

WAVETEK

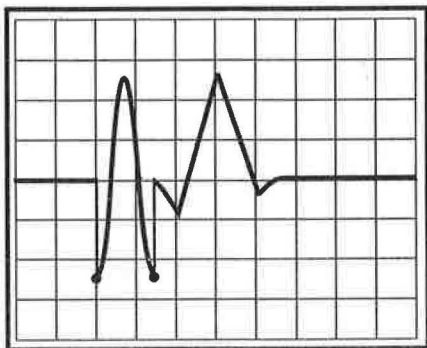
**DELTA ELECTRONICS LABORATORY**

NBS Traceable Calibration


2402 S. Nashville Ave.

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**Model 95**  
**Arbitrary Waveform**  
**Editing Guide**







# **Model 95 Arbitrary Waveform Editing Guide**

This guide will enable you to make changes to existing waveforms or to create new waveforms using the four front panel editing modes provided in the Wavetek Model 95 .

## **WAVETEK**

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## I. Arbitrary Waveforms

The arbitrary waveform generator (arb) is different than the function generator because instead of instrument defined functions such as sine, triangle and square, the arb produces User-Defined or custom functions. The Model 95 allows the user to construct arbitrary waveforms which are approximately 8K x 4K. See figure 1. To understand what this means, think of the

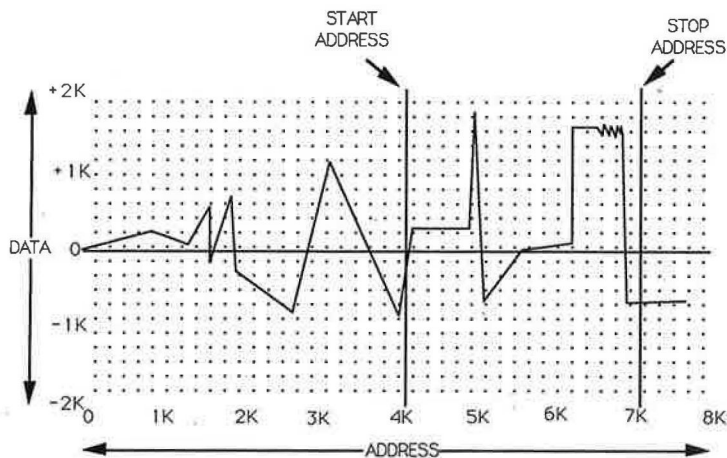


Figure 1

Model 95 arb generator as a piece of graph paper which has 8191 points along the horizontal axis. The graph's vertical axis contains 2047 points above the center line (+2047) and 2047 points below the center line (-2047). The Model 95 refers to the horizontal points as **addresses** and the vertical points as **data**.

Within this horizontal 8K x 4K space one large waveform or many smaller waveforms can be constructed. You can control how much of this 8K x 4K memory space is output from the Model 95 at any one time by choosing the start address and stop address. These points are shown in figure 1 at the 4K and 7K points respectively. Only the address and data values between the start and stop addresses will be output from the arb when it is operating. You can change these values at any time if you wish to change the output waveform information. This is easily accomplished from the front panel or remotely across the GPIB. The start and stop address points are the beginning and ending points of your waveform.

The frequency of an arbitrary waveform is defined as the sampling frequency (which in the Model 95 is between 1mHz and 20 MHz) divided by the number of horizontal points in the waveform. Thus, if you wish to produce a 20 kHz output frequency and your arbitrary waveform is 1000 points in length, you would need to sample at a rate of  $20,000 \text{ Hz} \times 1000$  points, or 20 MHz. These frequency calculations can sometimes become tedious, so the Model 95 will automatically calculate the arb waveform frequency for you when you provide the start and stop addresses (thus determining the horizontal width of the waveform) and the sampling frequency.

The Model 95 uses two forms of memory for arb waveforms. First, the **active memory** (or active RAM) is where the waveform is created, edited and replayed. Second, the **arb function memory** (or storage RAM) is where the completed arb functions are stored. The active memory can be thought of as a scratch pad where you are working with a waveform in real time, and the function memory (which is non-volatile) can be thought of as long-term memory storage. When you select one



of the arb functions (1-4) a copy of the function memory is placed in the active memory for you to work with. Arb functions in active memory can be modified without affecting the waveform data in arb storage memory. But, when the function (FUNCTION key) is changed, the Model 95 automatically stores the waveform if any of the arb parameters have been changed. **This feature keeps you from forgetting to save your changes when you exit the arb function that you were working with!**

## **2. Arb Keys**

Before we discuss the setup to be used for creating waveforms using the Model 95, let's review the operation of several important keys. This section is provided for your reference, so take a few moments to become familiar with it now before proceeding.

**FREQ/SAMP** – This keys sets the arb waveform sample frequency (period) or waveform frequency (period).

**Sample Period** clocks each point of the arb waveform; sample period ranges from 1000.0s to 0.00005 ms.

**Sample Frequency** clocks each point of the arb waveform; sample frequency ranges from 0.001 Hz to 20 MHz.

**Waveform Period** is the repetition rate of a complete cycle of an arb waveform (Start to Stop Address). The maximum waveform period depends upon the number of points in the waveform:

Waveform Period = (Sample Period) × (Stop Address – Start Address).

For example, if the waveform consists of 1000 points, the maximum block period will be 50 μs.

**Waveform Frequency** is the frequency of a complete cycle of an arb waveform. The maximum block frequency depends upon the number of points in the waveform:

Waveform Frequency = (Sample Frequency) ÷ (Stop Address – Start Address).

For example, if the waveform consists of 1000 points, the maximum block frequency will be 20 kHz, since the maximum sampling frequency is 20 MHz.

**AMPLITUDE**—This key sets the amplitude of the arb waveform. The type of amplitude depends upon the arb's edit mode.

**Amplitude.** If the arb is operating in the EDIT OFF mode, the AMPLITUDE key allows the setting of the output amplitude of the entire arb waveform. This amplitude value assumes that the arbitrary waveform uses the entire block (-2047 to 2047). If the waveform does not use the entire waveform data block, the following formula will calculate the actual amplitude.

Peak Output Voltage = (Selected Output Voltage) × (Peak to Peak Waveform Data Value) ÷ (Maximum Data Value).

For example, if the Selected Output Voltage is 10 Vp-p, the Peak to Peak Waveform Data Value is 2047, and the Maximum Data Value is 4094 then

$$\begin{aligned}\text{Peak Output Voltage} &= (10 \text{ Vp-p}) \times (2047) \div 4094 \\ &= 5\text{Vp-p}.\end{aligned}$$

**Digital Amplitude (DAMPL).** If the arb is operating in any of the arb edit modes, the AMPLITUDE key allows the setting (scaling in percent) of selected portions of the arb waveform amplitude. Only the portions between the left and right cursors can be changed by Digital Amplitude. On the scope, the minimum and maximum values of the waveform portion will be highlighted with a cursor. If the knob is used, minimum and maximum markers move up or down to preview the new level. The original peak to peak level of the selected portion waveform is defined as 100%.

**OFFSET** – This key sets the amplitude of the arb waveform. The type of offset depends upon the arb edit mode.

**Offset.** If the arb is operating in the EDIT OFF mode, the OFFSET key allows the setting of the offset of the entire arb waveform. The Model 95 limits the offset to  $\text{Offset Vdc} + \text{Amplitude Vp} \leq 7.5 \text{ Vp}$

**Digital Offset (DOFST).** If the arb is operating in any of the arb edit modes, the OFFSET key allows the offsetting of selected portions of the arb waveform. Only the portions between the left and right cursors can be changed by Digital Offset. On the scope, the minimum and maximum points of the waveform portion will be highlighted along with the left and right cursors. If the

knob is used, minimum and maximum markers move up or down together to show the new level. The level is measured relative to the left cursor's position which the Model 95 displays as 00. Digital Offset is displayed as absolute data points relative to the left cursor. When digital offset is varied, the peak offset level depends on the maximum point of the waveform ( $\text{Digital Offset} + \text{Digital Amplitude} \leq 2047$ ). If the waveform data values fill the entire vertical portion of the memory, then digital offset will not operate.

### **3. Arb Editing**

This section explains the use of the four editing modes in the Model 95 and also shows you how to use the waveform memory to perform storage and recall functions. Analog and digital filtering concepts are also discussed. Section 4 applies these principles by taking you step by step through the creation of an EKG (heartbeat) waveform.

The Model 95 supports four types of waveform editing: point, 2 point (also known as "line"), 3 point and block. Point editing is simply the creation of a waveform point by point in memory by manually entering successive address and data values. Two point editing allows you to enter two separate address and data points and then automatically draw a line between them. Three point editing uses Z-axis oscilloscope modulation to draw sets of lines on the screen between their illuminated cursors. Finally, block edit allows you to insert standard functions (such as sine, triangle or square) between cursor points on the screen. An "undo edit" feature allows you to correct editing mistakes,

and an "invert" feature allows you to invert arb functions on screen and then store them.

The paragraphs that follow describe these editing modes and other features in more detail.

#### **A. Erasing an Arb Waveform during Editing**

When working in the arb active memory (editing), the waveform can be erased (all data goes to 0) without affecting the arb storage memory by pressing the SHIFT key and then the ARB RESET key.

#### **B. Erasing a Stored Arb Waveform**

Any stored arb waveform can be erased. Press the SHIFT key and then the ARB RESET key to initialize the active RAM. The active RAM resets immediately to all zeros at all addresses. To write this into one of the four arb functions, press SHIFT key and then the ARB STORE key to select one of the four ARB waveform storage locations. Use the knob to scroll through the list: ARB 1, ARB 2, ARB 3, and ARB 4. Press the ENTER key to reset the arb function. In addition, the cursors reset to the last selected start and stop addresses. In 3 point edit, the Model 95 places a cursor in the middle of the line.

#### **C. Correcting a Mistake**

If a mistake is made while editing an arb waveform, select "undo edit" using the EDIT key. Since the original waveform is still in the arb function memory, it can be retrieved unless the waveform was stored using arb store or by changing the arb FUNCTION.

Once UNDO EDIT is selected, press ENTER. This eliminates all of your editing steps since the last store operation, and another copy of the arb waveform memory is placed in active memory for your use.

#### D. Z-Axis Setup on Your Oscilloscope

Several of the editing modes in the Model 95 utilize Z-axis modulation. The Z-axis output makes editing much easier by accenting the cursors on your oscilloscope screen. Use the following steps to setup the Z-axis level for waveform editing.

1. **Connect cables.** Using figure 2, connect the Model 95 to the oscilloscope's inputs.

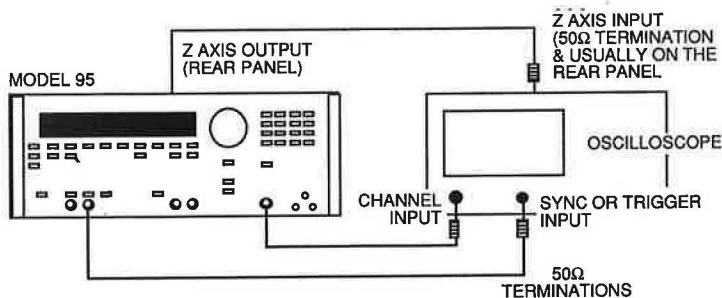
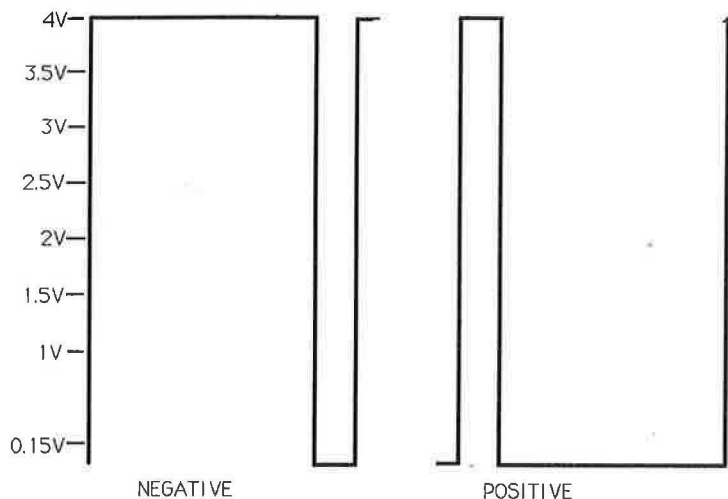


Figure 2.

2. **Set voltage level.** Refer to the scope's manual to determine the logic sense and level of the Z-Axis input requirements. Choose a setup to match the scope's Z-Axis input. Press the

Z-AXIS key or use the knob to scroll through the list, of positive and negative symmetry pulses outputs from 0.15V to 4V; see below. The output is active when selected.



*Figure 3. Z-axis levels*

2. **Set intensity.** Adjust the oscilloscope intensity to the desired brightness.
3. **Lower voltage range if necessary.** If the contrast between the bright dots ( cursors ) and the rest of the waveform is too high, then add a 50 $\Omega$  X10 attenuator and re-adjust the Z-AXIS level and the intensity of the oscilloscope.

## E. Point Edit

Point edit method defines waveforms by modifying a single point at a time without affecting other points. Figure 4 illustrates a point edit waveform. The horizontal line or X axis represents arb addresses (0 to 8191), and the vertical line or Y-axis represent the arb data (-2047 to +2047). Using point editing allows you to input a waveform a single data point at a time, or modify single points of existing waveforms. This method is best suited for short waveforms or simple modifications of existing waveforms. It is especially useful for adding "glitches" or spikes to existing waveforms.

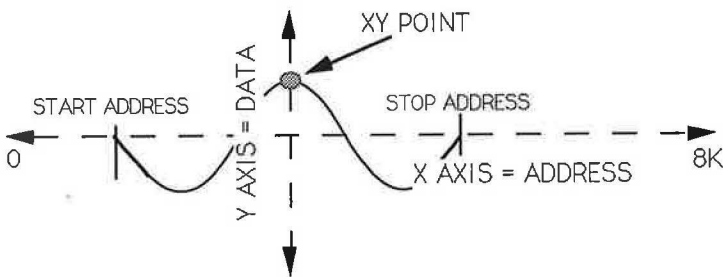


Figure 4. Point Editing

After Power On use the following steps to set up arb waveforms on the Model 95 using the point edit method. First, connect the Model 95 and a Scope as illustrated in figure 2.

1. **Enter Point Edit.** To select point edit, press the EDIT key , the Model 95 displays the last selected edit method. Use the EDIT key or knob to step to POINT EDIT.



- 2. Adjust Sync Address if desired.** Press the SYNC ADDR key to display the current arb sync address. Use the keypad or the knob to change the sync address if desired. The sync address can be set between 0 and 8191 with the start address being the default. If the sync address must be changed, it can only be placed between the start and stop addresses.

*Note: you may enter or change data by using either the control knob or the numeric keypad provided on the unit. In order to use the control knob, it must be enabled. To enable it, simply press the knob key in the upper left corner of the numeric keypad. The ENABLE annunciator light on the panel should then come on. When entering numeric data with the knob, the flashing digit on the display represents the digit that is currently significant. Continuing to press the knob key enables different significant digits until you have scrolled through all of them. Then the knob is disabled (turned off). This is indicated by the absence of the ENABLE indicator on the front panel. Pressing the knob key again will turn the knob on and repeat the sequence. Also, the Model 95 remembers the last setting of the knob key for each parameter. So, if you leave it enabled and then go and perform another function, it will remain enabled when you return.*

*The numeric keypad operates just like that of a calculator. Numbers may be entered as actual values (e.g., 1000 = 1kHz) or by exponential notation using the EXP key. Pressing ENTER causes the change to take affect. Pressing CE clears the entry and starts over again.*

- 3. Enter the Start and Stop Address.** Enter the waveform start address using SHIFT and START ADDRESS keys. Then enter the waveform's stop address using SHIFT and STOP ADDRESS. The portion of the waveform between the start and stop address will be the waveform used as an arb

function. The Model 95 will not allow the start address to be greater than the stop address and vice versa.

4. **Select the Address.** Press the ADDRESS key to display the last selected address. The data for that address is also displayed. A "P" to the left of the address indicates the Model 95 is in point edit. Use the keypad or the knob, if enabled (ENABLE indicator lit), to change the address.
5. **Enter the Data.** Once the address has been selected, press the DATA key to display the data for that address. Use the keypad or the knob, if enabled (ENABLE indicator lit), to change the data.

**Random Point Edit.** If the points are random (not adjacent addresses), press the ADDRESS key and use the keypad or knob to select the desired address. Press the DATA key, and enter the new data using the knob or keypad. Press the ENTER key to accept the new data. Then select another address and enter its new data. Only the points selected will be changed.

**Sequential Point Edit.** For sequential points (adjacent addresses), press the ADDRESS key and select the address (start at the lowest address in the sequence). Press the DATA key, and enter the new data. Press the DATA key to accept the new data. This key sequence automatically increments to the next arb address. All you have to do at that point is continue entering data values.

## F. Two point (Line) Edit

Two point (line) editing allows the user to develop waveforms by drawing a line between two points. The locations of the points are defined by address (X) and data (Y) entries. Figure 5 illustrates a line edit waveform. The horizontal line or X axis represents arb addresses (0 to 8191), and the vertical line or Y axis represents the arb data (-2047 to +2047). The line edit method draws a line between the first address data point and the second address data point. Intermediate data values for intermediate address points are automatically calculated and inserted in memory for you. This editing method works quite well when you have waveforms that are either triangular or rectangular in nature; they can easily be constructed using a series of straight line segments.

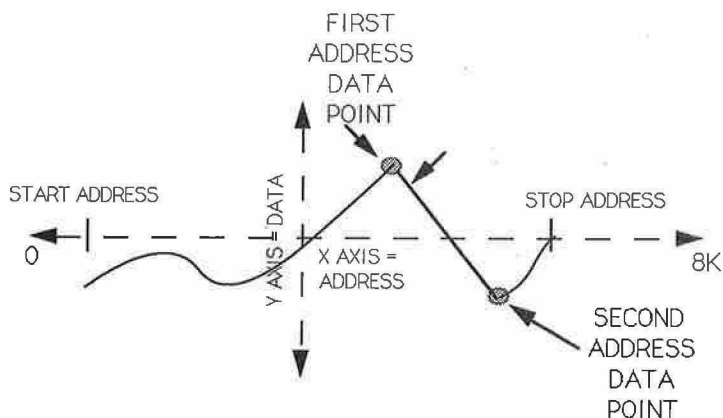


Figure 5. Line Edit

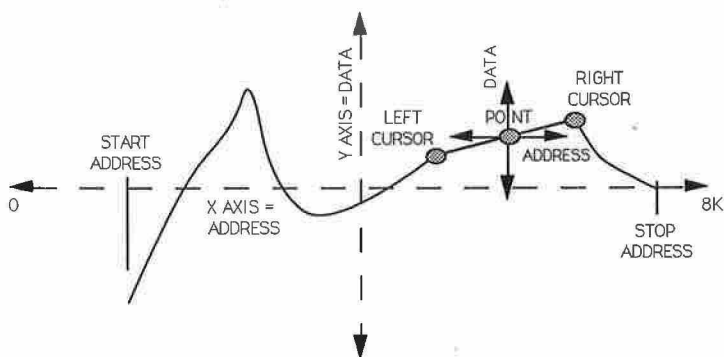
After Power On, use the following steps to set up arb waveforms on the Model 95 using the line edit method. First, connect the Model 95 and a Scope as illustrated in figure 2.

1. **Enter Line Edit.** To select line edit, press the EDIT key, the Model 95 displays the last selected edit method. Use the EDIT key or knob to step to line edit (LINE EDIT = 2-PT).
2. **Enter the First Address Data Point.** To place the first point, press the ADDRESS key and select the desired address using the keypad. Press the DATA key and enter the new data using the keypad. When in the Line edit mode, the display shows an "L" to the left of the address/data display.
3. **Enter the Second Address Data Point.** To place the second point, press the ADDRESS key and select another address. Press the DATA key and enter the new data.
4. **Drawing the Line.** Pressing ENTER enters the second point, and a second ENTER causes the Model 95 to draw a line between the first and second address and data points. All existing data between the two points will be lost and replaced with the new information.
5. **Concatenation** For a multi-line waveform where the second point of one line is the first of the next, simply continue entering points as in step 3. Do not press the two ENTERS until the final point data is entered.

### G. Three Point Edit

Three point edit allows the user to define waveforms by placing left and right cursors on a "line". An adjustable point, which can be moved vertically or horizontally, is placed between the

cursors. When the adjustable point has been placed to your satisfaction, a line segment is drawn connecting all three points. Figure 6 illustrates the three point edit method. The horizontal line or X axis represents arb addresses (0 to 8191), and the vertical line or Y axis represents the arb data (-2047 to +2047). Three point editing is useful for many complex editing tasks, such as curve approximation.



*Figure 6. 3-Point Edit*

After Power On, use the following steps to set up arb waveforms on the Model 95 using the three point edit method. First, connect the Model 95 and a scope as shown in figure 2.

1. **Enter Three Point Edit.** To select three point edit, press the EDIT key, the Model 95 displays the last selected edit method. Use the EDIT key or knob to step to three point edit (LINE EDIT 3-PT). Press the ENTER key to begin.

2. **Place the Left and Right Cursors.** Use the CURSOR key to place the left and right cursors (addresses). Use the knob or keypad to change the cursor locations. If your scope is set up properly, you should be able to see these points moving across the scope screen when you rotate the knob. When using the keypad, pressing ENTER should cause the cursor to jump to the new location. Pressing the CURSOR key again steps to the next cursor. The left and right cursors can not extend beyond the start and stop addresses.
3. **Place the Point Horizontally.** Place the point( the center cursor) on the line between the left and right cursors using the ADDRESS key. Press this key to display the current address, and use the knob or keypad to change the address. Rotating the knob moves the point left or right (the data value does not change). A highlighted point shows the new address position.
4. **Place the Point Vertically.** After selecting the address, press the DATA key to display the current data value. Use the knob or keypad to change the data value. Rotating the knob moves the point up or down (the address does not change). A highlighted point shows the new data position.
5. **Enter.** Press the ENTER key to "draw" the line segments between the cursors..

Repeat these items until the waveform is complete.

## H. Block Edit

Block edit allows you to insert standard functions between left and right cursors in your arb waveform. Once inserted, these

functions (such as sine, triangle, etc.) may be modified using any of the editing techniques discussed so far, or they may be inverted, smoothed or adjusted in amplitude or offset. When inserting block functions between cursors, the waveform is always inserted at full amplitude. That means that the waveform fills up the entire vertical contents of the memory block ( $\pm 2047$  points). This can be made lower at a later time. Figure 7 illustrates the block function.

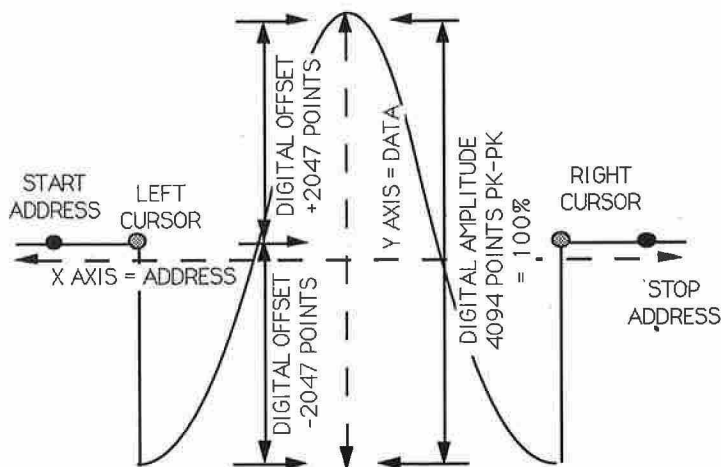


Figure 7. Block Edit

Block editing is useful for creating waveforms that use standard waveforms as a building block. For example, if you

wanted to create a pulse with overshoot on the leading edge, you could start with a square wave using a block function and add noise at a later time.

After Power On , use the following steps to set up arb waveforms on the Model 95 using the block edit method. First, connect the Model 95 and a scope as shown in figure 2.

1. **Enter Block Edit.** To select a standard function, press the EDIT key, the Model 95 displays the last selected edit method. Use the EDIT key or knob to step through the functions. All block functions are preceded by the word block followed by the waveform type. The available waveforms are: dc, triangle, square, ramp up, ramp down, sine, cosine, inverted sine, and inverted cosine.
2. **Place the Left and Right Cursors.** Use the CURSOR key to place the left and right cursors. Cursors actually are arb addresses. The Model 95 first displays the left cursor (address). Use the knob or keypad to change the left cursor address. Again press CURSOR key to step to the right cursor. Use the knob or cursor to enter right cursor (address). The left and right cursors cannot extend beyond the start and stop address.
3. **Insert the waveform.** Once a standard function has been selected and the left and right cursors have been placed, press ENTER to insert the function between the left and right cursor points.
4. **Adjust the Amplitude.** To vary the amplitude of the block function, press the AMPLITUDE key. This places you in the



digital amplitude mode. Now only, the amplitude of the function between the cursors will be adjusted. Digital Amplitude is in percentage of full scale or  $\pm 2047$  points. Use the knob or keypad to vary the digital amplitude from 100% to -100%. A negative percent inverts the waveform. If the knob is used, the minimum and maximum markers will show the new digital amplitude. Press ENTER to change the digital amplitude. If the keypad is used, the digital amplitude changes when the ENTER key is pressed.

5. **Adjust the Offset.** To vary the offset of the inserted standard function, press the OFFSET key. This places you in the digital offset function. This allows only offset of the function between the left and right cursors to be adjusted. Instead of an actual value listed in percent, the digital offset varies the waveform up or down a fixed number of data points (up to the  $\pm 2047$  point limit). Use the knob or the keypad to enter the digital offset value. Press ENTER to accept the digital offset; the offset value does not change until the ENTER key is pressed.
6. **Modify the Standard Function if required.** Use the point edit, line edit, or three point edit to modify the standard waveform if necessary.

Repeat these steps as needed until the desired waveform is created.

## I. Storing Arb Waveforms

Once an arb waveform has been created it can be stored as any of the following arb functions: ARB1, ARB2, ARB3, or ARB4. Stored arb waveforms contain the following information:

Address/Data Points

Sync Address

Start Address

Stop Address

Left Cursor Address

Right Cursor Address

Waveform Data (Can include effects of SMOOTH function)

Note that information about frequency/Sample rate, Amplitude, and Offset are not stored with the arb waveform. Rather, they must be selected after the arb waveform is selected as a function. If you wish, you can save this information in one of the 10 front panel setup registers for later use.

There are two methods of storing arb waveforms: automatically and manually.

The Model 95 automatically stores an arb waveform when the FUNCTION key is pressed after changing any of the following conditions:

- An edit operation was performed on the waveform
- The start or stop address was changed,
- The left or right cursor was changed, or
- The waveform was smoothed.

This automatic storage feature was designed so that you won't lose waveform information by forgetting to perform a manual arb store after an editing session.

If you have made a change to a waveform that you do not wish to save, select UNDO EDIT from the menu under the EDIT key. Press ENTER to wipe out all of your editing commands from that session. The original waveform will be restored, and you

can move to another arb function without overwriting your old waveform with the auto-save feature.

To manually store an arb waveform, press the SHIFT key and then the ARBSTORE key to select one of the four ARB waveform storage locations. Use the knob to scroll through the list: ARB 1, ARB 2, ARB 3, and ARB 4. Press the ENTER key to accept the location. To recall a stored setting, use the Function key to move to the desired arb location. A copy of the storage RAM will automatically be retrieved for you. Pressing the SHIFT key before the FUNCTION key allows you to scroll backwards through the list.

## J. Filter

The Model 95 contains two analog low-pass filters that may be applied to your arb waveform to increase its purity. These filters are two-pole active Bessel type, and are provided with corner frequencies of 50 kHz and 5MHz respectively. They may be enabled by pressing the FILTER key repeatedly until the frequency you desire is shown. A third position entitled "NONE" is also provided which turns all filtering off. Since these filters are applied to your arb waveform at the output stage, they do not affect the contents of your arb memory.

After Power On, use the following steps to set up the arb filter.

1. **Select the Filter Bandwidth.** To select the filter bandwidth, press the FILTER key to display the currently selected filter bandwidth. Use the knob or FILTER key to step through the list:

FILTER NONE,  
FILTER 5MHZ,  
FILTER 50 KHZ.

## K. Smoothing

Smoothing is the software equivalent of the a simple RC filter with seven selectable bandwidths. Smoothing requires user selection of a smoothing constant "N" which the Model 95 also calculates and displays as equivalent bandwidth. The equivalent bandwidth depends on the arb sample rate. The larger the smoothing constant, the more pronounced the smoothing effect is on the resultant waveform.

Since smoothing is a software algorithm that recalculates data values on your arb waveform, the arb memory is affected when you perform a smoothing operation. Therefore, once an arb waveform is smoothed, it cannot be unsmoothed. However, if the arb waveform has not been stored, use the EDIT key to select UNDO EDIT which retrieves the unedited waveform.

After Power On, use the following steps to set up smoothing.

1. **Select Smoothing Bandwidth.** To select smoothing bandwidth, press the SHIFT key and then the SMOOTH key to display the currently selected smoothing constant and equivalent bandwidth. Use the knob to step through the list:

BW-1 XY HZ

BW-2 XY HZ

BW-3 XY HZ

BW-4 XY HZ

BW-5 XY HZ

BW-6 XY HZ

BW-7 XY HZ

XY represents the equivalent bandwidth. This is calculated and displayed automatically for you for a given sample fre-

quency. When the desired bandwidth is displayed, press the ENTER key to accept the selection.

Repeat this process for additional smoothing.

## 4. Example Waveform

The following procedure demonstrates how a waveform can be built using some of the Model 95's editing capabilities. This procedure constructs an EKG (heartbeat) waveform.

### A. Initial Setup

1. Connect Model 95 to a oscilloscope per the diagram in Fig. 2.  
Set Z-axis level and intensity to desired brightness.
2. Set Model 95 and oscilloscope as follows:

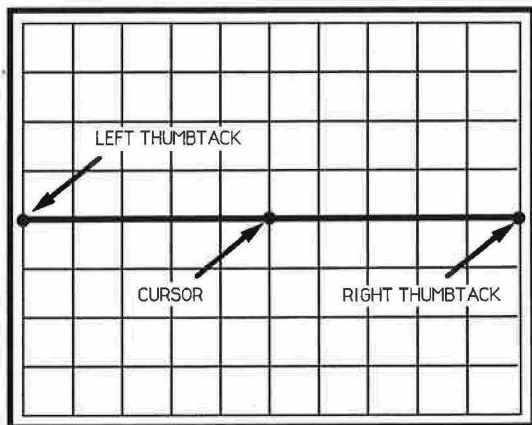
Model 95		
Press	Display	Comments
(SHIFT)RESETALL		Initialize all parameters.
FREQUENCY 1MHz		Set frequency to 1MHz.
FUNCTION	ARB1	Use the keypad or the control knob.
(SHIFT)ARBRESET		
(SHIFT)STARTADDR	0	
(SHIFT)STOPADDR	2000	Keypad or knob
LEFT CURSOR	0	Keypad or knob
RIGHT CURSOR	2000	Keypad or knob

Press	Display	Comments
ADDRESS		1000 Keypad or knob
EDIT	LINE (3-PT)	Press EDIT until LINE = 3-PT is displayed.
ENTER		
OUTPUT	ON	

### Oscilloscope

Parameter	Setting
VOLTS/DIV	2
HORIZONTAL	.2 ms

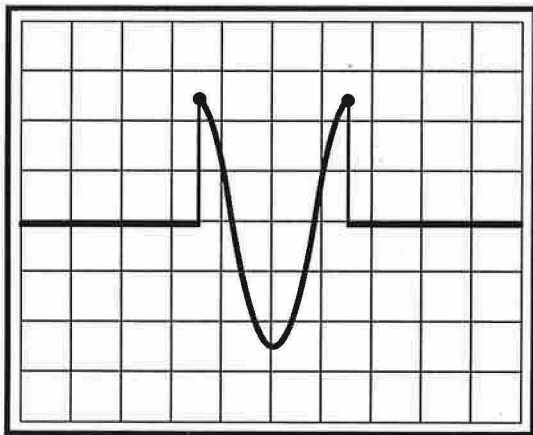
3. The scope should display a dc waveform with three cursors (left, right and center).



## B. Waveform Creation

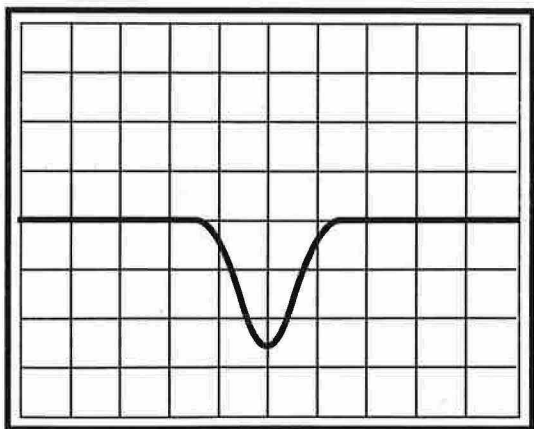
1. Set Model 95 as follows:

Press	Display	Comments
LEFT CURSOR	0696	Use CURSOR key
RIGHT CURSOR	1301	Use CURSOR key
EDIT	BLOCK EDIT +COS	Press EDIT until +COS is displayed.
ENTER		



2. Set Model 95 as follows:

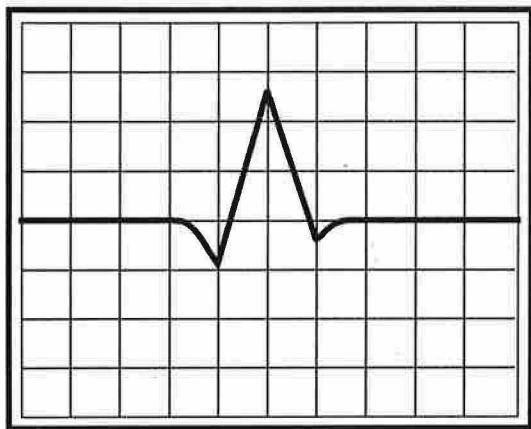
Press	Display	Comments
DAMPL	50	
ENTER		
DOFST	-2040	
ENTER		





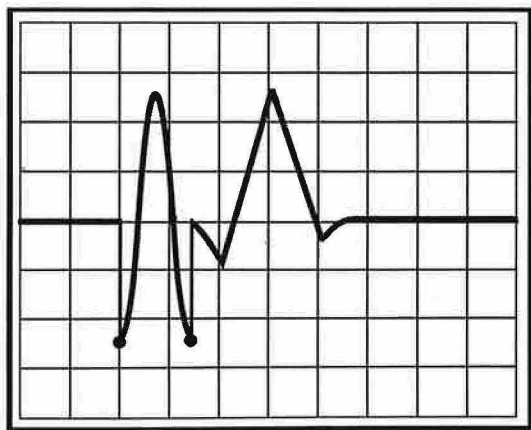
3. Set Model 95 as follows:

Press	Display	Comments
LEFT CURSOR		0811
RIGHT CURSOR		1211
EDIT	LINE EDIT (3-PT)	
ENTER		
DATA	2047	Center cursor is at address 1000 from step 2.
ENTER		



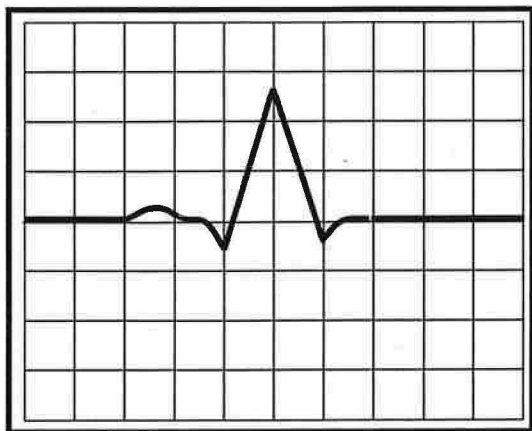
4. Set Model 95 as follows:

Press	Display	Comments
LEFT CURSOR		0410
RIGHT CURSOR		0706
EDIT		
BLOCK EDIT	-COS	Press EDIT until -COS is displayed.
ENTER		



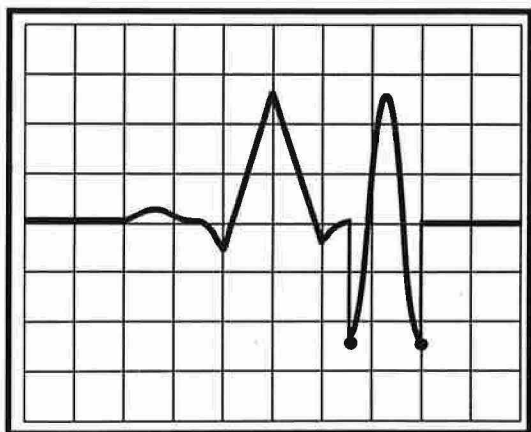
5. Set Model 95 as follows:

Press	Display	Comments
DAMPL	5	
ENTER		
DOFST	91	
ENTER		



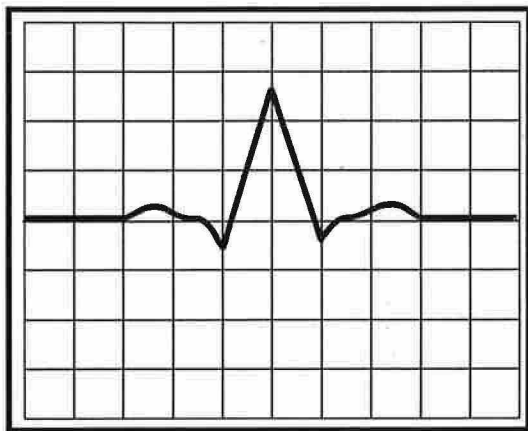
6. Set Model 95 as follows:

Press	Display	Comments
LEFT CURSOR	1290	
RIGHT CURSOR	1660	
EDIT BLOCK EDIT -COS		Press EDIT until -COS is displayed.
ENTER		



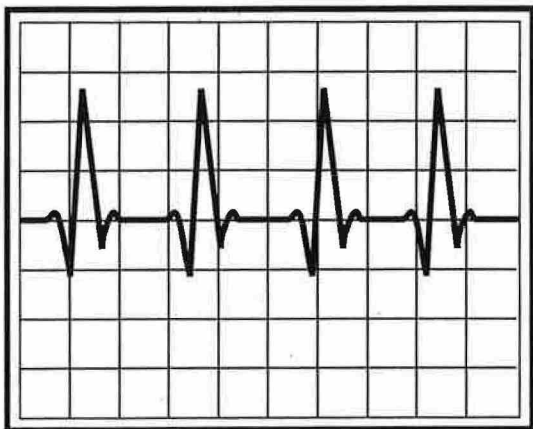
7. Set Model 95 as follows:

Press	Display	Comments
DAMPL	6	
ENTER		
DOFST	125	
ENTER		



8. Set Model 95 as follows:

Press	Display	Comments
(SHIFT)SMOOTH		
	5 (5.1 kHz)	
ENTER		Smooth occurs each time ENTER is pressed.
ENTER		
FREQUENCY 4MHz		





# WAVETEK

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