleMyo DTS can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the TeleMyo DTS as recommended below, according to the maximum output power of the communications equipment. |  |                   |                    |
| Rated maximum output power of transmitter<br><br>W  | Separation distance according to frequency of transmitter<br>m |                   |                    |
|   | 150 kHz to 80 MHz  | 80 MHz to 800 MHz | 800 MHz to 2,5 GHz |
|   | $d = 1.2\sqrt{P}$  | $d = 1.2\sqrt{P}$ | $d = 2.3\sqrt{P}$  |
| 0,01  | 0.12   | 0.12              | 0.23               |
| 0,1   | 0.38   | 0.38              | 0.73               |
| 1   | 1.2  | 1.2               | 2.3                |
| 10  | 3.8  | 3.8               | 7.3                |
| 100   | 12   | 12                | 23                 |
| For transmitters rated at a maximum output power not listed above, the recommended separation distance <i>d</i> in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where <i>P</i> is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.  |  |                   |                    |
| NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.   |  |                   |                    |
| NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.  |  |                   |                    |

Noraxon will make available on request circuit schematics, component parts lists and calibration instructions to assist qualified technical personnel in the service and maintenance of the TeleMyo DTS. Please contact Noraxon 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  
 Email: info@noraxon.com  
 Technical Support Email: support@noraxon.com

 **Authorized European Representative:**  
 Velamed GmbH  
 Contact: Ingrid Konrad  
 Grafen-von Bergstr. 10  
 Cologne, Germany 50769  
 Phone: (49) 221-7910976  
 Fax: (49) 221-9792992  
[www.velamed.com](http://www.velamed.com)  
[i.konrad@velamed.com](mailto:i.konrad@velamed.com)



**Appendix A – WiFi Channel Frequencies and SSIDs**

| WiFi Channel | Radio Frequency (GHz) | SSID |
|--------------|-----------------------|------|
| 1            | 2.412                 | TM1  |
| 2            | 2.417                 | TM2  |
| 3            | 2.422                 | TM3  |
| 4            | 2.427                 | TM4  |
| 5            | 2.432                 | TM5  |
| 6            | 2.437                 | TM6  |
| 7            | 2.442                 | TM7  |
| 8            | 2.447                 | TM8  |
| 9            | 2.452                 | TM9  |
| 10           | 2.457                 | TM10 |
| 11           | 2.462                 | TM11 |

## Appendix B – Sensor RF Channel Frequencies

The EMG Sensors and sensors operate on up to 4 RF channels simultaneously. The RF Channels (A-F) are assigned the RF frequencies according to the table below.

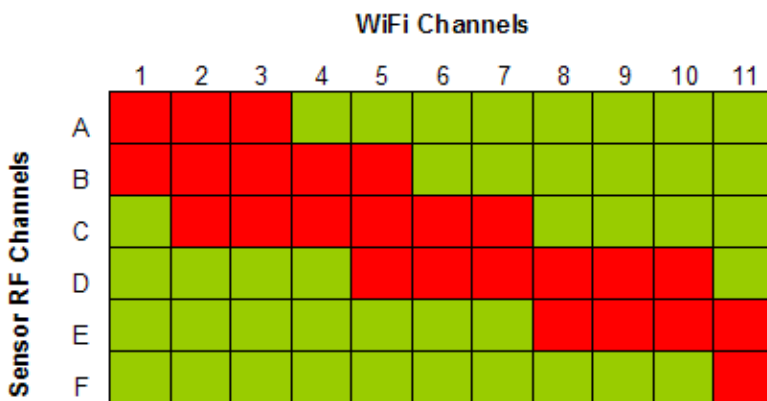
| RF Channel | Freq. 1 (GHz) | Freq. 2 (GHz) | Freq. 3 (GHz) | Freq. 4 (GHz) |
|------------|---------------|---------------|---------------|---------------|
| A          | 2.400         | 2.403         | 2.406         | 2.409         |
| B          | 2.415         | 2.418         | 2.421         | 2.424         |
| C          | 2.427         | 2.430         | 2.433         | 2.436         |
| D          | 2.439         | 2.442         | 2.445         | 2.448         |
| E          | 2.451         | 2.454         | 2.457         | 2.460         |
| F          | 2.463         | 2.466         | 2.469         | 2.472         |

## Appendix C – Recommended WiFi and Sensor RF Channel Combinations

Because the WiFi radio and the sensor RF radios share the 2.4GHz frequency spectrum there is the possibility that the RF channels may overlap and interfere with each other, resulting in extra lost data. To avoid overlap, use the chart below to find recommended combinations of Sensor RF and WiFi channels that do not interfere with each other.

For example, Sensor RF Channel “A” does not interfere with WiFi Channels 4-11. Sensor RF Channel D does not interfere with WiFi channels 1-4 and 11.

Selecting interfering channels will cause the DTS Receiver to display a warning message.



- = Recommended Combinations
- = Non-Recommended Combinations