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EPOCH SYSTEMS

Dual-Channel Wireless EEG Systems

EPOCH-MSE-SYS Mouse EEG System

EPOCH-RAT-SYS Rat EEG System

EPOCH-PUP-EEG-S Pup EEG System

EEG Wireless 2 Channel Sensors

EPTX-10128, EPTX-10129, EPTX-10165, EPTX-10212, EPTX-10213

EEG Wireless 4 Channel Sensors

EPTX-10211, EPTX-10210, EPTX-10238

EEG Wireless 6 Channel Sensors

EPTX-10208, EPTX-10209

EPOCH Differential Sensors

EPTX-10215, EPTX-10216, EPTX-10264, EPTX-10265, EPTX-10266, EPTX-10267

Wireless Telemetry Receiver Tray

EPRCVR-P4-100, EP2RCVR-M2-1/1, EP2RCVR-M2-1/2, EP2RCVR-M2-2/2, EP6RCVR-M6-60, EP2RCVR-R2-1/1, EP2RCVR-R2-1/2, EP2RCVR-R2-2/2, EP6RCVR-R6-60

Single-Channel Wireless ECG Systems

EPOCH-M-ECG-SYS Mouse ECG System

EPOCH-R-ECG-SYS Rat ECG System

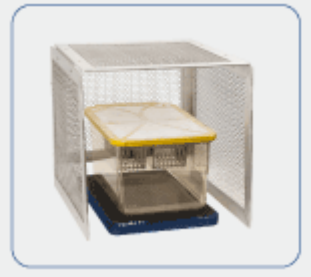
ECG Sensors

EPOCH-M-ECG-SEN Mouse ECG Sensor

EPOCH-R-ECG-SEN Rat ECG Sensor

EPOCH Sensor Activator

EPOCH-ACTI EPOCH® Sensor Activation Utility



Complete system includes a receiver tray, two 2-channel implantable EEG sensors, and interface cables (2 x CBL102 for MP150/UIM, 2 x CBL123 for MP160/HTL, or CBL125+SS9LA for MP36/36R) to collect data from a mouse or rat housed in an industry standard home cage. To record, the animal's cage is simply placed on top of the receiver tray with the implanted animal inside of the cage. EEG data from the sensor is telemetered to the receiving tray and then sent to the data acquisition system.

Complete ECG system includes a receiver tray, two single-channel implantable ECG sensors, and interface cables (2 x CBL102 for MP150/UIM, 2 x CBL123 for MP160/AMI/HTL, or CBL125+SS9LA for MP36/36R).

EPOCH® EEG Sensors amplify and transmit of high-fidelity EEG data and are available with two, four, or six channels. Implants are small enough to be implanted into mice as young as P21. The receiver tray has BNC connections that easily connect to a BIOPAC MP160/MP150 data acquisition system (via the AMI100D, HLT100C, or UIM100C) or third-party devices capable of accepting signals within the ±5 V range.

Sensors are shipped with the default Gain setting; other Gain settings are available if requested before order is placed. Acq*Knowledge* software includes the scale settings for each sensor Gain option.

Use the EPOCH Wizard to check compatible/recommended system components: www.biopac.com/epoch-wizard

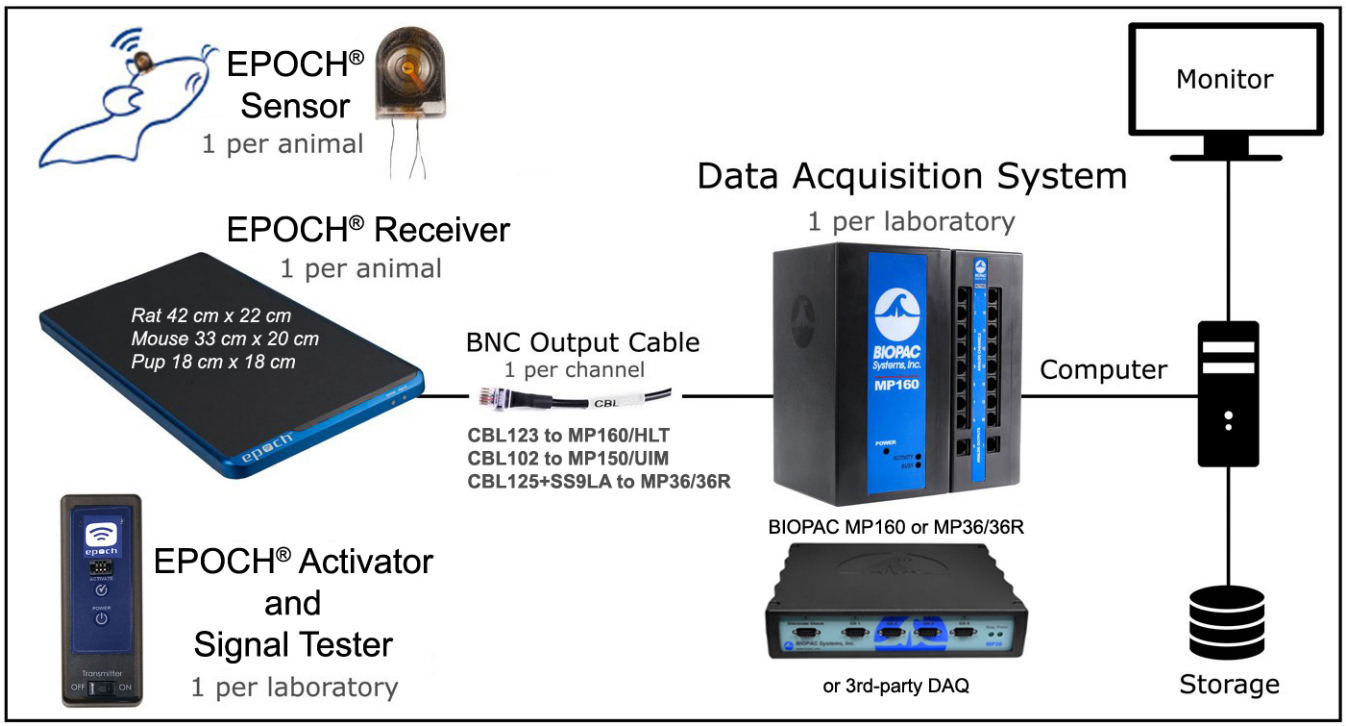
Click to view an EPOCH System Diagram with MP Hardware.

Neural Implant Options

Typical Use	Gain	Settings
EEG, ECoG, LFP - **default**	2000x	±1.0 mV range, 1.0 mVpp in = 2 V out
Status-Epilepticus	800x	±2.5 mV range, 5.0 mVpp in = 2 V out
LFP, EEG in rat or mouse pups	4000x	±0.5 mV range, 1.0 mVpp in = 2 V out

When used with an MP Research System, use the power of Acq*Knowledge* software's automation and scoring tools to identify seizures, predefine and control recording protocols, or set triggers based on external events (dosing, light changes, etc.). After recording, use automated EEG or ECG analysis routines to quickly score multiple channels of data simultaneously. Derive frequency bands, complete a Frequency analysis, look at Alpha RMS, etc., all with guided automated routines.

For more options, add SleepSign (SSA100W) for complete sleep data analysis or use Camera Systems (CAMSYS4 or 8) to monitor and record protocols and animal behavior. Recorded video will be time synchronized to the physiological signals in Acq*Knowledge* for easy investigation of key areas of interest.



Use the EPOCH Wizard to check compatible/recommended system components: www.biopac.com/epoch-wizard

Implantable EEG Sensors (2 CH, EPTX-10128, EPTX-10129, EPTX-10165, EPTX-10212, EPTX-10213, 4 CH, EPTX-10211, EPTX-10210, EPTX-10238, 6 CH, EPTX-10208, EPTX-10209

Sensors require an EPOCH-MSE-SYS, EPOCH-RAT-SYS or EPOCH-PUP-EEG-S to operate.

Implantable EEG/Neural wireless sensors for pup, mouse, or rat. These wireless sensors amplify and transmit two, four, or six channels of high-fidelity EEG data to an EPOCH® System receiver tray for long-term wireless EEG recording from small animals in their home cages.

- small implants uniquely suited for neonatal and adult rodent recording
- two-week sensors suitable for pre-weaned rodents (< postnatal day 21)
- two-month sensors suitable for rats as young as postnatal day 7 and older
- two-month sensors suitable for mice as young as postnatal day 12 and older
- six-month sensors suitable for adult rats and mice
- sensor mounts to the skull with cyanoacrylate
- reduces surgical time to tens of minutes
- Teflon insulated platinum electrode wires are shipped at 10 cm and can be truncated to desired length; custom longer lengths available on request.

Sensors ship deactivated; EPOCH-ACTI required for sensor activation.

Use the EPOCH Wizard to check compatible/recommended system components: www.biopac.com/epoch-wizard

Reusable EEG Sensor – EPTX-10217, EPTX-10214

This two-channel reusable sensor can be used multiple times in multiple animals—easily activate/deactivate with the EPOCH-ACTI Sensor Activation Utility.

Bandwidth: 0.1-200 Hz

Battery life: 2 months (12-month shelf-life prior to activation)

Footprint: 8 mm x 13 mm Height: 28.55 mm* Weight: 2.5 g Volume: 1.34 cc

Compatibility: Select sensor based on Receiver Tray EPOCH Classic, - or- EPOCH2, or EPOCH6 Receiver

Interface: Includes Plastics1 MS333/3-A/SPC ELECT SS .005" 3C UNTW

*Height off the Plastics1 electrode. Height of Plastics1 electrode off the skull depends on how electrode is user-implanted.

Use the EPOCH Wizard to check compatible/recommended system components: www.biopac.com/epoch-wizard

EPOCH-ACTI EPOCH Sensor Activation Utility

This is an activation and test utility for EPOCH sensors (EEG, ECG, EMG, or reusable).

Sensors are shipped from the factory deactivated and this reusable utility is required to start a sensor battery. The reusable activator is battery operated and can be used for any deactivated sensor.

The activator utility can also output two independent channels of data (sine waves) for testing purposes.

- Allows users to start the battery when they are ready to use the sensor.
  Sensors must be activated within 6 months of shipment to ensure the full active battery-life.

NOTE: The Activator was updated in April 2017 to include an ON/OFF switch for reusable sensors. If you purchased the ORIGINAL and want to use reusable sensors, contact BIOPAC to discuss options.

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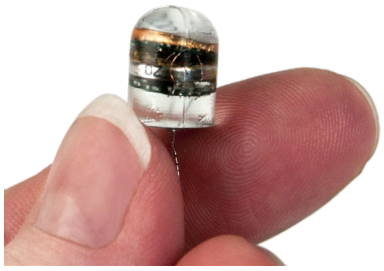
Differential Sensors – EPTX-10215, EPTX-10216, EPTX-10264, EPTX-10265, EPTX-10266, EPTX-10267



EPOCH differential sensors enable wireless recording of two different biopotentials with their own reference.

Record long-term EEG+EEG, EEG+ECG, EEG+EMG, or ECG+EMG.

Sensors amplify biopotentials and wirelessly transmit data to a receiver tray placed under each animal cage for continuous wireless recording of rats, mice, or pups. There is no crosswalk between cages, unlike other types of implantable sensors that use RF.

Sensors ship deactivated—activate with EPOCH-ACTI when ready to start recording.

Choose sensor size/battery life: 2-week (P10), 2-month, or 6-month.

Differential Reference Electrode Layout	Differential Signals	Signal Bandwidth	Compatible Receiver Tray
Looking up at bottom of Sensor • B • A • D • C **Example 2-CH** CH 1 = A - B CH 2 = C - D	1-CH EEG + 1 CH EEG	0.1-100 Hz 0.1-100 Hz	EP2RCVR-x-1/1
	1-CH EEG + 1 CH ECG	0.1-100 Hz 0.1-200 Hz	EP2RCVR-x-1/2
	1-CH EEG + 1 CH EMG	0.1-100 Hz 0.1-200 Hz	
	1-CH ECG + 1 CH EMG	0.1-200 Hz 0.1-200 Hz	EP2RCVR-x-2/2

Use the EPOCH Wizard to check compatible/recommended system components: www.biopac.com/epoch-wizard

EEG and ECG Sensor Specifications

Implant Weight:	2 week: 0.5 g	2 month: 2.3 g	6 month: 4 g
Sensor Footprint:	2 week: 4 mm x 6 mm	2 month: 7 mm x 9 mm	6 month: 7 mm x 12 mm
Volume:	2 week: 0.192 cubic cm	2 month: 0.756 cubic cm	6 month: 1.344 cubic cm
Electrode Wire Length:	Default 10 cm (truncate to desired length; longer lengths available upon request)		
Electrode Wire Material:	Teflon insulated platinum material		
Implant Material:	Medical Grade Epoxy		
System Gain Options:	2000x – (±1.0 mV range, 1.0 mV in = 2 V out) - EEG and ECG 800x – (±2.5 mV range, 2.5 mV in = 2 V out) - EEG version only		
Bandwidth:	EEG: 0.1 – 100 Hz per channel		
Input:	5 MΩ impedance		
Operating Temperature:	30 – 45° C		
Dimensions (LxWxH): Receiver Tray + Faraday Cage	Pup: 181 mm x 175 mm x 21 mm (7.125” x 6.875” x .83”) + Faraday 203 mm x 254 mm (8” x 10”) Mouse: 345 mm x 210 mm x 21 mm (13.6” x 8.25” x .83”) + Faraday 356 mm x 305 mm x 305 mm (14” x 12” x 12”) Rat: 429 mm x 216 mm x 21 mm (16.9” x 8.5” x .83”) + Faraday 508 mm x 365 mm x 365 mm (20” x 14.37” x 14.37”)		
Receiver Tray Power (Classic/blue):	16 VDC, 500 mA		
Maximum Animal Size:	1 kg		
Maximum Output:	±4 V peak-to-peak		

EPOCH System FAQs

1. *Are EEG and ECG receiver trays interchangeable?*

   No, receiver trays are not interchangeable (signal optimization requires hardware and firmware changes). EEG system receivers work with EEG sensors only, and ECG system receivers work with ECG sensors only.

2. *Does the 2-channel EEG sensor have the same battery life as the previous single channel system?*

   Yes, the 2-channel system has a 2 or 6 month battery life, similar to what was previously available for the 1-channel system. (2 weeks for pup system.)

3. *How many electrodes does the 2-channel sensor use?*

   The 2-channel device has three electrodes - one ground/reference electrode, and the two recording electrodes. The recording electrodes are measured with respect to the ground/reference electrode.

4. *Is it possible to implant one or two electrodes in deep brain structures for recording LFPs? Can you explain the procedure for that case?*

   Yes, we have several users that attach the implant to their stereotactic frame and insert the electrode(s) in the hippocampus, and then glue the implant in place. A surgery manual that demonstrates implanting the EPOCH sensor in deep brain structures is available. See the Support tab on the EPOCH EEG System page.

5. *Is one receiver tray required per sensor/subject?*

   Yes. It is not possible to use one receiver tray with multiple animals in a single cage. The rat and mouse size implants and trays are also completely interoperable. For example, if a customer wants to buy a rat size tray for a large mouse setup, this is not a problem. Each tray provides an analog output between ±4 volts.

6. *Is the battery life determined from the time a sensor is activated?*

   Yes, the battery life starts when the sensor is activated. An EPOCH-ACTI activator unit is required because the sensors are always shipped in an off state. An activated sensor cannot be deactivated and reactivated at a later time. The sensor must be activated within 6 months of shipment to ensure the full 2-month or 6-month active battery-life.

7. *Does each sensor provide a maximum of two EEG, ECoG, or LFP signals?*

   Yes. It is possible to change the gain of the sensor on a custom basis without degrading recording time. This gain setting can be chosen on the order form provided to customers.

8. *Are consultants available to provide surgical training to new EPOCH customers when needed?*

   Yes, surgical training can be provided by staff that are well trained in the procedures by contacting BIOPAC.

9. *Is it possible to have adjacent cages or should there be a minimum distance between cages, in order to prevent crosstalk?*

   The receiver trays can be placed adjacent to each other without picking up any crosstalk.

10. *Is it possible to reuse the implants?*

    The implants are technically reusable, though not recommended. Typically, a user explants the sensor, trims the leads, soaks the entire sensor in acetone, rinses with H_20, and lets it air dry.

11. *I have a special treatment chamber. Is it compatible with the EPOCH system?*

    Yes, as long as the animal is positioned over a receiver within 1" it will detect the sensor. However, we recommend using the Faraday enclosure at all times. Outer dimensions of the mouse Faraday enclosure are 14.25" x 12.5" x 12.5". (L x W x H) and rat Faraday cage are 20.25" x 14.5" x 14.5". For information about custom Faraday enclosures, contact BIOPAC.

12. *Will my data acquisition system work with the EPOCH?*

    In general, yes. The output of the EPOCH receiver is +/-4 V max. Most DAQs can handle this type of input, though BIOPAC recommends checking the manufacturer specifications first. BIOPAC can provide guidance as well. The EPOCH receiver uses standard BNC-style connectors and an adapter may be necessary for certain DAQ systems.

13. *What type of amplifier do I need?*

    The EPOCH system does not need an amplifier between the EPOCH receiver and your data acquisition system.

14. *Is the EPOCH system compatible with other wireless systems?*

    In general, no. However, if you have a wireless system that uses a separate data acquisition unit, it may be possible to use the EPOCH system with that unit.

15. *I need to video my animals during the recordings. Is this possible?*

    Yes. Contact BIOPAC for information about setting up a Faraday enclosure for recording video at the desired angle.

16. *Can the EPOCH system record ECG?*

    ECG recording functionality is now supported with the single-channel ECG System.

17. *Where and how is the ECG sensor implanted?*

    For sensor implant surgical guides, see the Support tab on the EPOCH ECG System page. Manuals are available for adult rat, adult mouse and rat pup post-natal 18. See page 8 of the EPOCH User Manual to view an ECG sensor placement diagram.

18. *Can the EPOCH system be used with neonatal pups similar to the previous 1-channel system?*

    Receiver trays and sensors for use with neonatal rodents as small as P6 pups are available by contacting BIOPAC.

19. *Can the EPOCH system be used with other devices, such as a drug infusion cannula?*

    Yes. The only constraint is that the sensor must be exposed to work properly.