Product Manual

MultiTester Manual

NORAXON®
EMG & Sensor Systems

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Noraxon MultiTester Checklist

The MultiTester is a general purpose testing device. It generates precise signals for testing preamp leads and EMG system performance. The digital display indicates electrode contact impedance at various (20, 100, 200 Hz) frequencies.

Unpack All Items and Check Inventory

The following items should be included with the Noraxon MultiTester.
(See figures on pages 5 & 6)

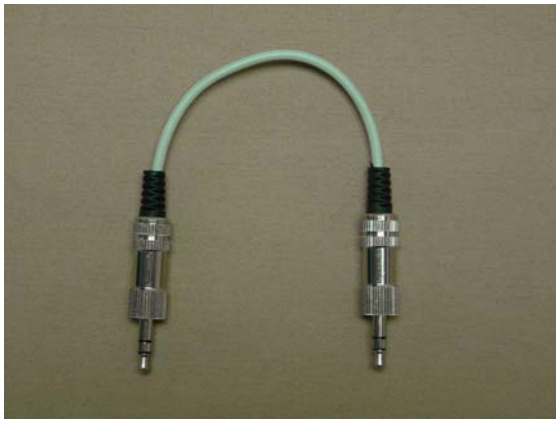
1. MultiTester Instrument (Part #280)
2. Test Block (Part #280B)
3. Dual Active Lead Adapter Cable (Part #CBL16)
4. Stereo Output Cable (Part #CBL12)
5. Electrode Test Lead Set (Part #CBL13)
   (A Set includes 2 leads)
6. Quick Probe Lead Set (Part #285B)
7. One 9v UltraLife Lithium Battery (Part #BATT1) (not shown)
8. MultiTester User Manual (Part #280A) (not shown)

MultiTester Components

1. MultiTester (Part #280)

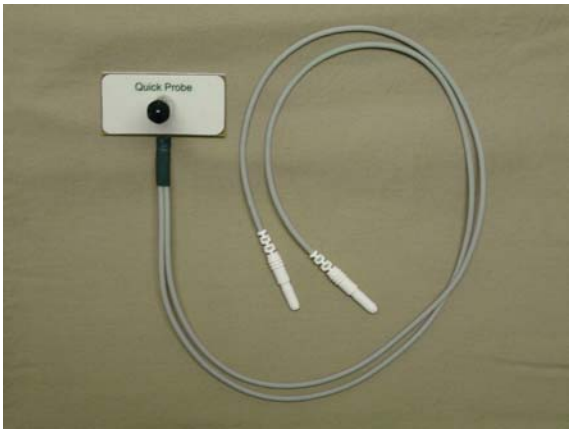
2. Test Block (Part #280B)

3. Dual Active Lead Adapter Cable (Part #CBL16)



4. Stereo Output Cable
   (Part #CBL12)

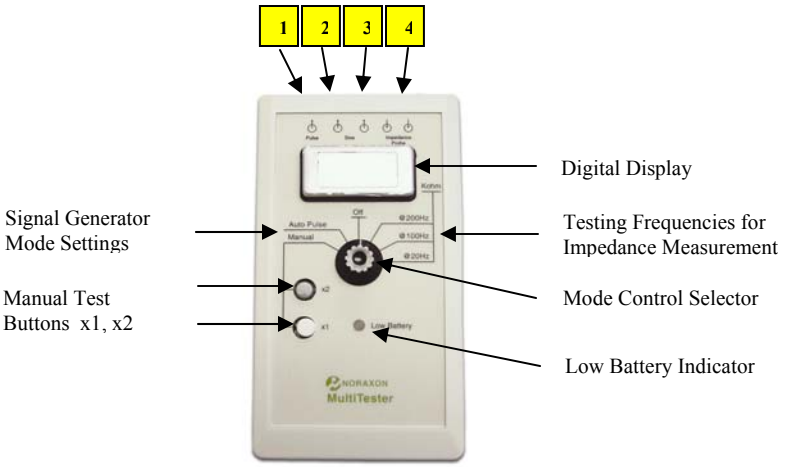
5. Electrode Test Lead Set
   (Part #CBL13)



6. Quick Probe Lead Set
   (Part #285B)

Controls and Displays

Figure 1: Front Panel



1. Signal Generator Pulse Mode Output
2. Signal Generator Sine Wave Continuous Mode Output
3. Signal Generator Sine Wave Intermittent Mode Output
4. Impedance Probe Inputs

Figure 2: Rear Panel

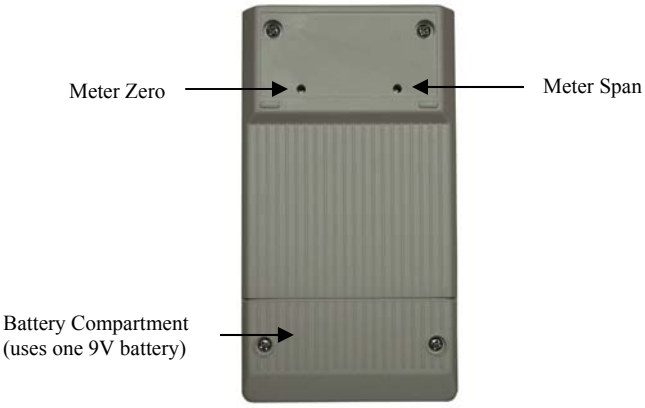
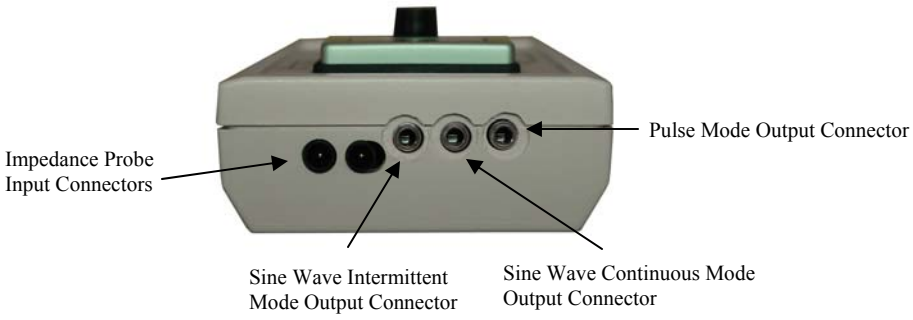


Figure 3: Top Panel



Noraxon MultiTester Instrument Setup

The MultiTester has essentially 2 modes: Signal Generator for testing preamp leads and EMG system performance and Impedance Measurement. The settings for the MultiTester depend on the intended use for the instrument.

Signal Generator:

On the left-hand side of the MultiTester are the controls and outputs for the Signal Generator mode. The signal generated can either be a pulse or a sine wave. Known precise test signals are generated so that the EMG system outputs can be compared to expected values. See figure 4 for setup.

Pulse Mode

The Pulse mode is used to send a precise high (1000 mV) signals (similar to a foot switch) to determine if the EMG A/D system is recording properly. The mode on the MultiTester can be set to either Auto Pulse or Manual.

AUTO PULSE MODE

In the Auto Pulse mode, one second long pulses followed by one second long pauses are continuously repeated. There is a delay between signal output 1 and 2 of 0.5 seconds. Also, output 2 will be 25% higher than output 1, which means that output 1 will display 1 volt (1000 mV) and output 2 will display 1.25 volts (1250 mV). If the observed outputs from the EMG system are within +/- 50 mV of these values, the EMG device is considered to be "in calibration". The Dual Active Lead Adapter Cable (Part #CBL16) is labeled "1" and "2" to identify the different outputs. To temporarily stop the pulses (e.g. to perform the "zero offset" in MyoResearch XP), press down on the "x2" button.

MANUAL MODE

In the Manual mode, there are two buttons "x1" and "x2" that operate according to table 1. If the observed outputs from the EMG system are within +/- 50 mV of the Table 1 values, the EMG device is considered to be "in calibration". The Dual Active Lead Adapter Cable (Part #CBL16) is labeled "1" and "2" to identify the different outputs.

Table 1: Manual Mode Outputs

Button Pressed	Output 1	Output 2
x1	1000 mV	1250 mV
x2	2000 mV	2500 mV

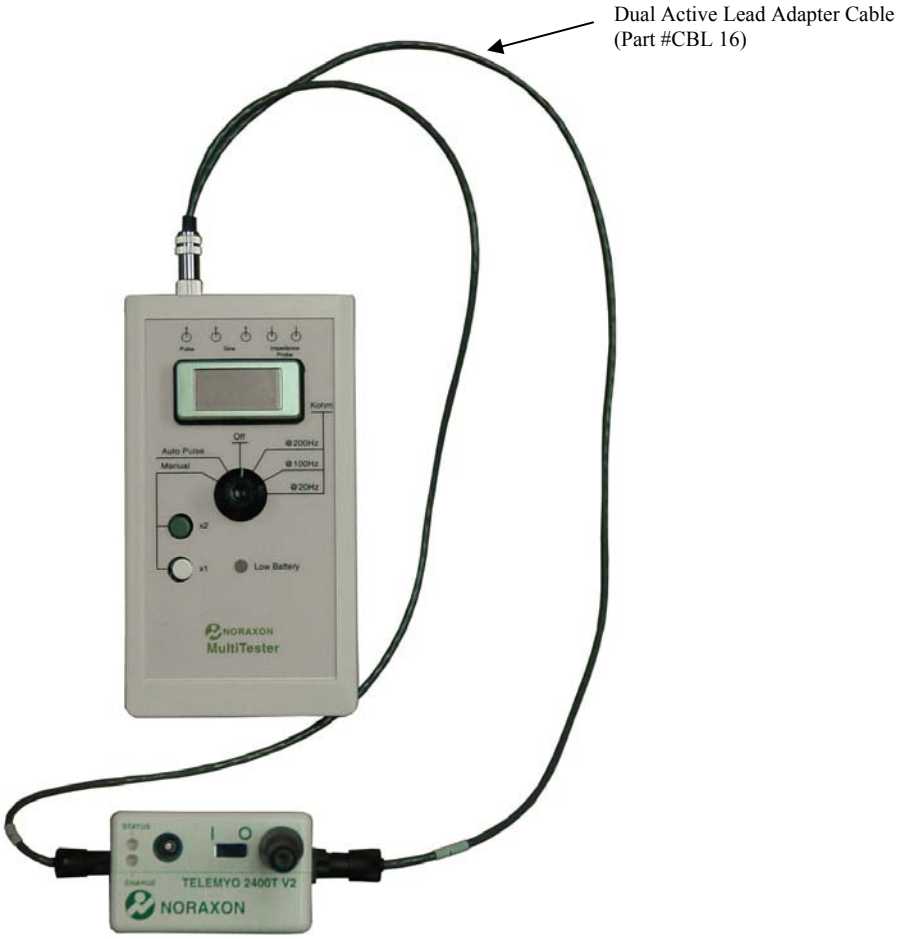


Figure 4: MultiTester Signal Generator Pulse Mode setup is used to test if the EMG A/D system is recording properly.

Sine Wave Mode

For the Sine Wave mode, place the main control knob in the Auto Pulse position. The Sine Wave mode is used to determine if a preamp lead(s) is working properly. There are two output connectors for the Sine Wave mode. One connector delivers a continuous sine wave (100 Hz, 1 mV) and the second connector delivers an intermittent sinusoid to simulate muscle activation. These signals are precisely 1 millivolt. If the observed outputs from the EMG system fall within +/- 50 microvolts of the expected 1 mV (1000 uV), the preamp is considered to be operating properly. For the Sine Wave mode, one end of the Stereo Output Cable (Part #CBL12) is attached to the MultiTester using the desired sine wave output connector and the other end is attached to the Noraxon Test Block (Part #280B). The EMG preamp leads are snapped onto the Test Block and then connected to an EMG system. See figure 5 for setup with the TeleMyo 2400T.

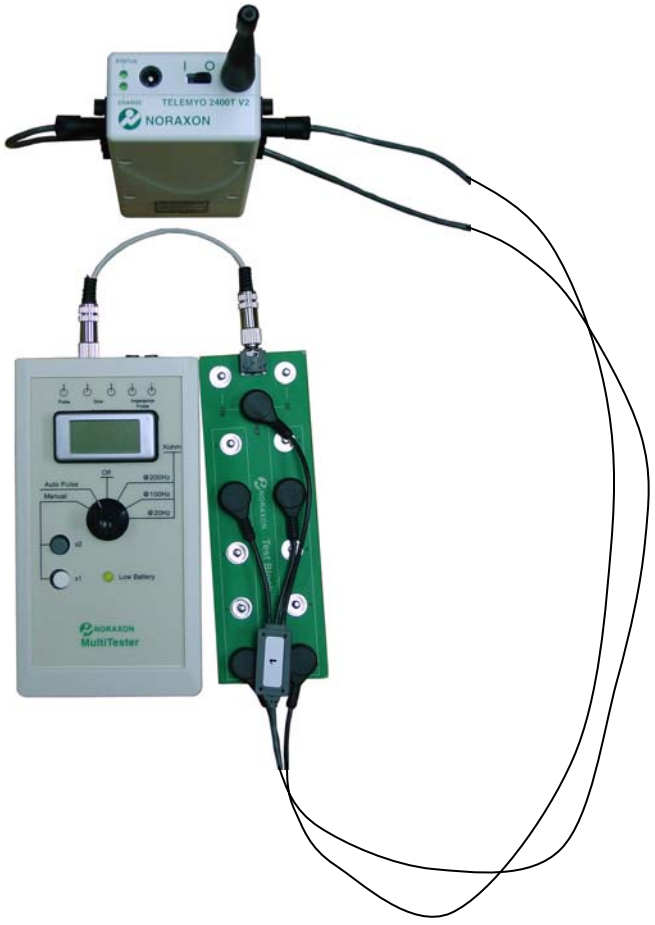


Figure 5: Signal Generator Mode Sine Wave Continuous Setup with the TeleMyo 2400T

Impedance Measurement:

On the right-hand side of the MultiTester are the settings and inputs for the Impedance Measurement mode. The impedance probe allows the user to determine the contact impedance between the skin and the electrode. There are two different cables to measure the impedance depending on the situation: Electrode Test Lead Set (Part #CBL13) and the Quick Probe Lead Set (Part #285B). The Quick Probe Lead Set is easy to use for closely spaced (< 2 cm) Noraxon Dual Electrodes. However, for some electrode types (e.g. Noraxon Singles) or situations (e.g. checking the single reference electrode), the Electrode Test Lead Set needs to be used because the two electrode snaps are widely separated (over 2 cm). See figure 6 for the Electrode Test Lead Set setup and figure 7 for the Quick Probe Lead setup. To test the reference electrode, one probe wire of the Electrode Test Lead Set should be attached to the reference electrode and the second probe wire attached to any other electrode that was previously tested and found to be acceptable.

For impedance measurement, three different frequencies are available (20, 100, and 200 Hz) using the Mode Control Selector. The digital display shows the impedance between any pair of electrodes. If the impedance is high, then one or both electrodes may need to be removed and the skin prepared thoroughly before applying a new electrode. The normal surface EMG signal bandwidth is between 10-350 Hz. The tester allows measurement of the electrode contact impedance at several frequencies in this range (20, 100, and 200 Hz). Slight differences in measured values at the different frequencies should be expected.

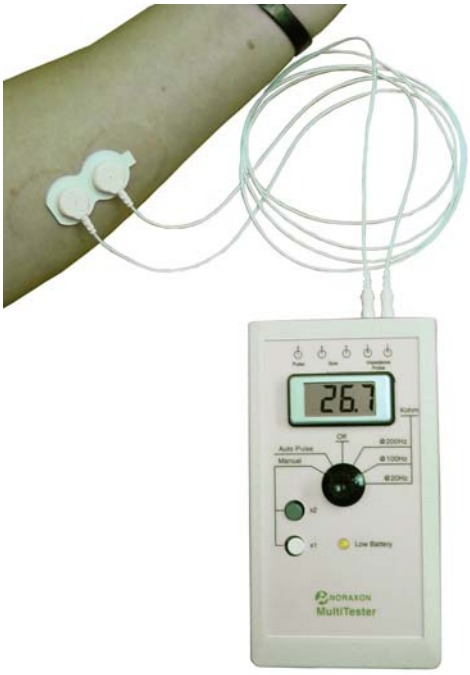


Figure 6: Impedance Measurement Mode using the Electrode Test Lead Set

Figure 7: Impedance Measurement Mode using the Quick Probe Lead Set

Advisory Note

To perform an impedance measurement, a very small (50 microamp) AC test current is delivered into one electrode, and then passes through the patient/subject before the test current is returned back to the MultiTester through the second electrode. This test current is completely harmless, but in some very sensitive individuals it can be felt as a tingling or burning sensation. This is more likely to be experienced when the measured impedance levels are low (under 10 Kohms).

Therefore, it is advisable to inform the patient/subject that they might experience a slight tingling sensation before making an impedance measurement. Keeping with that line of thought, all impedance measurements should be performed as briefly as possible. The Quick Probe was designed to facilitate making rapid measurements.

Low Battery Indicator

A green light indicates that the power is on and the battery is charged. The Low Battery light will turn red when the battery is low.

MyoResearch XP Hardware Setup

In MyoResearch XP version 1.04, the Noraxon Sensor selection in the Measurement Setup Menu contains a MultiTester. There are two buttons to select from: one is “Sinus” for the Sine Wave mode, and the other is “TTL” for the Pulse mode.

If you do not have MyoResearch XP version 1.04, the settings are as follows:

Sinus (Sine Wave)
Type: Test Sinus
Amplitude: 2000uV #dec: 3
Min Volt: 0 Max Volt: 1.000
Min Value: 0 Max Value: 2000uV

TTL (Pulse Mode)
Type: Test TTL
Amplitude: 3 Volts #dec: 3
Min Volt: 0 Max Volt: 5
Min Value: 0 Max Value: 5

Technical Specifications

Hi Level Output Signals

Manual Pulse Mode:
x1 button: Output 1 = 1.0V +/- .02V Output 2 = 1.25V +/- .03V
x2 button: Output 1 = 2.0V +/- .04V Output 2 = 2.5V +/- .05V

Auto Pulse Mode: (period = 0.5 Hz)
Output 1: 1 second on (at 1V), 1 second off (at 0V)
Output 2: 1 second on (at 1.25V), 1 second off (at 0V)

Output 2 is delayed 500 ms from Output 1.

Low Level Output Signals

1 mV peak-to-peak Sinusoid at 100 +/- 0.5 Hz

Output 1: continuous sine wave
Output 2: intermittent sine wave (1 second on, 1 second off)

Impedance Measurement

0.5K to 20Kohm +/- 0.2Kohm
Sensing current 50 uA at 20Hz, 100Hz or 200Hz

Power

9VDC battery at 45 mA

Physical

6 x 3.25 x 1.5 inches (15.2 x 8.2 x 3.8 cm)
7.9 oz. (.224 Kg)