



MEASURING FOR EXCELLENCE

ANALOG INPUT SYSTEM User Manual



Model 222BNC

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SECTION 1: INTRODUCTION

Brief Description

The Analog Input System is a complementary module for converting analog signal voltages into digital form for acquisition and storage by a computer. The basic system can acquire data from up to 16 analog voltage signals at sampling rates matching those used by Noraxon's standard EMG and kinematic sensor measuring systems. Two Analog Input Systems can be linked to synchronously measure up to 32 analog signals.

Intended Use

The Analog Input System is intended to measure and quantify analog signals separately or in combination with other kinematic or kinetic signals.

Intended Users

Researchers and individuals trained in physical medicine, physical therapy or ergonomics

Subject Populations – Medical

Individuals with cerebral palsy, physical injuries, post surgical or post stroke conditions

Subject Populations – Non medical

Athletes, workers performing job functions, subjects in new product trials

Common Applications

Acquiring analog signals from force plates or isokinetic devices in conjunction with EMG or motion related measures.






Contraindications

None

SECTION 2: DEFINITIONS

Graphic Symbols and Meaning

The following international icons and symbols are found on the Analog Input System enclosure and in this user manual. Their meaning is described below.

	The USB cable is applied to this connection.
	Read material in the Instruction Manual wherever this symbol appears.
	Identifies the manufacturer of the device.
	Identifies the serial number of the device.
	Additional information available in a separate document

Glossary of Terms

AIS – (Abbreviation for Analog Input System) A modular subsystem that can be combined with other data collection systems to separately acquire signals that exist in analog voltage form.

Channel – In the case of the AIS a channel represents any one of the sixteen measurable signals designated as Channel 1 through Channel 16.

BNC - A common electrical connector scheme used to terminate shielded wire conductors. The shielding helps to minimize stray electrical noise pickup and cross talk between signals. This style of input connector is provided with the Analog Input System model 222BNC. There are 16 BNC connectors one for each channel. Individual BNC cables are routed between the BNC signal source and the AIS BNC input connector.

DB25 – A common multi-conductor connector scheme, in this case a connector configured with 25 contacts or wire points. The AIS provides a female version of a DB25 connector as an input port or socket for attaching analog signals. (A mating DB25 male plug with cable is required to wire incoming signals.) The first 16 pins on the AIS DB25 are wired to channels 1-16. Thus all incoming signals can be compactly routed through a single cable.

Screw Terminal Strip – A means to terminate individual signal wires without the use of solder. Bare wires are placed into designated slots and secured by tightening a screw. The AIS provides two 10 point screw terminal strips as an alternate input port for wiring analog signals. The 10 point terminal strips are wired to channels 1-8 and 9-16.

Parallel Connections – A scheme whereby removing any single element does not break the flow of current, or in the case of the AIS the incoming signals. The three AIS input ports (DB25, Screw Terminal Strip and optional BNC of the 222BNC) are parallel input connections. This means any of the 3 input ports can be used separately or in combination to wire signals into channels 1-16. However, care must be taken not to terminate different signals to the same AIS channel when using more than one input connector.

Signal Common – All signals (voltages) to be measured have a point of reference, termed a common or ground connection. In addition to the signals themselves, proper measurement requires that all signal commons be wired to the AIS. This is automatically handled when BNC connectors are used. When the DB25 or Screw Terminal Strip connectors are used separate DB25 pins (17-20) or designated screws terminals (labeled as **GND**) must be connected to signal common.

SECTION 3: IDENTIFICATION

Model Designation



Model **222** Analog Input System (Standard Version)



Model **222BNC** Analog Input System with optional BNC inputs

Product Versions and Configurations

The model 222 Analog Input System can accommodate up to 16 analog signals. Two AIS systems can be linked to accommodate synchronous sampling of up to 32 analog input signals.

For additional equipment details refer to Section 9 of this manual.

As the Analog Input System requires software to perform its function, the equipment is offered in combination with the following computer program packages.

Model 133 MyoResearch-XP Master Edition
Model 430-433 myoMUSCLE

SECTION 4: GENERAL WARNINGS AND CAUTIONS

Risks and Benefits

There is **no identified risk of physical harm or injury** with use of the Analog Input System product. The benefit provided by use of the device is the provision of objective measures to assess the severity of pathological human movement conditions and gauge any subsequent improvement offered by therapy, training, prosthetic alterations or ergonomic design changes.

Safety Information Summary



Warnings

- Do not expose the Analog Input System to water or liquid
- Do not use the equipment on individuals undergoing MRI, Electro Surgery or Defibrillation
- The Analog Input System product produces results that are informative, not diagnostic. Qualified individuals must interpret the results



Attention

- The operator must be familiar with typical characteristics of the signals acquired by the Analog Input System and be able to detect anomalies that could interfere with proper interpretation.

SECTION 5: GETTING STARTED

Quick Start Guide

MR3 – Quick Start Tutorial MyoMuscle

Step 1: Home/Start Screen

1 Select a module

2 Select/create a subject

3 Select a configuration

(To create a new configuration see next page)

Continue to next step with:



Step 2: Measure

1 Check the signals from the sensors and, if acceptable, follow the steps in green the tool bar.



Step 3: Viewer

1 Review/Replay the record

2 Set a marker at each start and end of a desired analysis period

Continue to next step with:



MR3 – General Quick Start Tutorial



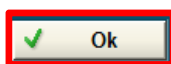
Step 4: Report Selection and Analysis Period Definition

1 Select a Report in one of the MyoMuscle tabs

2 Study report definition (Info)

Each report comes with a pre-configured mode for analysis period definition which is explained here.

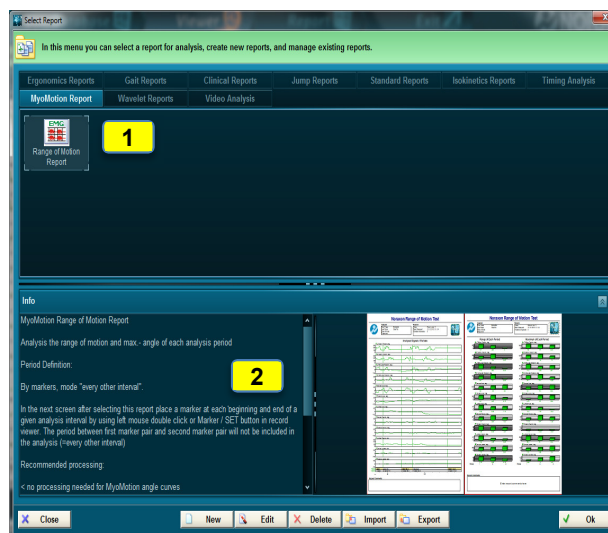
Continue to Period Definition Viewer with:



The Viewer is shown again: place marker at each start/end of analysis periods or confirm existing marker pairs (already placed in first viewer) and click:



Confirm or change the analysis period definition and continue with:



Step 5: Read and Print a Report

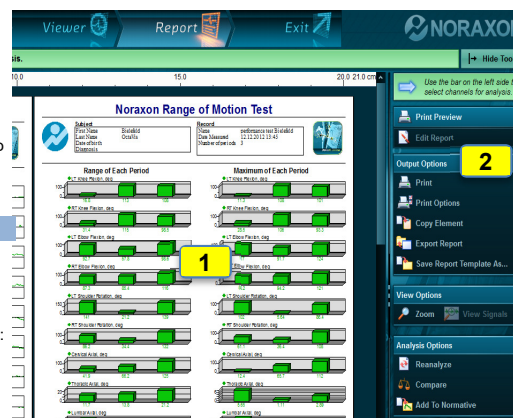
- 1 Scroll through the report results
- 2 Use Print, View or Analysis Options

Reports can be printed, copied to clipboard or exported to several files formats. The report can be Re-analyzed to adjust the period definition or to perform a comparison analysis. Averaged angle patterns can be stored as normative data or group data

Continue with:



To get back to the start screen or press measure to perform the next measurement:



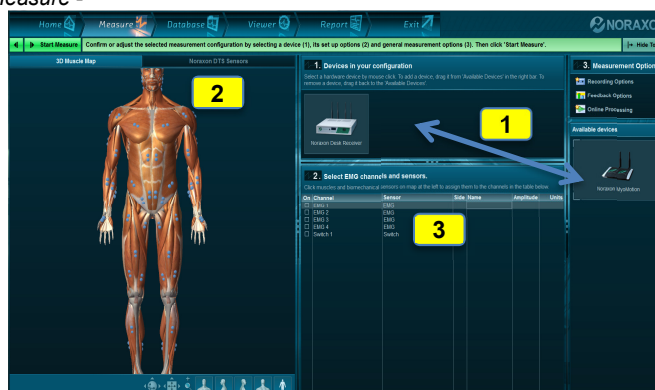
Optional step in Home/Measure: Create or Edit a measurement configuration

- click on New or Modify configuration in Home or Measure -

- 1 Insert or delete a device
by dragging a device in or from the list of "available devices"
- 2 Use "User Defined Sensors"
select the channel number and sensor tube.
- 3 Measurement Options

You can add Recording Options, Online Processing and Feedback Options if needed

Continue with:

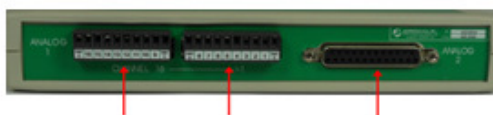


MyoResearch-XP – Quick Start Tutorial MyoMuscle

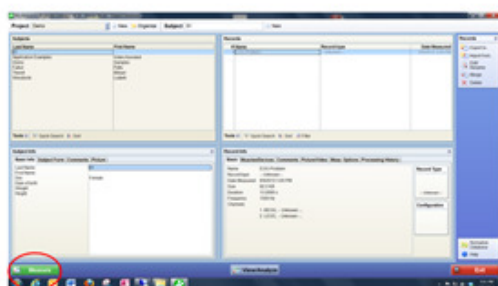
- 1) Attach USB cable to PC or USB hub



- 2) Screw down terminal strip plug (TSP) for channels 1-8 and 9-16 (if necessary) or plug a Male DB25 connector into the Female connector on the AIS

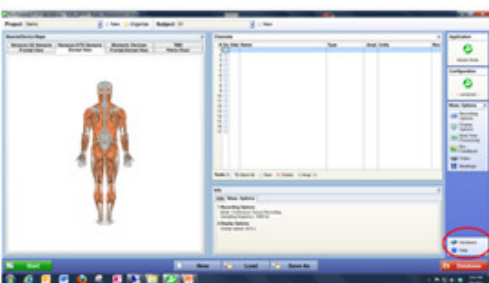


- 3) Open MyoResearch-XP and click on the **Measure** button



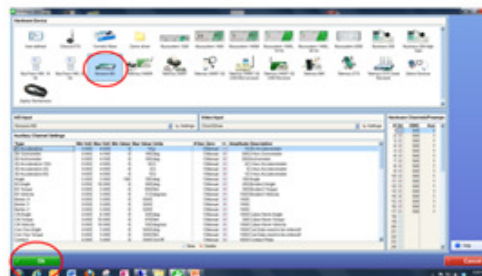
Measure

- 4) Click on the **Hardware** button



Hardware

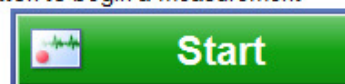
- 5) In hardware setup, select **Noraxon AIS** icon and click OK



- 6) In Measurement Setup the channel type will default to EMG. To change this, double click on the channel type and choose from the list.



- 7) When the setup is correct, hit the **Start** button to begin a measurement



For questions, comments concerns contact

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Email: support@noraxon.com

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Address: Noraxon USA, Inc

15770 North Greenway-Hayden Loop

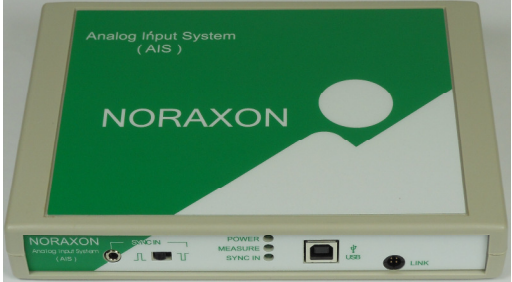


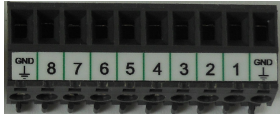
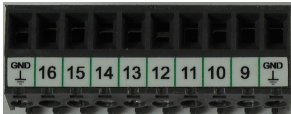
Suite #100

Scottsdale, AZ 85260 USA

SECTION 6: PREPARING THE PRODUCT FOR USE

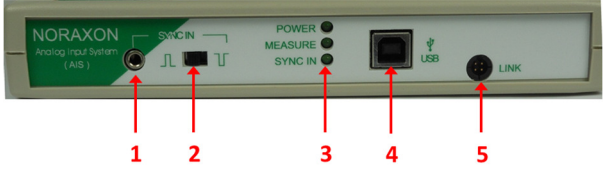
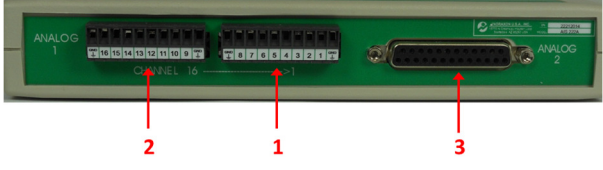
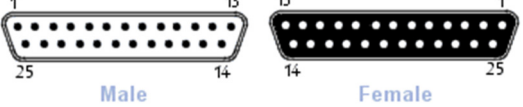
(SET-UP INSTRUCTIONS)


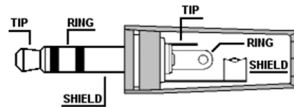
Unpacking and Component Identification

	Analog Input System (#222A)
or	
	Analog Input System (#222B) with BNC inputs
	A to B USB Cable (#CBL2)
	Terminal Strip Plug 1 (#TSP1) (Channels 1-8)
	Terminal Strip Plug 2 (#TSP2) (channels 9-16)
Additional contents not illustrated	
AIS User Manual (part #222C) <i>This document</i>	

If additional accessories have been included please see Section 9, Accessories for component identification.

Component Inputs, Outputs and Indicators

<p>1 AIS (Front)</p> 	<p>1 Sync – TTL (on-off) compatible 3.5 mm stereo jack connection to other devices. See Section 9, Interfaces for representative devices.</p> <p>2 Sync Polarity – Slide switch to accept positive or negative going sync pulses.</p> <p>3 Indicators – Green colored</p> <p>Power illuminates when attached to USB</p> <p>Measure illuminates (flashes) while measuring, off when idle</p> <p>Sync In illuminates with incoming sync pulse applied to the sync port (1 above)</p> <p>4 USB – cable port for USB connection to PC or USB hub</p> <p>5 Link – cable socket to synchronize two AIS systems for 32 channel operation</p>
<p>2 AIS (Rear)</p> 	<p>1 TSP1 – Screw down terminal strip plug for channels 1-8.</p> <p>2 TSP2 – Screw down terminal strip plug for channels 9-16. (note channels advance from right to left order)</p> <p>3 DB25 – Parallel 25 pin connector for channels 1-16.</p>
<p>3 AIS ANALOG 2 (DB25) pin connections</p> 	<p>The AIS provides a DB25 Female connector for attaching analog signals. The signals must be wired into a DB25 Male connector. (Note the mirror image for pin assignments)</p> <p>DB25 pin numbers 1-16 make direct 1 to 1 connections to AIS channels 1-16.</p> <p>Signal common should be wired to one or more of DB25 pins 17-20.</p>

4 AIS ANALOG 1 (Terminal Strip) pin connections 	<p>The AIS provides two 10-position screw terminal plugs that accept stripped and tinned wires.</p> <p>The signals should be terminated into the plugs according to the channel number labeling (1-8 and 9-16).</p> <p>Signal common should be wired to either or both of the plug's two end positions.</p>
5 Sync Port cable pin connections 	<p>The AIS provides a standard 3.5 mm phone jack connection for Sync In. The incoming sync signal is wired to a 3.5 mm phone plug 'tip' contact. Sync signal common is wired to the phone plug 'shield' contact. Sync appears as channel 17.</p>

Device Communication (Driver) Software Installation

The Analog Input System uses the Noraxon USB driver (nxnusb) for communication over the USB port. The driver is automatically installed with Noraxon software.

Companion Software Installation

The Analog Input System is compatible with several different software programs. Identify the companion software that accompanied the equipment (MyoResearch, MyoVideo or MR3) and follow the appropriate instructions given next.

MyoResearch XP Installation

1. Insert the MyoResearch XP Software CD into the PC.
2. A menu will automatically pop up.
3. Click on "Install MRXP" and follow the Wizard's instructions.
4. When the Wizard requests a password, enter the password printed on your CD case.
5. After installing MRXP exit (close) the MRXP software.
6. Click on "Install Patch" and follow the Wizard's instructions.

The installed companion software must be *activated* before unrestricted use is possible.

1. Open MRXP.
2. A dialog box will indicate how many more times MRXP can be opened.
3. Click on "Enter Activation Code".
4. Call or email Noraxon Support with the provided Activation Key.
5. Please include the following: Your name, Company/Organization Name, Serial Number on the AIS and the Activation Key.
6. Noraxon Support will email or respond by phone with the Activation Code
7. Enter the provided Activation Code to remove any restrictions on use.

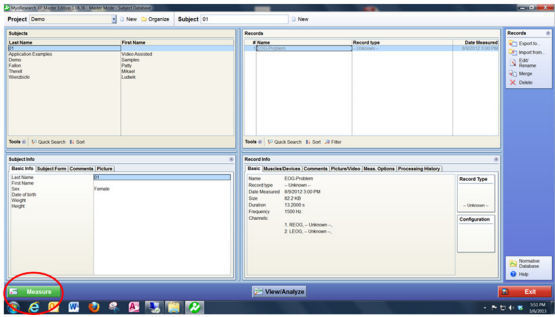

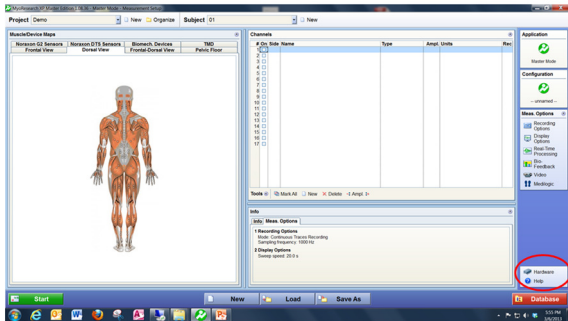
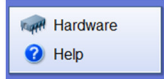
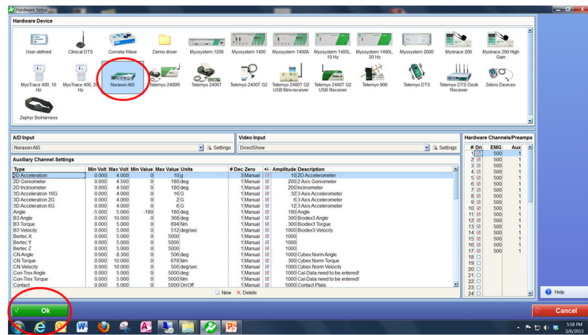

MR3 myoMUSCLE Installation

1. Insert the myoMUSCLE flash drive into the PC
2. A menu will automatically pop up
3. Click on “Install myoMUSCLE” and follow the Wizard’s instructions

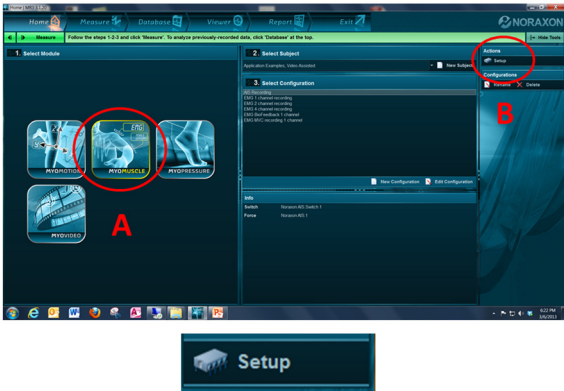
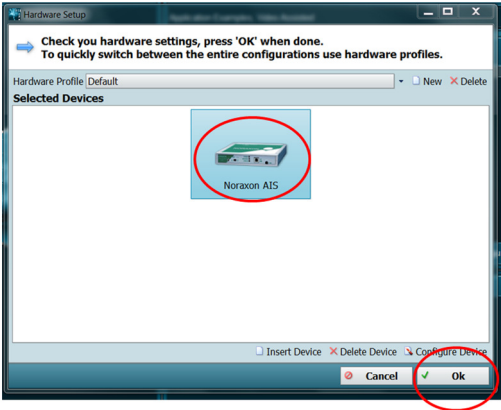
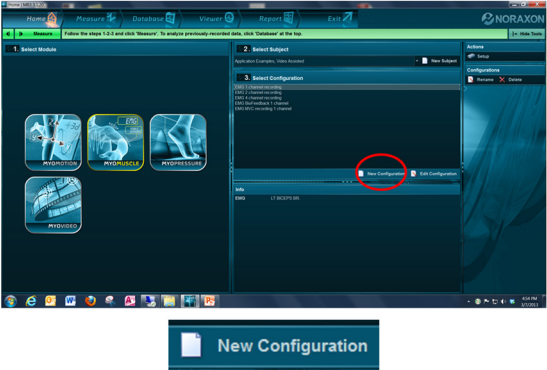
Companion Software Configuration

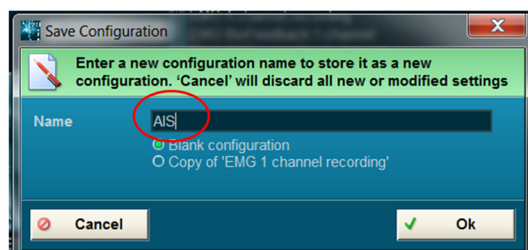
Before the AIS system can be used, the companion software must be configured to recognize the different components that make up the system. Refer to the following configuration instructions for the particular program (MyoResearch, or MR3 myoMUSCLE) supplied with the AIS.

MyoResearch XP Configuration

 	<p>Step 1</p> <p>Open MyoResearch XP and click on the Measure button.</p>
 	<p>Step 2</p> <p>Click on the Hardware button</p>
 	<p>Step 3</p> <p>Select (click on) the Noraxon AIS Icon from the various devices at the top of the screen.</p> <p>Click OK</p>

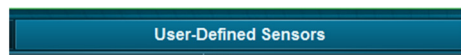
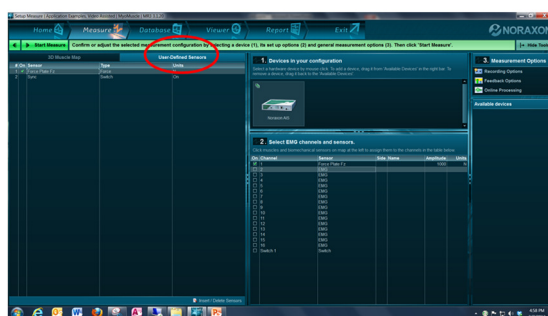
myoMUSCLE Configuration

	<p>Step 1</p> <p>Open the MR3 program</p> <p>A) Click on the myoMUSCLE Icon</p> <p>B) Click on the Setup Button</p>
	<p>Step 2</p> <p>Make sure the AIS device is attached to the USB port of the computer.</p> <p>Click on the Noraxon AIS icon</p> <p>Click OK</p> <p>Note: The AIS Icon will not be displayed if the device is not attached to the USB port of the computer. If absent go back to step 1</p>
	<p>Step 3</p> <p>Click on the New Configuration button</p> <p>(Only necessary when defining a new measurement configuration)</p>

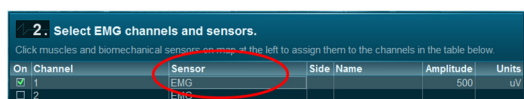
**Step 4**

Type in a configuration **Name** (label)

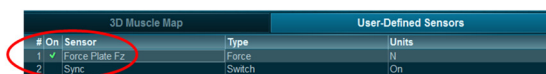
Click **OK**

**Step 5**

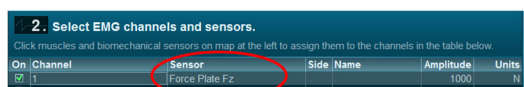
Click on the **User Defined Sensors** tab on the left side of the screen



A



B



C

Step 6

- A) Click on the channel number of interest
- B) Click on the User Defined Sensor type to be measured
- C) The User Defined Sensor will be assigned to the channel selected in step A
- D) Repeat A-C as needed

SECTION 7: PRE-USE CHECK-OUT

Normal Appearance of Indicators

If the POWER indicator is not illuminated, the AIS may not be attached to the USB port of the PC or to a USB Hub. Make sure the USB cable is connected on both ends and the computer has not turned off (set to sleep) its USB port to conserve battery power.

In the idle state, the MEASURE indicator will not be illuminated. While acquiring signals the MEASURE indicator will flash green at a low, once per second rate.

The SYNC IN indicator will flash in recognition of an externally applied sync signal. If the indicator flashes opposite to what is expected, slide the SYNC IN polarity switch into the other position.

Attaching the AIS to a signal source

Normally signal sources are semi-permanently wired to the AIS using one of the three attachment ports (ANALOG1, ANALOG2 or BNC) as described previously in section 6. If the indicators are illuminating properly but no signals are appearing on the PC screen, check to make sure the attachment connectors are secure and no individual wires or cables are disconnected.

Calibration

Calibration of the AIS itself is not required. More commonly analog signals measured by the AIS require interpretation or conversion to something more meaningful. Noraxon software provides the user with the ability to define signal or data **types**. Examples of common **types** include EMG (expressed in units of uV) or Force (expressed in units of Lbs. or Newtons).

The AIS measures voltages only. Any voltage measured by the AIS can be converted into appropriate Imperial or SI units representative of the signal source via the Noraxon supplied software's data **type** definition feature. Thus analog signals from third party devices can be defined by each user according to the creation of a unique data **type**. This activity is sometimes referred to as calibration but more properly is merely providing information about signal conversion or scaling factors.

In every case the Noraxon software presumes the signal voltage behaves in a linear fashion or otherwise varies along a straight line from a minimum to a maximum value. Since a straight line can be described by any two point pairs (x_1, y_1 and x_2, y_2) or in the case of the AIS (voltage₁, value₁ and voltage₂, value₂) it is only necessary to define two different AIS voltages and the corresponding physical values of the signal **type** at those two voltages.

The user of Noraxon software must enter at least 6 pieces of information concerning the analog voltage signal type definition:

- 1) A descriptive name for the signal or data type
- 2) The Units (Imperial or SI) which represent the signal value
- 3) A minimum voltage
- 4) Its corresponding minimal value or units
- 5) A maximum voltage
- 6) Its corresponding maximum value or units

The user should consult the supplier of the third party device for information on the nature of the analog output signal. In some cases only the maximum voltage and maximum value are given,

such as full scale output 5V = 100 Lbs. In that case it can usually be assumed the minimum voltage and minimum value are both 0 (zero). In other instances only a single scaling factor is given, which corresponds to the slope of the line relating value or units to volts. In the last example 100Lbs/5V the resulting scaling factor is 20Lb/Volt. This is an equivalent way to express the relationship of the output value to volts. In that case enter 1 as the maximum voltage and the numerator or scaling factor (20) as its corresponding maximum value.

An example of several of the Noraxon software data **type** definition screens are shown below. The user must click **New** and then enter the appropriate information in each column.

Note that the terms Min and Max are arbitrary. One does not need to literally enter the minimum and maximum voltages and values. Any two different voltages and values are acceptable with a min of 0, 0 very common for min value and min volts.

MyoResearch XP Data Type Definition Screen

Auxiliary Channel Settings

Type	Min Volt	Max Volt	Min Value	Max Value	Units	#	Dec	Zero	+	-	Amplitude	Description
2D Acceleration	0.000	4.000	0		10/g	3	Manual					10/2D Accelerometer
2D Goniometer	0.000	4.500	0		180/deg	1	Manual					200/2 Axis Goniometer
2D Inclinator	0.000	4.500	0		180/deg	1	Manual					200/Inclinometer
3D Acceleration 16G	0.000	4.000	0		16/G	1	Manual					32/3 Axis Accelerometer
3D Acceleration 2G	0.000	4.000	0		2/G	1	Manual					6/3 Axis Accelerometer
3D Acceleration 6G	0.000	4.000	0		6/G	1	Manual					12/3 Axis Accelerometer
Angle	-5.000	5.000	-180		180/deg	1	Manual					180/Angle
B3 Angle	0.000	10.000	0		368/deg	1	Manual					300/Biodex3 Angle
B3 Torque	0.000	5.000	0		694/Nm	1	Manual					300/Biodex3 Torque
B3 Velocity	0.000	5.000	0		512/deg/sec	1	Manual					1000/Biodex3 Velocity
Bertec X	0.000	5.000	0		5000	1	Manual					1000
Bertec Y	0.000	5.000	0		5000	1	Manual					1000
Bertec Z	0.000	5.000	0		5000	1	Manual					1000
CN Angle	0.000	8.300	0		506/deg	1	Manual					1000/Cybex Norm Angle
CN Torque	0.000	10.000	0		678/Nm	1	Manual					300/Cybex Norm Torque
CN Velocity	0.000	10.000	0		500/deg/sec	1	Manual					1000/Cybex Norm Velocity
Con-Trex Angle	0.000	5.000	0		5000/deg	1	Manual					1000/Cal-Data need to be entered!
Con-Trex Torque	0.000	5.000	0		5000/Nm	1	Manual					1000/Cal-Data need to be entered!
Contact	0.000	5.000	0		5000/On/Off	1	Manual					5000/Contact Plate

MyoMuscle Data Type Definition Screen

Edit User Sensors

Manage your custom sensors in this dialog. When inserting a new sensor, refer to its technical specification for the proper parameters of conversion from the voltage to the physical units.

#	Sensor	Type	Calibr	Res	Units	Min Units	Max Units	Min Volts	Max Volts
1	Force Plate Fz	Force	Manual	1	N	0.000	1000.000	0.000	10.000

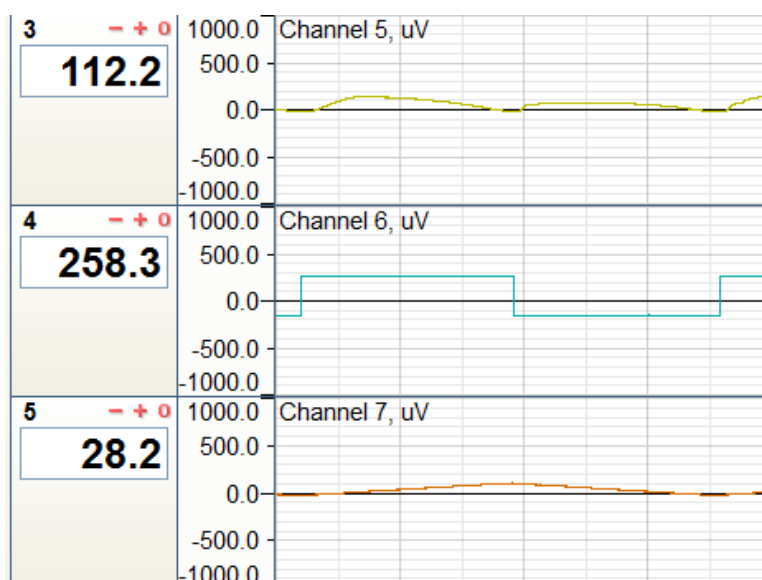
SECTION 8: OPERATING INSTRUCTIONS

Safety Information Summary

There are no safety related restrictions on use of the AIS.

Normal Functions with Interface to a PC

During normal operation the AIS **MEASURE** indicator will be illuminated. Analog signals wired into the input channels of the unit will be shown graphically on the computer screen.



Exceptional Functions/Situations (error messages)

Error Message	Meaning
Cannot Open USB Driver. Device can be unplugged or turned off.	1. The USB cable is disconnected 2. The USB port on the PC does not have the USB driver installed

For more detailed USB troubleshooting instructions consult this link:

<http://www.noraxon.com/support/faqs/docs/usb-device-not-found-users-v4a.pdf>

To obtain a more extensive breakdown of errors, it is possible to activate a logging feature for the AIS. In this case all measurement activity is written to a file named *nxairg2.log* found in the root folder of the application software. This file may be copied and sent to Noraxon for an in depth analysis.

SECTION 9: ACCESSORIES AND OPTIONAL MODULES

Accessories

Part No.	Image	Description	More...
222X		Cable for linking together two AIS devices	
CBLS1		Sync cable (to other Noraxon devices)	

As new accessories may be available after the time of printing, please check Noraxon's website at this link for the latest offerings.

<http://noraxon.com/products>

Interfaces to Other Devices

Device	Part No.	Description
Biodex Systems 3&4	222E	10 ft. cable for Torque, Velocity and Position
CSMI (Cybex Norm)	222F	10 ft. cable for Torque, Velocity and Position
AMTI MSA6 Out	222G	10 ft. cable for Fx, Fy, Fz, Mx, My, Mz
Bertec AM6501 Out	222H	10 ft. cable for Fx, Fy, Fz, Mx, My, Mz

SECTION 10: CLEANING

Safety Precautions When Cleaning



WARNING

Only use a damp cloth with mild soap and water or isopropyl alcohol to clean the Analog Input System.

Do not immerse the enclosure in any water or liquid.

Cleaning by Users

If needed the AIS can be cleaned with a cloth slightly dampened with a solution of mild soap and water or isopropyl alcohol.

SECTION 1 1: MAINTENANCE

Safety Precautions When Performing Maintenance

No precautions required.

Maintenance by Users

No routine maintenance is required for the Analog Input System.

Maintenance by Qualified Individuals

The following activities should only be undertaken by PC support (IT) personnel, equipment technicians, or those with suitable training.

Companion Software Updates

- Perform a backup of the data folders to a separate drive as a precaution.
- Click on the Patch/Update link provided in the email or as given on the Noraxon website <http://noraxon.com/software-downloads>
- Download the Patch/Update file.
- To install the Patch/Update, click “Run” on the dialog box. No password is required.

Device Software (firmware) Updates

The internal program (firmware) inside the Analog Input System can be updated through the use of a special utility program available at this link:

<http://noraxon.com/software-downloads>

The installed program will permit updates to the Analog Input System

SECTION 12: TROUBLE SHOOTING, FAULT DIAGNOSIS

Troubleshooting Chart

Symptom: Problem with the PC recognizing the AIS	
Possible Reason	Remedial Action
USB cable is disconnected or loose	Check USB cable connection at both AIS and computer (including a USB hub and its power if used)
The USB port on the computer is in power save mode or a USB hub is not powered.	Disable the power saving mode on a laptop computer. If used check that a USB hub is powered.
Symptom: Problem with a non-changing signal appearing on a given channel	
Possible Reason	Remedial Action
An unconnected input may report a constant value (typically around 2 Volts)	Check the given input channel for broken or disconnected wires at either end (AIS or signal source).
Symptom: Problems with a DC offset on some or all channels	
Possible Reason	Remedial Action
The application software zero offset control button was pressed.	Cancel the active measurement and then press the start button to begin over.
The selected data type for affected channels may automatically perform a zero offset correction at the start of a measurement. (See section 7 about data types)	Check data type assigned to the affected channels. The zero correction (Zero or Calibr column) for the data type should be <i>manual</i> and not <i>automatic</i> .
Symptom: Problems with cross talk or similar signals appear on several channels	
Possible Reason	Remedial Action
An unconnected input may mimic or copy the signal on an adjacent properly wired channel.	Check the given input channel for broken or disconnected wires at either end (AIS or signal source).
Symptom: Problems with unrecognizable signals appearing on one or more channels	
Different signals are wired to the same AIS channel but on different input connectors.	If both the ANALOG1 and ANALOG2 (or BNC) connectors are used, unplug all but one connector then check the results.

Website Link to FAQ

Answers to common questions can be found at Noraxon's Frequently Asked Questions (FAQ) website page at this link:

<http://noraxon.com/faq>

Other educational material is available at this link:

<http://noraxon.com/educational-materials>

SECTION 13: SERVICE AND REPAIR

Availability of Circuit Diagrams and Component Lists

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 Analog Input System.

Warranty Information

Noraxon equipment including optional items is guaranteed to be free from defects in material and workmanship for 1 year from the date of purchase. The warrant period begins on the date of product shipment from Scottsdale, Arizona.

Warranty coverage does not apply to damage incurred through accident, alteration, abuse or failure to follow instructions contained in this document.

An optional extended warranty is available. Please contact Noraxon USA for further details.

Submitting Service Requests

A Service Request can be submitted using the online form available at this link:

<http://noraxon.com/service-request>

Provide all information requested by the form including a **detailed** description of the problem being experienced and your telephone number or e-mail address.

Returning Equipment

Be sure to obtain an RMA Number (return material authorization) before returning any equipment. Completing the online service request form will assign an RMA Number. Otherwise contact Noraxon USA.

Send the equipment **postage prepaid** and **insured** to the address below. Include the RMA Number on the shipment label. Mark the package "Goods to be repaired – Made in USA" to avoid unnecessary customs charges. (Beware listing a Customs or Insurance value of \$5,000.00 USD or more will result in a delay at United States Customs.)

Noraxon USA
15770 N. Greenway-Hayden Loop
Suite 100
Scottsdale, AZ
85260, USA




If you are shipping from outside the USA please use UPS, FedEx, DHL, or EMS (US Postal Service) and **not a freight-forwarder**. Using a freight-forwarder incurs additional brokerage fees. If a package is shipped to Noraxon via a carrier other than the ones listed above, it may be refused.

SECTION 14: SPARE PARTS AND CONSUMABLES

Consumable Items

None

Replaceable Items

Part No.	Image	Description
CBL2		USB Type A cable set (AIS to PC)
TSP1		Terminal Strip Plug 1-8
TSP2		Terminal Strip Plug 9-16
222X		AIS Link Cable (AIS 1 to AIS2)

SECTION 15: TAKING PRODUCT OUT OF OPERATION

Disposal of Equipment

Please check with the governing authorities in your location before disposing of the Analog Input System and its contents.

SECTION 16: SPECIFICATIONS OF THE PRODUCT

Expected Useful Lifetime

The Analog Input System has a usable life of seven years.

Dimensions and Weight

- Dimensions:
 - Standard Version 7.5" L x 5.5" W x 1.2" H (19 cm x 14 cm x 3 cm)
 - BNC Version 7.5" L x 5.5" W x 1.7" H (19 cm x 14 cm x 4 cm)
- Weight:
 - Standard Model 12.5 oz. (354 grams)
 - BNC Model 16.3 oz. (462 grams)

Performance Characteristics

Data Acquisition System

- 16-bit resolution
- Bipolar input voltage range $\pm 10V$
- Input overvoltage protection $\pm 16 V$ (no damage)
- Input impedance 1 Meg ohm
- Oversampling 64x (192 KHz per channel)
- Final sample rates 1500 or 3000 samples/sec/channel
- Second order anti-alias filter (3db cutoff at 22 KHz)
- Sync input logic low < 0.4 volts
- Sync input logic high > 1 volt
- Sync input maximum 5 volts

Energy Consumption, Condition of Use

- The Analog Input System is powered by USB host 5V at 150 ma

Environmental Conditions for Storage and Transport

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

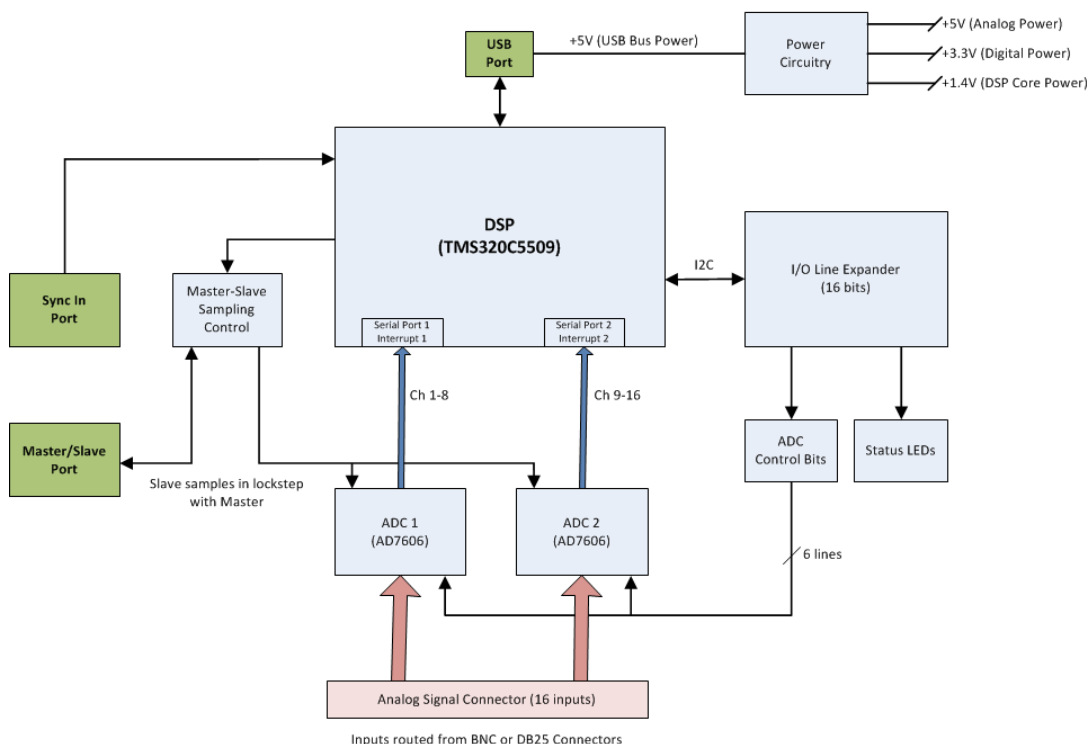
IP (Ingress Protection) Rating

The Analog Input System enclosure has a low ingress protection rating (IP20). The AIS is not waterproof. Care must be taken to avoid exposure to all liquids.

SECTION 17: TECHNICAL INFORMATION

Block Diagram

Model 222 USB ADC Block Diagram



Theory of Operation

The Analog Input System is completely powered by the USB connection to a PC. All necessary internal operating power levels are derived from the USB power supply of the PC (or USB hub).

A digital signal processor controls the acquisition of digital readings from two 8-channel precision Analog to Digital (A/D) integrated circuits. The analog signals are oversampled by a factor of 64. Operationally 64 readings are taken and averaged to produce one reading transferred back to the computer via the USB communication link. This high rate of oversampling alleviates the need for a high order (strong) anti-aliasing filter and significantly reduces noise levels normally present on electronic signals. Sampled data is reported back to the computer at either a rate of 1500 or 3000 samples per second.

Data in 16 bit resolution is transferred back to the PC for all 16 channels. In addition a 17th channel is also passed. This is a binary (1 bit) signal that represents the state of the sync channel (present or absent, on or off). This allows the AIS acquired analog data samples to be correlated with a common external synchronizing signal. The sync signal is only monitored and does not control the start or stop of AIS data collection.

Two AIS devices can be connected by cable in a linked Master-Slave arrangement. The sole purpose of this link is to ensure both devices sample signals at exactly the same instant in time. This allows precise alignment of up to 32 analog signal channels.