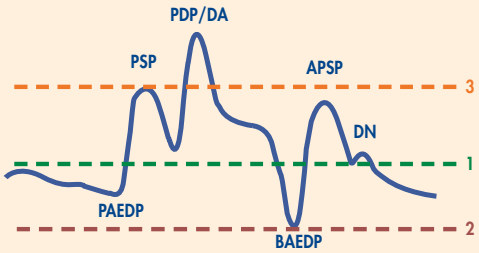
Timing Guidelines

"The Timing Three"



Assisted Arterial Waveform (1:2)

Abbreviation	Definition
PAEDP	Patient Aortic End Diastolic Pressure
PSP	Peak Systolic Pressure
PDP/DA	Peak Diastolic Pressure/Diastolic Augmentation
BAEDP	Balloon Aortic End Diastolic Pressure
APSP	Assisted Peak Systolic Pressure (Systole after IAB deflation)
DN	Dicrotic Notch

Inflation

Goal: To produce a rapid rise in aortic pressure (optimize PDP/DA), thereby increasing O_2 supply to coronary circulation.

1. Inflate just prior to DN which should result in PDP/DA > PSP

Deflation

Goal: To reduce aortic end diastolic pressure (afterload), thereby decreasing MVO_2 while improving the CO (cardiac output).

2. BAEDP < PAEDP
3. APSP < PSP

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Intra- Aortic Balloon Pump

Recommended IABP Triggers

Rhythm	Pattern R-Wave criteria: 25-135msec.	Peak Wide Complex QRS	AFIB Varying R-R Automatic R-Wave deflation	V-Pace[1] 100% Paced	A-Pace[1] 100% Paced	AP (Consistent BP)	INT Rate 80 automatic Range 40-120
NSR	*	*	*[4]			*	
S Brady	*	*	*[4]			*	
S Tachy	*	*[5]	*[4]			*	
Cautery Interference						*	
NSR with Premature Beats	* (atrial)[2]	* (vent)	*				
NSR with Pauses	*	*	* if severe			*	
PAT/SVT	*	*				*	
Atrial Flutter	*	*	* if irregular				
Atrial Fibrillation	*[3]	*	*				

* Applies to KAAT Series and ACAT™1 IABP.
[1] Note: No capture beat needed for trigger.
[2] Depends on type and number of premature beats.
[3] For significant irregularity use Peak.
[4] If real time timing desired.
[5] May be preferred for HR > 140 bpm.

see back side for more triggers

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Intra- Aortic Balloon Pump

Balloon Pressure Waveform

Description

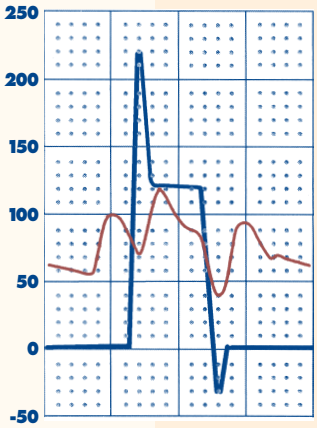
The Balloon Pressure Waveform (BPW) represents helium movement from the console to the IAB catheter. It is shown as a calibrated, continuous waveform which allows objective assessment of the safety and effectiveness of counterpulsation.

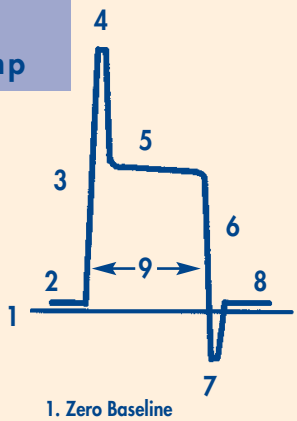
BPW Height

Reflects the pressure in the aorta, therefore the plateau pressure on the BPW should be within ±20mmHg of the PDP.

BPW Width

Is approximately the duration in which the balloon is inflated.





1. Zero Baseline
2. Balloon Pressure Baseline
3. Rapid Inflation
4. Peak Inflation Artifact
5. Plateau Pressure
6. Rapid Deflation
7. Deflation Artifact
8. Return to Baseline
9. Duration of Balloon Cycle

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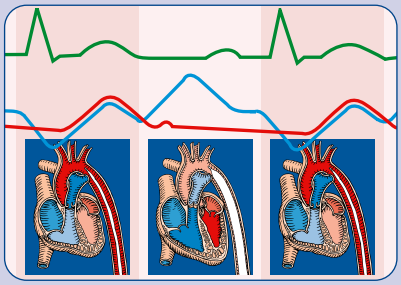
Balloon Inflation and Deflation



Electrical and Mechanical Relationship

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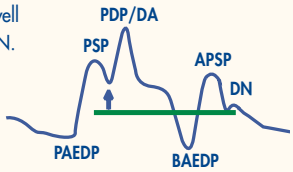
Incorrect Timing States

Early Inflation

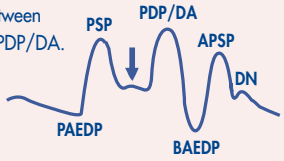
IAB is inflated well before actual DN. (aortic valve closure.) Violates **Rule 1** for inflation.



Result: Premature closure of aortic valve. Reduces stroke volume/CO. Increase in LVED volume.

Late Inflation

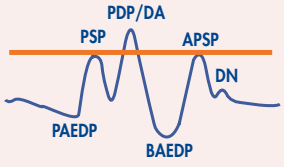
DN is visible between points PSP and PDP/DA. Violates **Rule 1** for inflation.



Result: PDP/DA less than optimum. Decreased perfusion pressure and volume to coronary arteries.

Early Deflation

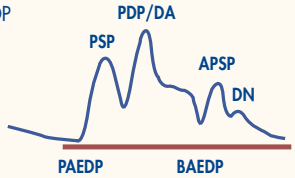
APSP = PSP
Violates **Rule 3** for deflation.
May see "U" shape at BAEDP.



Result: No afterload reduction.

Late Deflation

BAEDP > PAEDP
Violates **Rule 2** for deflation.



Result: Increased workload of left ventricle. Increased MVO_2. Decreased CO.

Recommended IABP Triggers

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Atrial Pacing	* demand	* demand			* 100% paced	*	
Ventricular Pacing		* demand		* 100% paced		*	
A-V Pacing		* demand		* 100% paced		*	
RBBB, LBBB		*				*	
Ventricular tachycardia		*				*	
CPR						* first choice	*
Bypass-Pulsatile Flow System Test							*

* Applies to KAAT Series and ACAT®1 IABP.

[1] Note: No capture beat needed for trigger.

ECG Pattern
The pre-set (default) trigger mode. The computer analyzes the height, width, and slope of a positively or negatively deflected QRS complex. The width of the R-wave must be between 25-135msec.

ECG Peak
The computer analyzes the height and slope of a positively or negatively deflected QRS complex. The trigger mode of choice for wide complex rhythms. Preferred trigger for HR > 140.

A-FIB
The computer analyzes the QRS complex in the same manner as in the peak mode. The balloon will automatically be deflated whenever an R-wave is sensed. The trigger mode of choice for rhythms with varying R to R intervals.
- Rejection of pacer spikes and artifact is automatic in ECG Pattern, Peak and A-Fib.

V Pace
The computer uses the ventricular spike as the trigger signal. Used with ventricular or AV paced rhythms. It is ESSENTIAL that the patient's rhythm is 100% paced.

A Pace
The computer uses the atrial pacing spike as the trigger signal. This mode can only be used with 100% atrial paced rhythms.

Arterial Pressure
The computer uses the systolic upstroke of an arterial pressure waveform as the trigger signal. An option for clinical situations where an ECG is unavailable or distorted.

Internal
The balloon inflates and deflates at a preset rate regardless of the patient's cardiac activity. Used in situations where there is no cardiac output and no ECG. Must be confirmed by an additional keystroke.

During Cardiac Resuscitation
If counterpulsation is to be continued and synchronized to the CPR effort, then *Arterial Pressure* should be selected. In the event that the CPR cannot generate a consistent and reliable trigger, *Internal* may be utilized.

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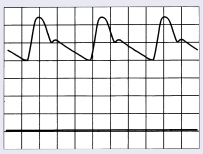
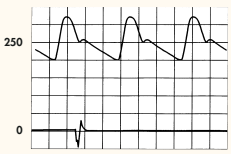
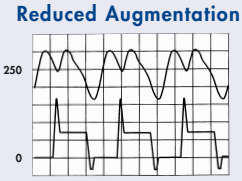


Purge Failure
Check for: • Loss of trigger



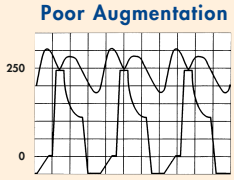
Purge Failure
Check for: • Leaks
• Low helium

Reduced Augmentation



Low Plateau Pressure
Check for: • Volume setting too low
• Balloon too small for patient
• Balloon too low in aorta
• Low systemic vascular resistance

Poor Augmentation



Wide Inflation and/or Deflation Artifact
Check for: • Proximal portion of IAB in sheath
• Suture too tight around catheter
• Partial obstruction
• Partial kink
• Slow catheter or He shuttle speed
• Very tortuous vessels

Wide deflation artifact may cause Possible Helium Loss Alarm in 1:1 assist.

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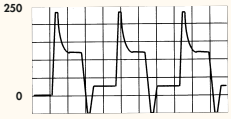
Baseline Elevated

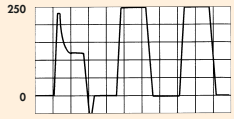


High Baseline
Check for: • Kinked catheter
• Partially wrapped balloon
• IAB in sheath
• IAB too low in aorta
• IAB too large
• Overfill

Baseline Below Zero

Possible Helium Loss
Check for: • Blood in catheter tubing
• Possible leak in connections or tubing
• Kinked catheter
• Ectopic beats

Squared or Rounded Plateau Pressure



High Pressure
Check for: • Partially wrapped balloon
• Kink in catheter or tubing
• Balloon too large for aorta
• Balloon position too high or too low
• Balloon in sheath

TTB-M 07/01 10M CZ