

## Sources of Electromagnetic Interference (EMI)

### For Pacemakers, Implantable Cardioverter Defibrillators (ICDs), and Heart Failure Devices (CRT-Ds)

Your implanted device is designed to work properly in the presence of most appliances and equipment. Most things you handle or work near every day will not cause a problem. But, some strong electrical or magnetic fields may affect your:

- Pacemaker
- Implantable cardioverter defibrillator (ICD)
- Heart failure device (cardiac resynchronization therapy defibrillator or CRT-D)

**Attention heart failure patients:** Your CRT-D is a special type of implantable cardioverter defibrillator (ICD). All information about interference that applies to ICDs also applies to your heart failure device (CRT-D).

The guidelines in this document will help you understand which items are safe and which to stay away from. This document includes the most common items that cause interference, but may not include every item that you handle or work near.

**Note:** If you have an ICD, some strong magnetic fields may cause your device to make beeping tones. If you hear beeping tones from your device you should:

- Immediately move away from the object that may be causing the beeping tones.
- Call your doctor to report the beeping tones.

Talk to your doctor if you have more questions about an appliance, tool, medical procedure, or piece of equipment. Be sure to ask your doctor if you should follow any special instructions not listed here. You can also call Boston scientific Technical Services at 1-800-CARDIAC (1-800-227-3422).

#### Sources of Electromagnetic Interference Listed by Category:

- Personal Items
- Kitchen and Household Items
- Do-It-Yourself Items
- Entertainment Items
- Travel and Environment
- Medical Procedures
- Miscellaneous

**GUIDANT**

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scientific.com](http://www.bostonscientific.com)

# Personal Items

## Safe<sup>1</sup>

**Copy machines** - There are no known or reported interactions.

**Cordless phones** - There are no known or reported interactions. However, you should avoid placing your household cordless phone receiver directly over your implanted device.

**Electric blankets** - There are no known or reported interactions.

**Electric razors** - There are no known or reported interactions.

**Fax machines** - There are no known or reported interactions.

**Hair dryers** - There are no known or reported interactions.

**Hand-held massagers** - There are no known or reported interactions. Do not place directly over your implanted device.

**Heating pads** - There are no known or reported interactions.

**Pagers** - There are no known or reported interactions.

**Patient alert devices** - There are no known or reported interactions.

**Personal computers** - There are no known or reported interactions.

**Personal digital assistants (PDAs)** - There are no known or reported interactions.

**Radio-controlled clocks and watches** - There are no known or reported interactions. These watches and alarm clocks automatically adjust themselves to a time-norm signal transmitted by radio signal. The watches serve only as receivers.

**Tanning beds** - There are no known or reported interactions. Depending on how long it has been since implant, your doctor may recommend putting something over the implant site to protect the incision.

**Tattoos** - There are no known or reported interactions.

**Thermolysis (hair removal)** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Cell phones** - In certain cases, a cellular phone could affect an ICD or pacemaker's operation if it is closer than 6 inches (15cm) to the implanted device. This interaction is temporary, and moving the phone away from the implanted device will return it to proper function. To reduce the chance of any interaction, follow these precautions:

- Maintain a distance of at least 6 inches (15 cm) between the cellular phone and the implanted device; if the phone transmits more than 3 watts, increase the distance to a minimum of 12 inches (30 cm)
- Hold the cellular phone on the opposite side of the body from the implanted device
- Don't carry a cellular phone in a breast pocket or on a belt if it places the phone within 6 inches (15 cm) of the implanted device

These precautions apply only to cellular phones, not to household cordless phones.

## Avoid<sup>3</sup>

**Body-fat measuring scales** - Not recommended for use by patients with a pacemaker or an ICD.

**Electrolysis (hair removal)** - Not recommended for use by patients with a pacemaker or an ICD.

**Magnetic mattresses/chairs** - Not recommended for use by patients with a pacemaker or an ICD. Several magnetic-mattress/chair manufacturers recommend not using if you have a pacemaker or an ICD.

# Kitchen and Household Items

## Safe<sup>1</sup>

**Blenders** - There are no known or reported interactions.

**Can openers** - There are no known or reported interactions.

**Clothes dryers** - There are no known or reported interactions.

**Convection ovens** - There are no known or reported interactions.

**Electric brooms** - There are no known or reported interactions.

**Electric knives** - There are no known or reported interactions.

**Electric ovens** - There are no known or reported interactions.

**Food processors** - There are no known or reported interactions.

**Gas ovens** - There are no known or reported interactions.

**Microwave ovens** - There are no known or reported interactions.

**Pest control systems** - There are no known or reported interactions. Some manufacturers of pest control systems advertise the use of magnetic or ultrasound waves to repel rodents. They operate below levels that would affect implanted devices.

**Portable space heaters** - There are no known or reported interactions.

**Sewing machines** - There are no known or reported interactions.

**Toasters** - There are no known or reported interactions.

**Vacuum cleaners** - There are no known or reported interactions.

**Washing machines** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Induction ovens** - Induction ovens can create large magnetic fields that could potentially deactivate or temporarily inhibit an ICD. Pacemakers could have an issue with "magnet rate" pacing. Effects are only temporary. Recommend maintaining at least a 12-inch (30-cm) separation between the oven and your implanted device.

## Avoid<sup>3</sup>

**None**

# Do-It-Yourself Items

## Safe<sup>1</sup>

None

## Precaution<sup>2</sup>

**Arc welding equipment** - Recommend maintaining at least a 24-inch (61-cm) separation between the cables, arc, transformer, and your implanted device.

- Keep all cables straight, close together, and extending away from the body
- Wear dry, nonconductive gloves
- Do not weld alone
- Do not weld with rapidly repeating short bursts; wait a few seconds between welds
- If you experience symptoms of faintness, dizziness, nausea, etc., stop immediately and step away from the area or turn off the equipment

Use extreme caution if welding energy exceeds the following values:

- 100 amps for TIG/MIG welding
- 250 amps for AC arc welding
- 250 amps for plasma welding
- 350 amps for DC arc welding

**Battery-powered, cordless power tools** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Car engine repair** - Alternators create magnetic fields, which could potentially deactivate or temporarily inhibit an ICD. Pacemakers are also affected by magnetic fields, but any effect will be temporary by moving away from the source of the magnetic field. Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device. Avoid leaning directly over the alternator of a running car engine.

**Chain saws** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Drills** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Electric screwdrivers** - Recommend maintaining at least a 12-inch (30-cm) separation between the screwdriver and your implanted device.

**Hedge clippers** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**High-power generators** - Recommend maintaining at least a 36-inch (3 feet/91 cm) separation between the generator and your implanted device.

**Jigsaws** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Lawn mowers** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Leaf blowers** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Running motors and alternators** - Alternators create magnetic fields, which could potentially deactivate or temporarily inhibit your ICD. Pacemakers are also affected by magnetic fields, but any effect will be temporary by moving away from the source of the magnetic field. Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device. Avoid leaning directly over the alternator of a running car engine.

**Small motor repair** - Alternators create magnetic fields, which could potentially deactivate or temporarily inhibit your ICD. Pacemakers are also affected by magnetic fields, but any effect will be temporary by moving away from the source of the magnetic field. Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device. Avoid leaning directly over the alternator of a running car engine.

**Snow blowers** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Soldering guns** - Recommend maintaining at least a 12-inch (30-cm) separation between the soldering gun and your implanted device.

## Avoid<sup>3</sup>

**Jackhammers** - Mechanical pressure of large hammers can damage your implanted device and/or leads. The device may sense electromagnetic interference from small hammers, thus generating inappropriate therapy. Not recommended for use by patients with pacemakers or ICDs.

# Entertainment Items

## Safe<sup>1</sup>

**AM/FM radios** - There are no known or reported interactions.

**CD/DVD players** - There are no known or reported interactions.

**Hot tubs/Jacuzzis** - There are no known or reported interactions. Patients with heart conditions often will have medical restrictions. Patients should contact their doctor for medical approval. Your medical condition may not permit this activity; however, it will not harm your implanted device.

**Laser tag** - There are no known or reported interactions.

**Remote controls (TV, stereo, garage door, video equipment, cameras)** - There are no known or reported interactions.

**Televisions** - There are no known or reported interactions.

**VCRs** - There are no known or reported interactions.

**Video games** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Bingo wands** - Recommend maintaining at least a 6-inch (15-cm) separation between the wand and your implanted device.

**CB/police radio antennas** - Recommend maintaining at least a 24-inch (61-cm) separation from your implanted device.

**Remote controls with antennas** - Recommend maintaining at least a 12-inch (30-cm) separation between the antenna and motor and your implanted device.

**SCUBA diving** - Patients with heart conditions often will have medical restrictions. Patients should contact their doctor for medical approval. Boston scientific devices are tested up to 1.36 atmospheres gauge pressure, which is 2.36 atmospheres absolute pressure. 2.36 atmospheres absolute pressure = diving depth of 45 feet (14 m). Please contact Boston scientific Technical Services at 1-800-CARDIAC (1-800-227-3422) for details about your specific device model.

**Slot machines** - Recommend maintaining at least a 12-inch (30-cm) separation from your implanted device.

**Stereo speakers** - Recommend maintaining at least a 12-inch (30-cm) separation from your implanted device.

## Avoid<sup>3</sup>

**None**

# Travel and Environment

## Safe<sup>1</sup>

**Amusement parks/roller coasters** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Airport security systems** - Before boarding an aircraft, you will be asked to walk through a metal detector archway that emits a small amount of electromagnetic energy. This will not affect your implanted device. However, the metal of the device may cause the security archway to sound an alarm. The security archway will not harm your implanted device. In this case, tell security staff that you have an implanted device and show them your Medical Device Identification card.

Security staff may then request to use the hand-held wand type of metal detector. If possible, ask to be hand-searched instead of using a handheld wand. If a wand must be used, inform the security staff that you have an implanted device. Ask them not to hold the metal detector near the device any longer than is absolutely necessary; or, ask for an alternative form of personal search. A hand search is recommended.

If you have an ICD, airport security wands could temporarily affect your device. If you have any concerns about your exposure to electromagnetic interference, call your doctor.

*Note:* If you have an ICD, some strong magnetic fields may cause your device to make beeping tones. If you hear beeping tones from your device, you should:

- Immediately move away from the object that may be causing the beeping.
- Call your doctor to report the beeping.

**Residential power generators** - Recommend maintaining at least a 36-inch (3 feet/91 cm) separation between the generator and your implanted device.

**High-voltage lines** - No device interaction if traveling in the vicinity of high power lines. If your job requires you to be next to high power lines, check with your company's safety board to gain clearance to work in that area. If you live next to high power lines, please consult your doctor.

**Radio frequency transmitters** - Recommend maintaining at least a 12-inch (30-cm) separation between the motor and your implanted device.

**Theft detection systems** - Interference has been noted when in close proximity to the detection poles. Recommendations:

- Walk through the systems at a normal pace, without pausing or lingering near the equipment
- Be aware that systems may be hidden or camouflaged in many commercial establishments, in entrances and exits where they are not readily visible
- Do not stay near the system or metal detector longer than is necessary, and do not lean against the system

**Theft tag deactivation** - The special tags attached to store merchandise as part of theft detection systems are deactivated at the checkout counter by either running the merchandise over a scanner or using a hand-held deactivator. This deactivator works via magnetic fields. Some tag deactivation systems have been shown to cause interference with ICDs at close range. Recommend maintaining a distance of at least 20 inches (51 cm) between the tag deactivator and your ICD.

**Transformers** - Recommend maintaining at least a 12-inch (30-cm) separation between the transformer and your implanted device.

**TV or radio towers** - No device interaction if traveling in the vicinity of TV or radio towers. If your job requires you to be near or on TV or radio towers, check with your company's safety board to gain clearance.

## Avoid<sup>3</sup>

None

# Medical Procedures

## Safe<sup>1</sup>

**CT scans** - There are no known or reported interactions.

**Dental drills** - There are no known or reported interactions.

**Diagnostic x-rays** - There are no known or reported interactions.

**Electrocardiogram (ECG)** - There are no known or reported interactions.

**Ultrasound** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Electrocautery** - This equipment is used during surgical procedures to stop blood vessels from bleeding. It should be used only when your implanted device is turned off.

**High-energy radiation** - Therapeutic radiation treatment for cancer can affect your implanted device and will require special precautions. If you should need radiation treatment, talk with your doctor about any special precautions to protect your implanted device.

**TENS** - TENS is prescribed by doctors or chiropractors for control of chronic pain. A TENS unit can affect your implanted device and will require special precautions. If TENS must be used, talk with your doctor about any special precautions to protect your implanted device.

## Avoid<sup>3</sup>

**Diathermy** - This procedure uses an electrical field to apply heat to tissues in the body and could damage your implanted device. ICDs should be turned off during this procedure. If diathermy must be used and you have either a pacemaker or an ICD, talk with your doctor about any special precautions to protect your implanted device.

**Magnetic resonance imaging (MRI)** - This diagnostic test uses a strong electromagnetic field. MRI scans can severely damage your pacemaker or ICD and should not be performed on a patient with an implanted device. Hospitals keep MRI equipment in rooms marked with signs that indicate magnets are inside. Do not go inside these rooms.

# Miscellaneous

## Safe<sup>1</sup>

**Air purifiers** - There are no known or reported interactions.

**Electric invisible fences** - There are no known or reported interactions.

**House arrest devices** - There are no known or reported interactions. However, recommend maintaining at least a 12-inch (30-cm) separation from your implanted device.

**Polygraphs** - There are no known or reported interactions.

## Precaution<sup>2</sup>

**Magnetic fields (general)** - Magnetic fields greater than 10 gauss will affect both pacemakers and ICDs. If you have any concerns about your exposure to electromagnetic interference, call your doctor.

*Note:* If you have an ICD, some strong magnetic fields may cause your device to make beeping tones. If you hear beeping tones from your device, you should:

- Immediately move away from the object that may be causing the beeping.
- Call your doctor to report the beeping.

## Avoid<sup>3</sup>

**Stun guns** - Not recommended for use by patients with a pacemaker or an ICD.

## Footnotes

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**1.** "Safe" solely refers to the implanted device's electromagnetic interference with the items listed when used properly in accordance with their given intent. Check with your doctor for any additional restrictions that you may have with respect to these items.

**2.** Caution should be used when near the items listed. Check with your doctor for detailed information before use.

**3.** Consult your doctor. The general category of items is listed in the table. For specific branded items, consult the original manufacturer for any interaction with implantable cardioverter defibrillators (ICDs) and pacemakers.