

**Instruction Manual**  
**4416C ISOTRON® Signal Conditioner**  
**REV: A**

## SAFETY CONSIDERATIONS

This equipment has been designed and tested in accordance with the following standards:

EN61326-1:2013 Electrical equipment for measurement, control and laboratory use – Group1, Class B (Emissions)

EN61326-1:2013 Electrical equipment for measurement, control and laboratory use – Industrial Environment (Immunity)

CFR 47, Class A Code of Federal Regulations: Pt 15, Subpart B

This equipment is not designed to be used in potentially explosive environments. It should not be used in the presence of flammable liquids or gases.

This manual contains information and warnings that must be followed to ensure safety of personnel and the safe operation of the equipment.

## Warnings:

Switch off all power to equipment before making or breaking a connection. Failure to do so may cause damage to the equipment.

Any adjustment, maintenance or repair, other than detailed within this manual, must be carried out by trained service personnel.

If it is suspected that the correct operation of the equipment is threatened, impaired or otherwise, it must be made safe and free from further operation until the threat has been removed.

RoHAS Compliant 2011/65/EU

Waste Electronic and Electronic Equipment Directive: 2012/19/EU

This product complies with the WEEE Directive (2012/19/EU) marking requirement. The affixed product label (below) indicates that you must not dispose this electrical/electronic product in domestic household waste.

To return unwanted product for disposal, please contact your local MSS Representative.



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## 1. Basic Information

The Model 4416C ISOTRON® Signal Conditioner is a portable/desk top low-noise signal conditioner for use with integral electronics piezoelectric (IEPE) transducers or piezoelectric (PE) transducers when used with a remote charge converter (RCC). The unit provides the two wire constant current supply to the transducer/remote charge converter and signal amplification/filtering. Signal amplification (gain) is selectable as x1, x10 or x100 and the fixed frequency cut-off filter is selectable as IN or OUT. The unit is powered from an internal Lithium Ion (Li-ion) battery that can be recharged using the supplied charger. Led indicators are used to show the status of the battery, gain range selected, filter in, input status and battery charge.

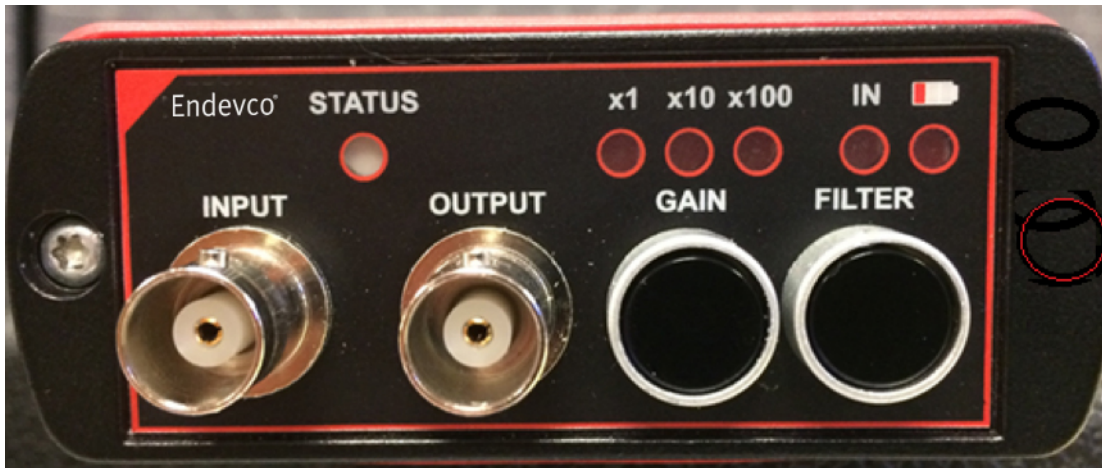


Photo 1. Front Panel

## 2. Detailed Description

### 2.1 Input

#### 2.1.1 Connection

The 4416C supports transducers with integral electronics, i.e. ISOTRON® and IEPE and also Piezoelectric (PE) types with the use of a remote charge converter (RCC). Input connector is a standard BNC located on the front panel with one side connected to signal ground. Power to the transducer/RCC is available at the input socket in the form of a constant current of 4.7mA with a compliance voltage of 24V dc.

#### 2.1.2 Status

An indicator on the front panel shows the status of the input – if a transducer is connected and functioning correctly the indicator will be “green”. If a fault condition exists, the indicator will be “Red”. A fault condition exists when

either the input is open circuit, i.e. no transducer connected, or if the input is short circuit, i.e. a cable fault. During turn on, both green and red conditions are cycled before the steady state is reached.

## 2.2 Output

### 2.2.1 Connection

The output connector is a standard BNC located on the front panel with one side connected to signal ground. The case of the unit is also connected to signal ground. If a connection to earth is required it should be made through via the output connector to associated instrumentation.

### 2.2.2 Gain

Three levels of amplification (gain) are provided and selectable on the front panel. The selected gain level is shown by the associated indicator.

### 2.2.3 Filter

A low pass filter is provided in the form of a second order Sallen Key. With the filter indicator on, the filter is selected IN.

## 2.3 Power

Power for the Conditioner comes from an internal Li-ion cell pack, and a supplied external universal power adapter. The power adapter functions as a charger for the internal battery, but also will power the Conditioner, while the battery is being charged. Battery charge and discharge are managed by internal circuitry to provide a safe and effective environment for the battery to operate. It is recommended that the charger be disconnected once charging has stopped to maximize battery life.



Photo 2. Rear Panel

**Warning!** Only use the power adapter supplied with the 4416C for charging otherwise internal damage may occur!

## 2.3.1 Turn On

The conditioner is turned on and off by a switch on the rear panel. To turn on, press the “1” and to turn off, press “0”. When turned on the Conditioner will cycle through the front panel indicators lighting the gain indicators in turn and lighting the filter indicator.

## 2.3.2 Low Battery Indicator

The battery Low indicator is on the front panel and will be “Red” when the battery reaches a pre-determined level. At this point it is recommended that the charger be connected. If the charger is not connected at this point the unit will continue to function until a second predetermined battery level is reached. At this point all power is turned off and no further operation is possible. The battery must be recharged before reuse, or connected to the charger and used while charging.

## 2.3.3 Battery Charge Indicator

The battery charge indicator is mounted above the charger socket on the rear panel. While charging is in progress the indicator will be “green”. When charging is complete the indicator is extinguished.

## 3. Operation

For optimum performance, it is recommended that the unit be fully charged before using it the first time. Note: Ensure the Conditioner is turned off before making any connecting to the 4416C. Once connections have been made, the unit can be turned on with the switch located on the rear panel. The unit will then cycle the front panel gain and filter indicators to verify all are working.

### 3.1 Transducer Connection

The transducer/RCC is connected to the Input socket. A constant current supply powers the transducer /RCC. When powered on, the transducer/RCC will set a bias voltage at the input of the 4416C of approximately 12Vdc (dependent on the transducer). The 4416C monitors the dc bias to be within a pre-set range of 8V to 16 VDC. If the bias is within the range the status indicator is turned Green and the system is ready to use. If the bias is out of range, the status indicator is turned Red – an alert condition exists. (This does not mean a sensor is bad, just verify the bias voltage is acceptable.) Note: Some transducers can take 1 – 2 minutes before the bias settles into range, and some Low Frequency RCC's can take as long as 5 minutes to reach their operating point.

## 3.2 Output Connection

Measuring Instrumentation, i.e. data acquisition, data logger etc., should be connected to the output socket using coaxial cables. Load impedance should be no lower than 100kΩ to meet all specifications. Ideally, the 4416C should be placed near the measuring instrumentation to minimize the effect of cable capacitance loading.

## 3.3 Gain Setting

Depressing the “Gain” switch cycles through the gain ranges of x1, x10 and x100. The gain range selected is shown by the indicator above the range turning Green. The gain together with the transducer sensitivity determines the acceleration range available from the system and the output sensitivity, i.e. for an accelerometer with a sensitivity of 10mV/g pk, and the maximum output of the 4416C being 10V pk:

Gain = 1 Range = 1000g Output sensitivity = 10mV/g

Gain = 10 Range = 100g Output sensitivity = 100mV/g

Gain = 100 Range = 10g Output sensitivity = 1000mV/g

## 3.4 Filter Selection

A second order low pass filter is selected by depressing the filter switch. This toggles the filter in and out. With the indicator Green, the filter is selected IN. The Standard filter provides attenuation of -5% at approximately 10kHz, and -3dB at 30 kHz for gains of 1 and 10, or 18kHz for gain of 100. The filter maybe used to reduce the effects of HF noise and aliasing in data acquisition systems.

## 3.5 Battery Charging

Ensure that both the Charger and Conditioner are turned OFF before connecting. Plug the Charger connector into the socket on the rear panel of the Conditioner. Turn on the charger. Charging is accomplished in two stages:

### **Stage 1 – Fast Charge Mode**

“Fast Charge Mode”, covers both constant current and constant voltage modes and charges the battery to approximately 85% of its capacity in approximately 3 hours. Once 85% capacity has been achieved, the charging will automatically switch into “Stage 2”.

### **Stage 2 – Trickle Charge Mode**

“Trickle Charge Mode” will deliver sufficient charge to top up the battery to 100% of its capacity in approximately 45 minutes.



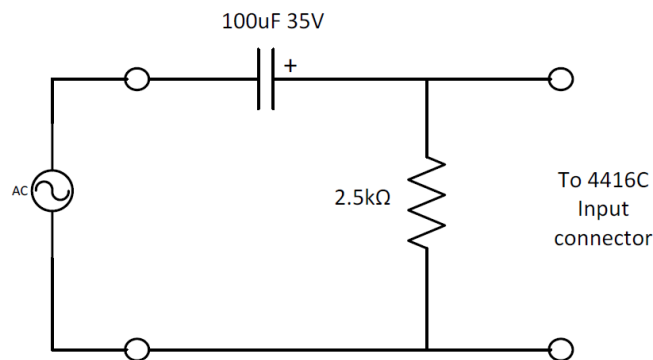
Once 100% capacity has been achieved the charge indicator will extinguish. In the event of a fault with the battery charging circuit, or the battery pack itself, the charge indicator will be “Red”. In this event, please contact your local representative to arrange for the repair of the Conditioner. Note: For any repair, return the charger with the unit to insure all components are performing properly – the charger could be the problem source.

The charging times are approximate and will vary depending on initial battery charge state and temperature. If the Conditioner is turned on while being charged, the power from the charger will be shared between operation and charging with the priority given to its operation.

To conserve battery life, it is recommended that once the battery is fully charged, the charger is disconnected.

## 4. Maintenance, Calibration and Repair

If the unit is suspected of not working or malfunctioning it can be checked by use of the following circuit. This circuit should also be used when performing a calibration of the unit.



### 1.1 Check Out Procedure

#### 4.1.1 Equipment Required:

Signal Generator, static free mat, DMM and Oscilloscope

#### 4.1.2 Instructions

- Ensure the battery is fully charged.
- Connect the circuit above to the input of the 4416C.
- Set the signal generator for 70mV rms at a frequency of 100Hz.
- Turn on the 4416C and select a gain of 1. Allow 5 minutes to stabilize.
- Measure with the DMM across the 2.5kΩ resistor for a voltage of approximately 12V dc.
- Verify on the oscilloscope that an undistorted sine wave of approximately 100mV pk is displayed.

- Select a gain of 10. Verify the signal on the oscilloscope is undistorted and approximately 1V pk in amplitude.
- Select a gain of 100. Verify the signal on the oscilloscope is undistorted and approximately 10V pk in amplitude.
- To verify the output noise, replace the signal generator with a short circuit.
- If any of the above conditions are not met, the unit should be considered faulty and requires repair.

## 4.2 Repair

In the event that the Conditioner requires repair please contact your local Sales Representative or distributor who will advise on the returns procedure. Note: Return the charger with the Conditioner whenever repair is required. The charger could be the source of the problem.

## 4.3 Battery Replacement

Battery life is > 300 cycles, which under typical operating conditions should exceed 3 years. Should the battery need to be replaced please contact your local Sales Representative or distributor who will advise on the returns procedure.

The internal battery of the Model 4416C is located centrally within the case. Replacement of the battery requires minimal skill but the greatest of care. The following describes how to replace the internal battery.

Parts Required: Replacement Battery – Part Number EHM2106  
Tools Required: Torx T10 Driver, Small sharp implement

### 4.3.1 Procedure

- a. Using the small sharp implement, gently pry out and remove the plastic screw covers located on the front panel, shown removed on the left side and at the red circle on the right side of the front panel in Photo 3 below. Do not discard the plastic covers.
- b. Remove the two screws securing the front panel using the T10 TORX driver. Gently pull the front panel away from the body – there are short connecting wires behind the panel. Note: The gasket remains with the panel.
- c. In a similar manner, remove the two screws securing the rear panel using the T10 TORX driver. Gently pull the front panel away from the body – there are short connecting wires behind the panel, shown in Photo 4. Do not discard the covers. (The wire connections can be disconnected if preferred, but less stress on the cables is better.)
- d. Gently rotate the rear panel at an angle, allowing it to be flat, to easily pass through the case by pushing from the rear, extracting the entire assembly from the front. The entire assembly and battery will slide out with the circuit

board. A gasket goes with each panel. Place the entire circuit board assembly on a static free surface, to prevent potential static damage to components. See Photo 5.

- e. Unplug the battery from the socket on the circuit board. See photo 5.
- f. Locate the new battery and connect it to the socket on the circuit board.
- g. Gently ease the rear panel and one gasket first, into the case, followed by the circuit board and battery into the case, compressing the battery foam. Note: The circuit board is located in the lower channel in the case, just below the two mounting screw holes. See Photo 6.
- h. Replace and secure the rear panel.
- i. Replace and secure the front panel.
- j. Replace all plastic screw covers.
- k. Place the unit on charge.
- l. Dispose of the original battery responsibly or return it to MSS for disposal.

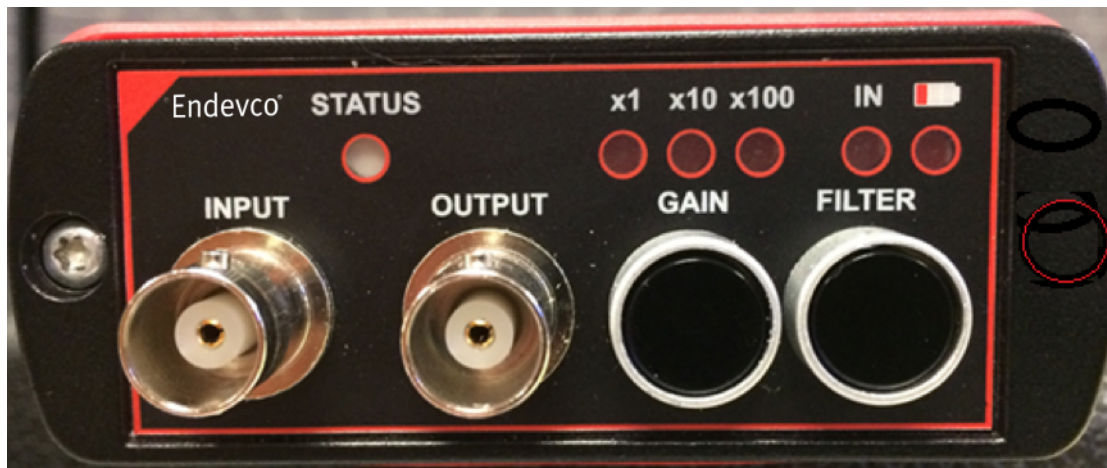


Photo 3



Photo 4

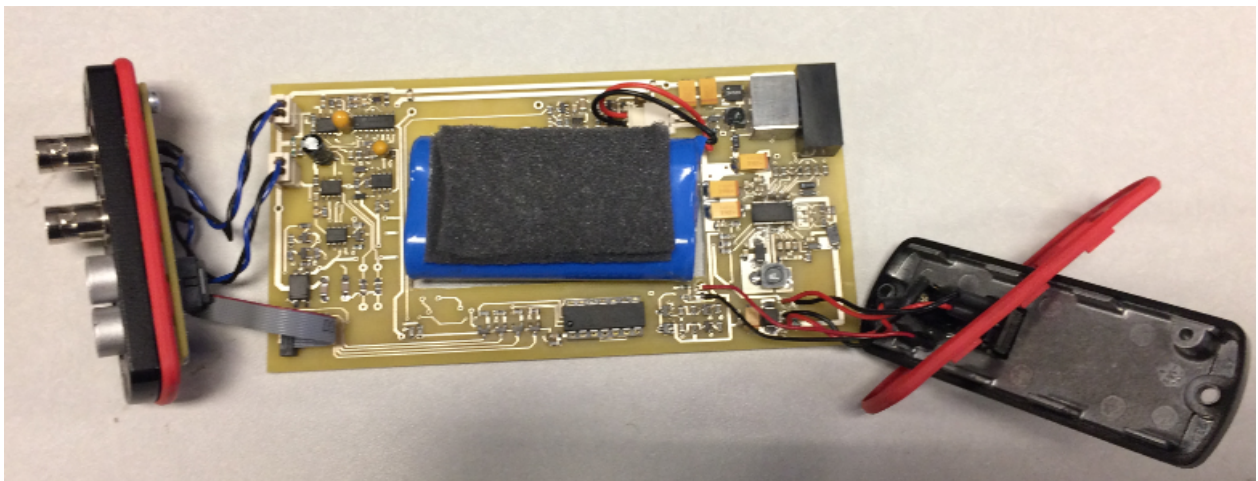


Photo 5

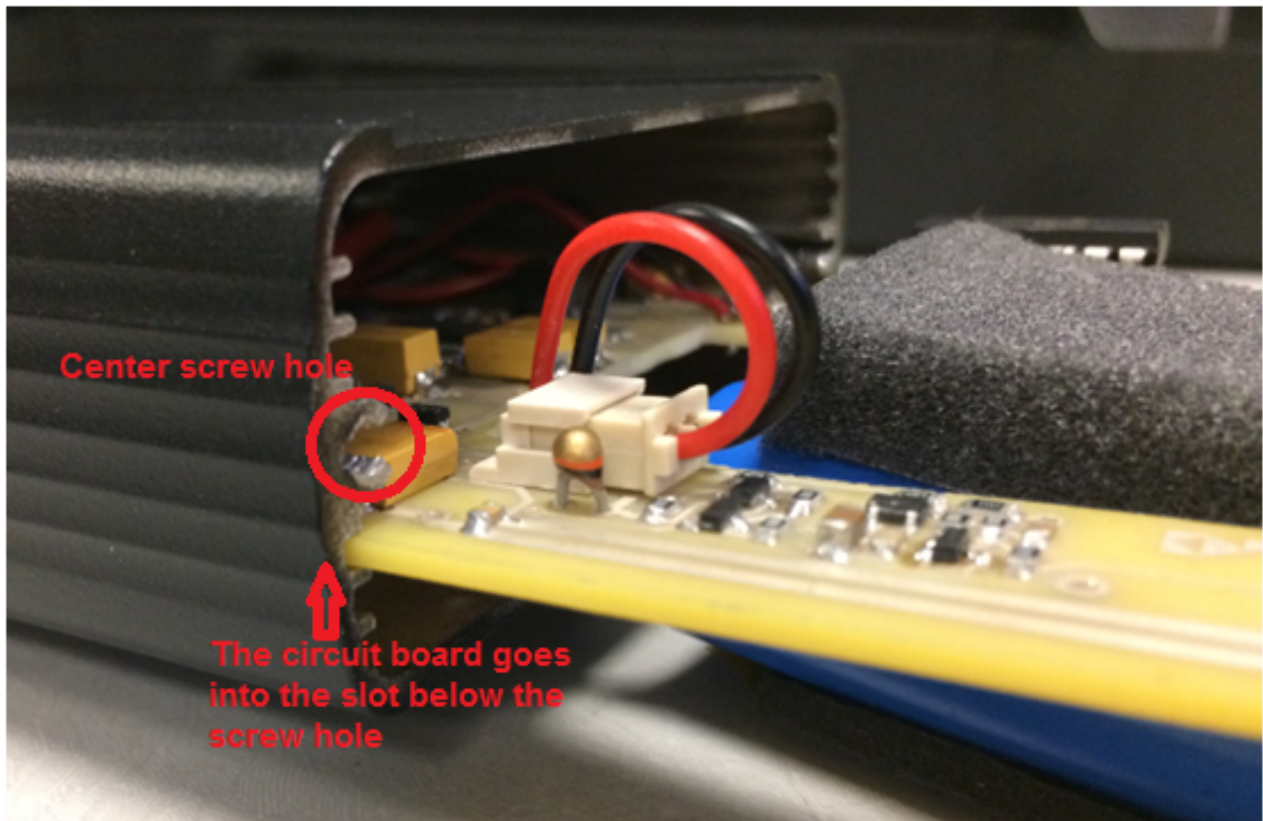


Photo 6

## 5. Options and Accessories

### 5.1 Included Accessories

QSG4416C  
IM4416C  
website)  
EHM2107

Quick Start Guide included  
Instruction Manual (Download from [Endevco.com](http://Endevco.com))

Universal power supply, with adaptors for USA, UK, EURO, Japan and Australia

### 5.2 Options

EJ21  
EHM2106  
EHM2107

10-32 to BNC adapter  
Replacement Battery  
Replacement Universal power adapter

## 6. Compliance

- 6.1 ROHS to 2011/65/EU;
- 6.2 CE to EN61326-1:2013; CFR47 Pt 15 B Class A.