To optimize defibrillation thresholds (DFTs), some clinicians find it helpful to test a reversed lead polarity configuration. When the Boston Scientific ICDs and CRT-Ds referenced in this article are implanted with integrated bipolar transvenous leads, reversed lead polarity must be accomplished with electronic programming. Not only is electronic programming easier, faster, and non-invasive, but it avoids several issues that are created by physically switching the lead terminal pins in the DF(+) and DF(-) lead ports.

Programming Reversed Lead Polarity

As depicted in Figure 1, when Initial Lead Polarity is programmed, energy flows from the ventricle (distal coil) to the atrium/superior vena cava (proximal coil) and the device case. When Reversed Lead Polarity is programmed, energy flows from the atrium/superior vena cava (proximal coil) and device case to the ventricle (distal coil). In either case, energy is focused in the ventricle, whether shock energy originates from or is collected within the ventricle. By programming reversed lead polarity, the polarity of each electrode is reversed to create an energy pathway that has also been demonstrated to successfully convert tachyarrhythmias.

Physically Reversed Lead Terminal Pins in Device Header

Do not physically reverse the defibrillator lead terminal pins in the device header ports. Physically reversing the leads creates the shock energy pathway depicted below (Figure 2). This shock energy pathway may direct energy away from the ventricle (proximal shock electrode to the device case). Furthermore, this energy pathway is not supported by clinical data and may be ineffective in converting the patient’s tachyarrhythmia.

In addition, physically reversing the terminal pins of an integrated bipolar lead in the device header creates an additional rate sensing vector, between the lead tip and case. This broad, unipolar sensing vector may cause the device to sense pectoralis muscle activity, which may result in noise, oversensing and/or the delivery of inappropriate therapy.

Note: A dedicated bipolar lead does not use the distal coil as part of the sensing vector so if dedicated bipolar leads are reversed in the device header ports, the sensing vector will not be altered.
Proper Insertion of Defibrillation Leads

The defibrillating terminal pins of an integrated bipolar lead are to be inserted into the device header such that the defibrillating lead terminal that is labeled "Distal –" is inserted into the – (negative) DF-1 lead port and the defibrillating lead terminal that is labeled "Proximal +" is inserted into the + (positive) DF-1 lead port. Note that for the ICD and CRT-D systems referenced in this article, the device case and the DF-1 port labeled as “+” (positive) are electrically common. When programming reversed polarity via the programmer, the new energy pathways are the same as the original pathways, except that the energy flows in the opposite direction because the polarity of each electrode is reversed.

Key points to remember:
1. Utilizing electronic Reversed Lead Polarity may occasionally improve defibrillation thresholds.
2. Do not physically switch the high voltage terminal pins in the device header to accomplish Reversed Lead Polarity. Rather, reverse Lead Polarity with programming.
3. Physically switching the high voltage terminal pins of an integrated bipolar lead in the DF(+) and DF(-) ports may result in oversensing, inappropriate shocks, or nonconversion of an arrhythmia.

To program reverse polarity using the ZOOM® LATITUDE® programmer (Figure 4):

1. Select the Setup screen
2. Select Therapy Features
3. Program Lead Polarity to Reversed

Note: For VITALITY® AVT and CONTAK RENEWAL® 3/4 AVT devices, atrial and ventricular polarity are separately programmable.

Figure 2. Physically reversing DF-1 lead terminal pins in the device header creates a less-effective shock energy pathway and a suboptimal sensing configuration.

Figure 3. Electrogram illustrating noise and potential inappropriate shock due to high voltage leads physically reversed in the header.

Figure 4. Programming steps to achieve reversed shock lead polarity.