

Proper Insertion and Configuration of Defibrillation (Shocking) Leads

SUMMARY

Reversing the polarity of shock delivery with a Boston Scientific defibrillation system should be achieved via programming the polarity feature. **Do not reverse polarity** by physically switching the defibrillation lead terminal pins. Physically reversing the defibrillation lead terminal pins to achieve reversed polarity creates an energy pathway that can be less effective in converting tachyarrhythmias. Furthermore, this configuration may lead to oversensing and potentially inappropriate therapy.

CRM PRODUCTS REFERENCED

The following are trademarks of Cardiac Pacemakers Inc., a Boston Scientific company:

ENDOTAK®, ENDOTAK ENDURANCE®, and ENDOTAK RELIANCE® families of integrated bipolar leads used with an ICD or CRT-D family below:

ICDs: CONFIENT®, VENTAK MINI®, VENTAK® VR, VENTAK AV, VENTAK PRIZM®, VITALITY®

CRT-Ds: LIVIAN®, CONTAK® CD, CONTAK RENEWAL®

Products referenced herein may not be approved in all geographies. For comprehensive information on device operation, reference the appropriate product labeling.

CRT-D: Cardiac Resynchronization Therapy Defibrillator
ICD: Implantable Cardioverter Defibrillator

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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.

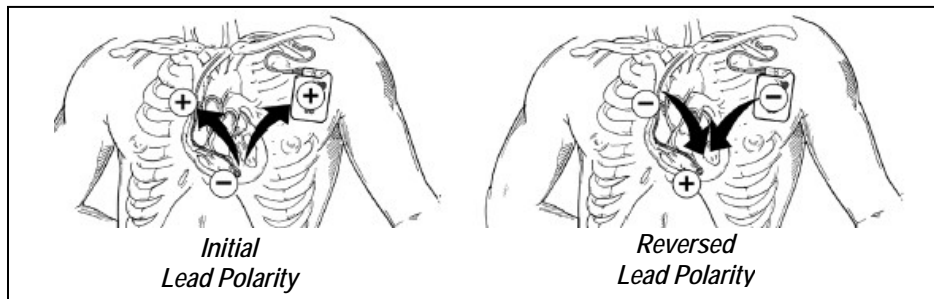


Figure 1. Shock energy pathways created by programming either Initial or Reversed lead polarity.

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.

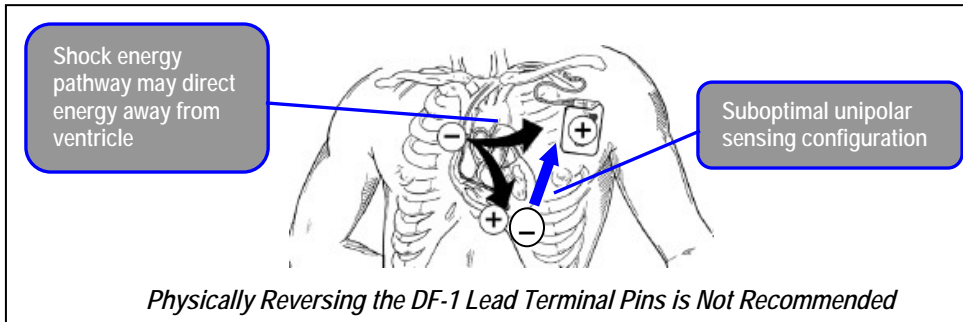


Figure 2. Physically reversing DF-1 lead terminal pins in the device header creates a less-effective shock energy pathway and a suboptimal sensing configuration.

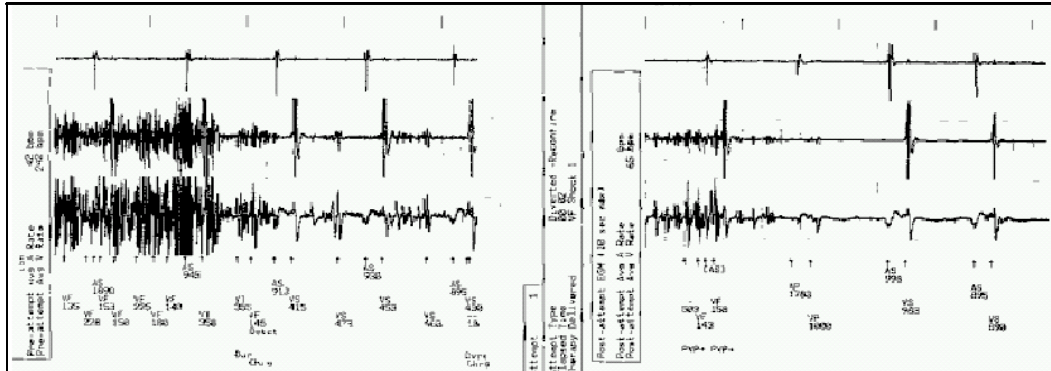


Figure 3. Electrogram illustrating noise and potential inappropriate shock due to high voltage leads physically reversed in the header.

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.

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.

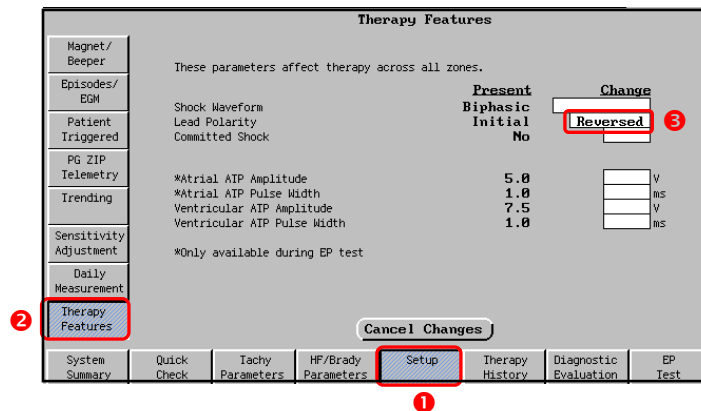


Figure 4. Programming steps to achieve reversed shock lead polarity.

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.