InterSim III

Temporary Pacemaker Troubleshooting

Discovering failures and solutions using the interactive heart simulator InterSim III

Version: 2025-06-13

The suggestions were taken from https://litfl.com/temporary-pacemaker-troubleshooting/ and from the education team at St Vincent's Hospital in Melbourne Australia.

© 2025 Ingenieurbüro Lang. All Rights Reserved

© 2025 Ingenieurbüro Lang. All Rights Reserved

Prerequisites

InterSim III Interface version 1.5.8483 or newer
InterSim III Touch version 1.5.8483 (package 023) or newer
InterSim III Temporary Adapter

Medtronic Temporary Pacemaker 5388 or Osypka Pace 203 H or similar

Preliminary Note

Starting with release 1.5.8483, there is an “Expanded voltage range for atrial and right ventricular thresholds and amplitudes” checkbox in the settings. You should select this checkbox when working with temporary pacemakers.

- InterSim III Interface: go to File menu, Settings menu item, select the “Expanded voltage range for atrial and right ventricular thresholds and amplitudes” checkbox
- InterSim III Touch: go to File menu, System menu item, select the “Expanded voltage range for atrial and right ventricular thresholds and amplitudes” checkbox

This checkbox was removed again in the release for the first half of 2025. Instead of the checkbox, there is now the “Temporary/External” device type.

- InterSim III Interface: select the “Temporary/External” device type on the home screen.
- InterSim III Touch: select the “Temporary/External” device type on the home screen.

All solutions work with the InterSim standard pulse width of 0.4 ms.

However, the temporary pacemakers deliver wider pulse widths, which leads to a reduction in the required pulse voltage. For example, the 5388 delivers 1 ms pulses in the atrium and 1.5 ms pulses in the ventricle.

If you want to use the pulse width used by the pacemaker in the PM Parameters dialog, you can also reduce the threshold values there (from version 1.6.9294).

© 2025 Ingenieurbüro Lang. All Rights Reserved

VVI - Failure to Pace due to Output Failure

Goal:

To show a broken or dislocated lead

Pacemaker settings:

Parameter	Value
Mode	VVI
Rate	80 bpm
V-Sense	1 mV
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
AV Block	AV Block III	Blocks menu	Select “AV Block III“
Lead condition	Fracture	Interface menu PM parameters	Right Ventricle Impedance, Tip Condition, select “Fracture“, press “Apply“

Result:

- Irregular sensing on the ventricular channel
- Some pacing activity on the ventricular channel
- No capture

Solution:

- Check the lead
- Check the location of the lead
- (Reset the fracture lead condition in the InterSim application)

© 2025 Ingenieurbüro Lang. All Rights Reserved

VVI - Failure to Capture

Goal:

To show a high pacing threshold

Pacemaker settings:

Parameter	Value	
Mode	VVI	
Rate	80 bpm	
Ventricular output setting	4 mA (Medt. 5388)	1.5 V (other)
All other parameters	default	

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
AV Block	AV Block III	Blocks menu	Select “AV Block III“
Lead impedance	Bipolar lead impedance of 400Ω (that is the sum of tip and ring impedance)	Interface menu PM parameters	Impedance Right Ventricle, Tip Impedance, change to 250Ω, press “Apply“
Threshold	High threshold of 8 V	Interface menu PM parameters	Change right ventricular threshold to 8 V, press “Apply“
Threshold (from ver. 1.6.9294, Medt. Pacemaker))	High threshold of 20 mA	Interface menu PM parameters	Change right ventricular threshold to 20 mA, press “Apply“

Result:

- No capture in the ventricle
- A ventricular escape rhythm of 28 bpm can be seen

Causes:

- Insufficient output current
- Problems with pacemaker or bridging cable
- Problems with pacing wire: detached/dislodged, inflammation of myocardium, fibrin accumulation, wire fracture.

© 2025 Ingenieurbüro Lang. All Rights Reserved

- Patient condition: hypoxia, myocardial ischemia/infarction, pH disturbances, electrolyte disturbances, some antiarrhythmics

Solution:

- Set the ventricular output of the temporary pacemaker to at least 16 mA

Hint:

- Lowering the impedance also lowers the voltage of the output pulse and is better suited to the measuring range of the InterSim device

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Loss of capture in the atria, but pacing appropriately in ventricles

Goal:

To show a high atrial pacing threshold

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	80 bpm
Atrial output setting	8 mA
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Threshold	High atrial threshold of 8 V	Interface menu PM parameters	Change atrial threshold to 8 V, press “Apply“
Threshold (from ver. 1.6.9294, Medt. Pacemaker))	High atrial threshold of 20 mA	Interface menu PM parameters	Change atrial threshold to 20 mA, press “Apply“

Result:

- No capture in the atrium
- The ventricle is paced with the base rate
- Some irregularities in the ventricle due to some intrinsic conductions

Solution:

- Set the atrial output of the temporary pacemaker to at least 16 mA

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Atrial pacing, but inappropriate ventricular capture

Goal:

To show a high ventricular pacing threshold

Pacemaker settings:

Parameter	Value	
Mode	DDD	
Rate	80 bpm	
Ventricular output setting	8 mA (Medt. 5388)	4 V (other)
All other parameters	default	

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
AV Block	AV Block II Mobitz II	Blocks menu	Select “AV Block II Mobitz II“ “2 : 1”
Threshold	High ventricular threshold of 8 V	Interface menu PM parameters	Change right ventricular threshold to 8 V, press “Apply“
Threshold (from ver. 1.6.9294, Medt. Pacemaker))	High ventricular threshold of 20 mA	Interface menu PM parameters	Change right ventricular threshold to 20 mA, press “Apply“

Result:

- No capture in the ventricle
- Only every second P wave is conducted
- This results in a slow ventricular rhythm

Solution:

- Set the ventricular output of the temporary pacemaker to at least 16 mA

© 2025 Ingenieurbüro Lang. All Rights Reserved

AAI - Failure to Sense (Atrium)

Goal:

To show a small intrinsic signal or a low sensitivity in the atrial channel

Pacemaker settings:

Parameter	Value	
Mode	AAI	
Rate	80 bpm	
Atrial sensitivity	1.4 mV	
Atrial output settings	4 mA (Medt. 5388)	2 V (other)
All other parameters	default	

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the pacemaker rate, 90 bpm	Home Screen	Parameters group, change “Atr.“ to 90 bpm
Atrial Amplitude	Small atrial intrinsic signal	Interface menu PM parameters	Amplitude Atrium, change to 0.9mV, press “Apply“

Result:

- No sensing in the atrium
- The pacemaker paces even though an intrinsic signal is present
- Risk of pacing stimulus being delivered during vulnerable period of repolarisation: AAI (risk of AF/Flutter) VVI (risk of VT/VF) DDD: as above + loss of AV synchrony

Causes:

- Sensitivity setting is too high (not sensitive enough)
- Asynchronous mode may have been selected (AOO, VOO, DOO)
- Problem with the pacemaker or bridging cable
- Problems with pacing wire: detached/dislodged, inflammation of myocardium, fibrin accumulation, wire fracture.
- Patient condition: hypoxia, myocardial ischemia/infarction, pH disturbances, electrolyte disturbances, some antiarrhythmics.

© 2025 Ingenieurbüro Lang. All Rights Reserved

Solution:

- Increase the sensitivity of the atrial channel of the pacemaker (reduce the absolute value) until the pacemaker senses the intrinsic signal again; a value of 0.5 mV should work

© 2025 Ingenieurbüro Lang. All Rights Reserved

VVI - Failure to Sense (Ventricle)

Goal:

To show a small intrinsic signal or a low sensitivity in the ventricular channel

Pacemaker settings:

Parameter	Value
Mode	VVI
Rate	80 bpm
Ventricular sensitivity	5 mV
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the pacemaker rate, 90 bpm	Home Screen	Parameters group, change “Atr.“ to 90 bpm
Right ventricular Amplitude	Small ventricular intrinsic signal	Interface menu PM parameters	Amplitude Right Ventricle, change to 2 mV, press “Apply“

Result:

- No sensing in the ventricle
- The pacemaker paces even though an intrinsic signal is present

Causes:

- Sensitivity setting is too high (not sensitive enough)
- Asynchronous mode may have been selected (AOO, VOO, DOO)
- Problem with the pacemaker or bridging cable
- Problems with pacing wire: detached/dislodged, inflammation of myocardium, fibrin accumulation, wire fracture.
- Patient condition: hypoxia, myocardial ischemia/infarction, pH disturbances, electrolyte disturbances, some antiarrhythmics.

Solution:

- Increase the sensitivity of the ventricular channel of the pacemaker (reduce the absolute value) until the pacemaker senses the intrinsic signal again; a value of 3 - 4 mV should work

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Undersensing in Atrium

Goal:

To show an atrial undersensing in combination with pacemaker timing

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	70 bpm
Atrial sensitivity	1.0 mV
AV interval	190 ms
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the pacemaker rate, 95 bpm	Home Screen	Parameters group, change “Atr.“ to 95 bpm
Atrial Amplitude	Small ventricular intrinsic signal	Interface menu PM parameters	Amplitude Atrium, change to 0.3 mV, press “Apply“

Description:

- The pacemaker doesn’t sense the atrial P wave
- The pacing rate is set to 70 bpm, which corresponds to a VV interval of 857 ms.
- With the set AV delay of 190 ms, this results in a VA time of 667 ms, which corresponds to a rate of 90 bpm.

Result:

- Within the VA time of 667 ms, the pacemaker senses a new intrinsic QRS complex, which inhibits both atrial and ventricular pace pulses.

Variation:

- Reduce the intrinsic sinus rate to 90 bmp. This leads to a “race” between the intrinsic QRS complex and the ventricular pace pulses. Atrial and ventricular pace pulses are delivered at irregular intervals.

Solution:

- Increase the sensitivity of the atrial channel of the pacemaker (reduce the absolute value) until the pacemaker senses the intrinsic signal again.

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Undersensing in Ventricle

Goal:

To show a ventricular undersensing

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	70 bpm
Ventricular sensitivity	4.0 mV
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Rhythm	Set a slow ventricular tachycardia	Rhythms Menu RV Tachy	Select “Slow 130 bpm”
AV block	AV block III	Blocks menu	Select “AV Block III”
Right ventricular Amplitude	Small ventricular intrinsic signal	Interface menu PM parameters	Amplitude Right Ventricle, change to 2 mV, press “Apply“

Result:

- The atria are paced with the base rate
- The ventricle runs with an accelerated idioventricular rhythm
- There is no synchrony between atrium and ventricle
- The pacemaker does not recognize the ventricular events and therefore paces inappropriately
- Some paces hit the vulnerable phase (blue color in the running heart)

Solution:

- Increase the sensitivity of the ventricular channel of the pacemaker (reduce the absolute value) until the pacemaker senses the intrinsic signal again.

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Undersensing in both Atrium and Ventricle

Goal:

To show an atrial and ventricular undersensing

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	70 bpm
Atrial sensitivity	1.0 mV
Ventricular sensitivity	2.0 mV
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the pacemaker rate, 90 bpm	Home Screen	Parameters group, change “Atr.“ to 90 bpm
Atrial Amplitude	Small ventricular intrinsic atrial signal	Interface menu PM parameters	Amplitude Atrium, change to 0.3 mV, press “Apply“
Ventricular Amplitude	Small ventricular intrinsic ventricular signal	Interface menu PM parameters	Amplitude Right Ventricle, change to 1.0 mV, press “Apply“
Normalize the amplitudes on the home screen		Home Screen below the ECG	Press “Normalize” button (you may have to wait a few seconds as the algorithm looks back 10 seconds)

Result:

- The pacemaker does not sense the intrinsic signals. This leads to unnecessary asynchronous pacing in addition to intrinsic activity.

Solution:

- Increase the sensitivity of both the atrial and ventricular channel of the pacemaker (reduce the absolute value) until the pacemaker senses the intrinsic signals again.

© 2025 Ingenieurbüro Lang. All Rights Reserved

AAI - Oversensing in the Atrial Channel

Goal:

To show an oversensing in the atrial channel

Pacemaker settings:

Parameter	Value
Mode	AAI
Rate	80 bpm
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a bradycardic rate of 45 bpm	Home Screen	Parameters group, change “Atr.“ to 45 bpm
AV Block	AV Block I	Blocks menu	Select “AV Block I”
Far-Field R Wave	Set a late and small far-field R wave	Parameters menu Far-Field R Wave	Select “Small” Set “Intrinsic” interval to 100ms

Result:

- Oversensing in the atrium
- The pacemaker only paces at 53 bpm, although the intervention frequency of the pacemaker is 80 bpm

Solution:

- Decrease the sensitivity of the atrial channel of the pacemaker (increase the absolute value) until the pacemaker doesn’t sense the noise; a value of 1.5 mV should work

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Oversensing in the Atrial Channel

Goal:

To show an oversensing in the atrial channel

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	80 bpm
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Rhythm	Set a Sinus Bradycardia	Rhythm Menu	Select “Sinus Brady”
EMI	Artifacts on Atrial Channel	Parameters menu PM Parameter	Atrial EMI Select “Artifacts” Press “Apply”

Result:

- Oversensing in the atrium
- The pacemaker alternates between intervention rate and irregular pacing

Solution:

- Check the atrial connection
- Consider using a VVI mode

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Oversensing in the Ventricular Channel I

Goal:

To show an unwanted inhibition of the pacemaker

Pacemaker settings:

Parameter	Value	
Mode	DDD	
Rate	80 bpm	
Ventricular sensitivity setting	2 mV	
Ventricular output setting	4 mA (Medt. 5388)	2 V (other)
All other parameters	default	

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
EMI	Noise on ventricular channel	Interface menu PM parameters	Select the “Noise” radio button in the “EMI Right Ventricle” group Press “Apply”

Result:

- Oversensing in the ventricle
- No/irregular pacing in both channels
- Stimulus is inappropriately withheld

Cause:

- Pacemaker sensitivity setting is too sensitive (ie: too low)
- Environment has high levels of electromagnetic interferences eg: diathermy
- Muscle potentials other than cardiac are being sensed eg: shivering, seizures
- Problems with the bridging cables
- Problems with the pacing wire: detached/dislodged, inflammation of myocardium, fibrin accumulation, wire fracture

Solution:

- Decrease the sensitivity of the ventricular channel of the pacemaker (increase the absolute value) until the pacemaker doesn’t sense the noise; a value of 5 mV should work

© 2025 Ingenieurbüro Lang. All Rights Reserved

Hint:

- In a later application release, the “Noise” will be replaced by “Myopotential”. The signal forms of noise and myopotential are different, but the effects on the pacemaker are comparable.

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Oversensing in the Ventricular Channel II

Goal:

To show an oversensing in the ventricular channel

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	80 bpm
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
AV block	Set a 2.1 block	Blocks menu	Select “AV Block II Mobitz II”, “2:1”
PR interval	Set PR interval (AV interval) for intrinsic conduction	Home Screen	Parameters group Set “PR” to 130 ms
T Wave Amplitude	Large T wave	Parameters menu T Wave Amplitude menu item	Select “Extralarge”

Result:

- Oversensing in the ventricle
- Every second pace comes with the escape rate of the pacemaker

Solution:

- Decrease the sensitivity of the ventricular channel of the pacemaker (increase the absolute value) until the pacemaker doesn’t sense the noise; a value of 4 mV should work

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - High Atrial Output with Oversensing in Ventricle (Cross Talk)

Goal:

To show an atrial oversensing with a ventricular safety pacing

Pacemaker settings:

Parameter	Value	
Mode	DDD	
Rate	80 bpm	
AV interval	170 ms	
Atrial Output Setting	20 mA (Medt. 5388)	10 V (other)
All other parameters	default	

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
A-Pace Crosstalk	Set latency and width of a crosstalk signal	Parameters menu	Select A-Pace Crosstalk checkbox
		Miscellaneous menu entry	Set Latency to a value between 0 and 50 ms, e.g. 50 ms
		A-Pace Crosstalk settings	

Result:

- The pacemaker shortens the AV interval to around 100 ms for safety pacing

Solution:

- Decrease the atrial output to also decrease the crosstalk signal
- (With InterSim, you have to turn off the A-Pace Crosstalk)

Macro:

You can use a macro to automatically turns A-Pace Crosstalk on or off. The macro switches the A-Pace Crosstalk on when the atrial pacing output exceeds 11 to 12 mA and off again at 10 mA and below. Copy the lines below into the macro window.

```
begin
  Reset;
  Set_APaceCrosstalkLatency(50);
  Wait(1);
  while True do begin
    AtrialPaceEvent.Clear;
    while not AtrialPaceEvent.Active do
      Wait(5);
```

© 2025 Ingenieurbüro Lang. All Rights Reserved

```
    if AtrialPaceEvent.Voltage > 4.5 then
      Set_APaceCrosstalk(True)
    else
      Set_APaceCrosstalk(False);
    Wait(1);
  end;
end.
```

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Pacemaker Mediated Tachycardia I

Goal:

To show a pacemaker mediated tachycardia

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	80 bpm
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press „Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
RP Interval Premature Contractions Coupling Interval	Set high intervals to enable a pacemaker race	Parameters menu Intervals	Set “RP” interval to 300 ms Set “Premature Contractions Coupling Interval” to 400 ms Press Ok
Retrograde Conduction	Enable retrograde conduction	Blocks menu	Check “Retrograde Conduction”
Start PMT with right premature ventricular contractions		Home Screen Premature Contractions Group	Press left “rPVC” button twice

Result:

- A pacemaker mediated tachycardia with the upper rate of the pacemaker can be seen

Solution:

- Switch the pacemaker mode to DVI

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD - Pacemaker Mediated Tachycardia II due to Atrial Oversensing

Goal:

To show a pacemaker mediated tachycardia

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	80 bpm
PVARP	150 ms
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a bradycardic sinus rate	Home Screen	Parameters group, change “Atr.“ to 50 bpm
AV block	AV block III	Blocks menu	Select “AV Block III”
Far-Field R Wave	Set a late and small far-field R wave	Parameters menu Far-Field R Wave	Select “Small” Set “Paced” interval to 200 ms

Result:

- Oversensing in the atrium
- A pacemaker mediated tachycardia with the upper rate of the pacemaker can be seen

Solution:

- Decrease the sensitivity of the atrial channel of the pacemaker (increase the absolute value) until the pacemaker doesn’t sense the Far-Field signal; a value of 1.0 mV should work
  or
- Increase the PVARP to the default value of 300 ms

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Long AVI interval on settings

Goal:

To show a long AV interval

Pacemaker settings:

Parameter	Value
Mode	DDD (the use of AAI is also possible)
Rate	80 bpm
AV interval	270 ms
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
AV block	AV Block I	Blocks menu	Select “AV Block I”

Result:

- The pacemaker paces with the base rate
- Patient shows a long AV interval

Solution:

- Reduce the AV interval to 150 ms

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Pacemaker upper rate behavior - Wenckebach block

Goal:

To show the Wenckebach behavior of the pacemaker

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	70 bpm
A-V interval	170 ms
Upper Tracking Rate	110 bpm
PVARP	300 ms
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the upper tracking rate, 120 bpm	Home Screen	Parameters group, change “Atr.“ to 120 bpm
AV Block	AV Block III	Blocks menu	Select “AV Block III“

Result:

- The pacemaker shows a Wenckebach behavior (5:4)
- The ventricle is paced with the upper tracking rate until an atrial intrinsic P wave falls into the PVARP

Solution:

- No solution, expected behavior

© 2025 Ingenieurbüro Lang. All Rights Reserved

DDD – Pacemaker upper rate behavior – 2 : 1 block

Goal:

To show the Wenckebach behavior of the pacemaker

Pacemaker settings:

Parameter	Value
Mode	DDD
Rate	70 bpm
A-V interval	170 ms
Upper Tracking Rate	110 bpm
PVARP	300 ms
All other parameters	default

InterSim settings:

Parameter	Value	Where to find	What to do
Factory settings	default	Home Screen	Press “Reset“ button
Device Type (until ver. 1.6.9294)	Dual Chamber	Home Screen	Select “Dual Chamber“ radio button
Device Type (from ver. 1.6.9294)	Temporary/External	Home Screen	Select “Temporary/External” from Device Type listbox
Sinus rate	Set a rate above the upper tracking rate, 145 bpm	Home Screen	Parameters group, change “Atr.“ to 145 bpm
AV Block	AV Block III	Blocks menu	Select “AV Block III“

Result:

- The pacemaker shows a 2:1 block
- The ventricle is paced with the half intrinsic rate

Solution:

- Adjust A-V interval, PVARP, and/or Upper Tracking Rate

© 2025 Ingenieurbüro Lang. All Rights Reserved

Ingenieurbüro Lang
Dipl.-Ing. Lutz Lang
Hintere Dorfstr. 10
09661 Rossau
Germany
Phone: +49 3727 649947
Mail: Lutz.Lang@Lang-IB.de
Created: Wednesday, February 4, 2025
Changed: Friday, June 13, 2025

© 2025 Ingenieurbüro Lang. All Rights Reserved