

PROTOR Tutorial : Historic Shaft Gap Displays

Don Davies. Prosig Ltd. 9th March 2001

Summary

It is possible to produce an shaft gap display within PROTOR for two perpendicularly mounted shaft proximity probes for system where the DC component of the proximity signal is measured. For more modern PROTOR systems both the AC and DC components of a proximity probe are available from a single measurement channel, on older systems this was possible by utilising two measurement channels one for the AC and one for the DC component. Shaft Gap displays provide useful information for the vibration engineer when investigating movement of a shaft within a bearing. A gap display may be displayed as a real-time display in Operator for from logged data using Historic. Both functions provide facilities for resolving vibration into the horizontal and vertical planes when it is not physically possible to mount the transducers at these positions. It is also possible to identify the shaft position when at rest and to show the movement relative to this position. This note provides some information on producing a gap display specifically from within the Historic module.

Display Selection

A display of the most recently selected data may be displayed as a Gap display by selection of the SHAFT display option and selecting the Gap suboption. The SHAFT display option allows the display of either Orbit data or Gap data. The Orbit display is described in a previous tutorial. When viewing the Gap display you may switch between the Orbit and Gap displays using the toggle buttons. The Gap display provides an X-Y display of the DC component of the selected channels.

Data Selection

The gap display uses whatever data is currently selected , this may be a time range selection or a runup or rundown. For this range of data the DC component of the selected X and Y channels is extracted and displayed against each other. From the Gap display a new Time range may be selected using the Data / Time Range option or a runup or rundown selected using the Data / Variable Speed selection option.

Channel Selection

Click on the Y and X buttons to select which channels are to be displayed against each other. If you select the channel associated with the Y axis first then if this channel has an associate channel setup in the configuration then this channel will be automatically selected as the X axis. This ensures that perpendicular channels are selected. If , however , you wish to select a completely different channel for the X axis then you may do so by clicking on the X axis button.

Scales

The scales of the display may be changed using the scales buttons. On entry to the display the scale for the DC component for the channels selected is used. Use the Scale

Up button (^) to make the display larger. This reduces the range of both the X and Y axes by a factor of 2. Use the Scale Down (v) button to reduce the size of the display by increasing the axis range by a factor of 2. To manually set the minimum and maximum values of the X and Y axes select the Scales button and a menu will be presented for you to input the values. Alternatively select the Auto option and the display will autoscale.

The following figure shows a typical gap display for a Runup.

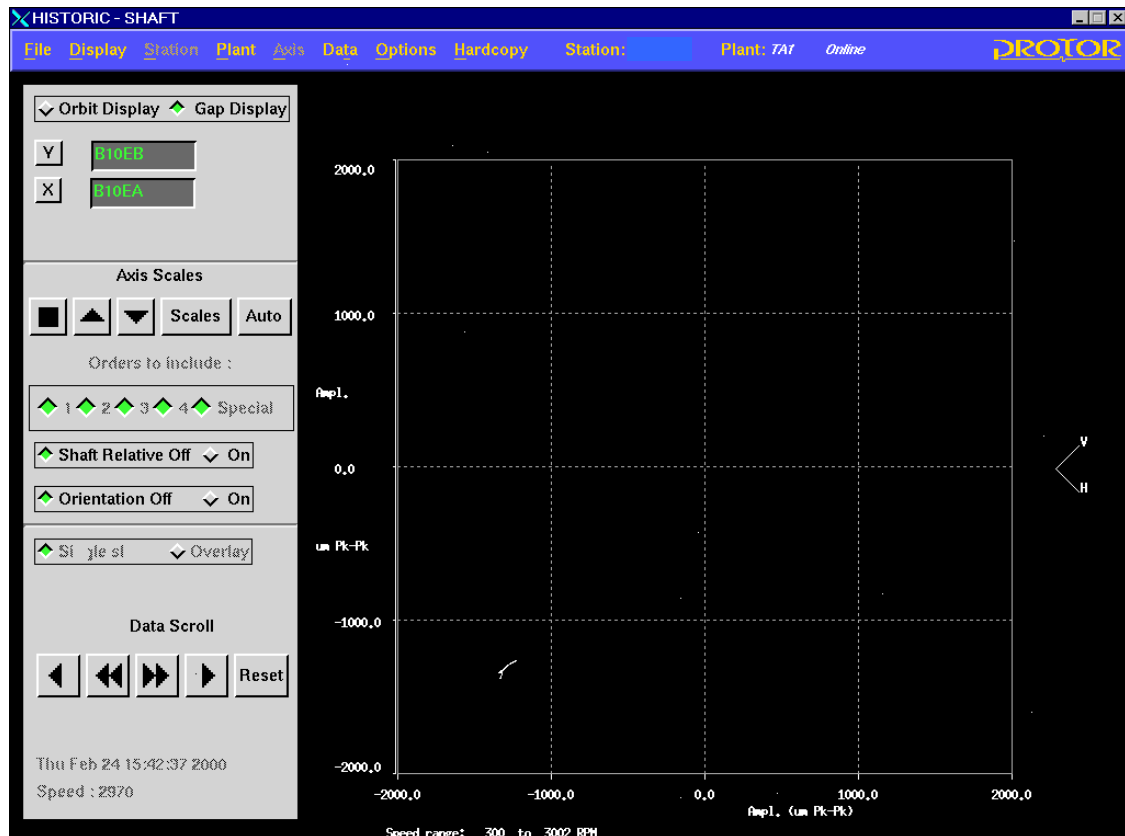
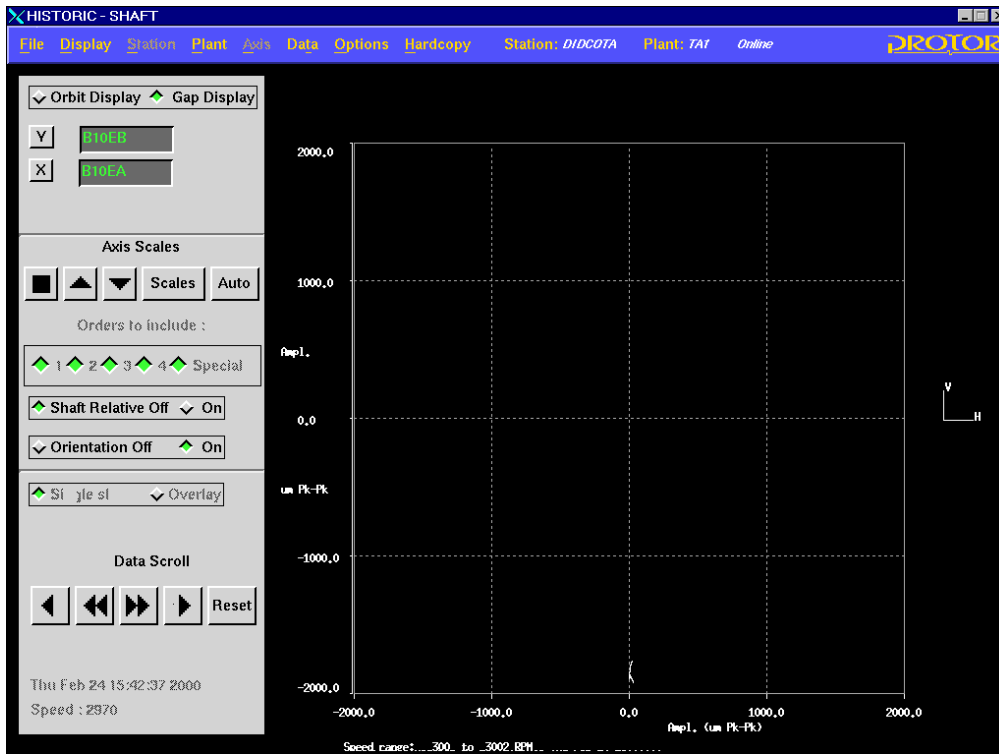


Figure HISTGAP1. Historical Gap Display

Orientation

In cases where the transducers are not mounted horizontally and vertically the configuration provides the orientation angles required to transpose a pair of channels on the vertical and horizontal axes. By default the channels displayed do not have this transposition applied. The direction of horizontal and vertical are shown by the indicators to the right of the display. If the orientation transposition is turned on then the display is redrawn with vertical upward and horizontal to the right.

The following display shows the same data as in Figure HISTORBIT1 but with the transposition applied and then when Autoscale is applied.



Note , if you have set tight scales around the Gap display (or used the Autoscale option) and then selected or deselected orientation transposition then the resultant display may become off scale. The best approach is to apply Orientation transposition first and then apply the Autoscale option.

Figure HISTGAP2. Orientation Applied

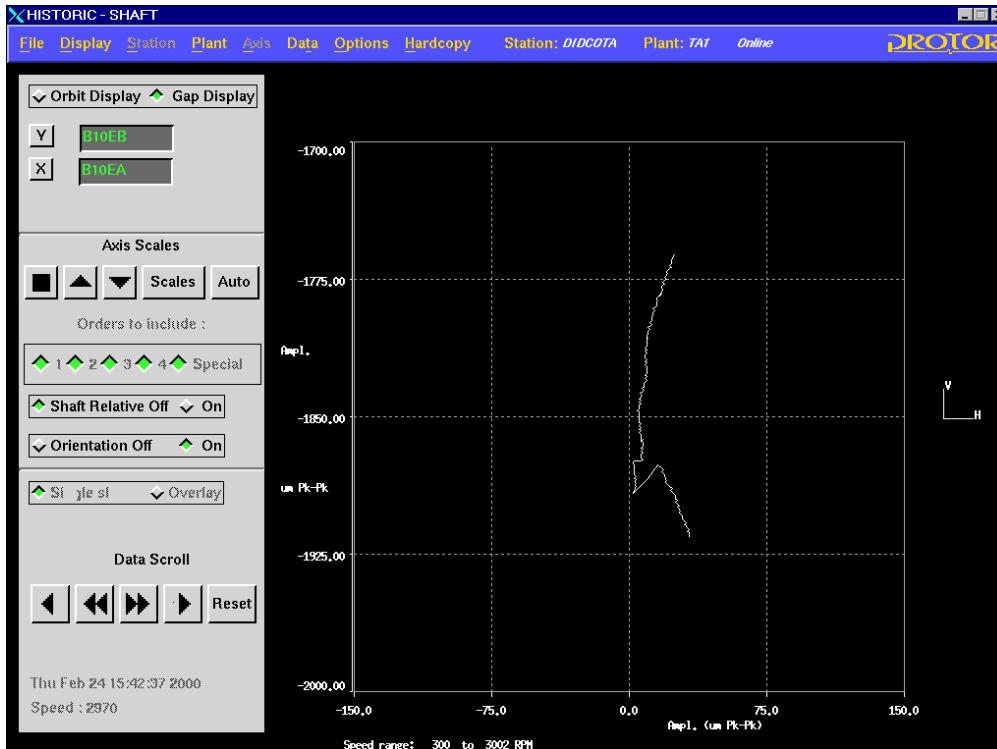


Figure HISTGAP3. Autoscale Applied

Gap Annotation

In order to see how the Shaft Gap position is changing with Speed or Time you may add annotation to the display. This annotation is similar to that provided for the Vector displays. From the Options menu select the Annotation Table option. On this menu you may select either speed or distance annotation and for each the amount of change required for a new annotation point to be drawn. For each annotation point a letter is shown on the display and an entry made on the annotation table.

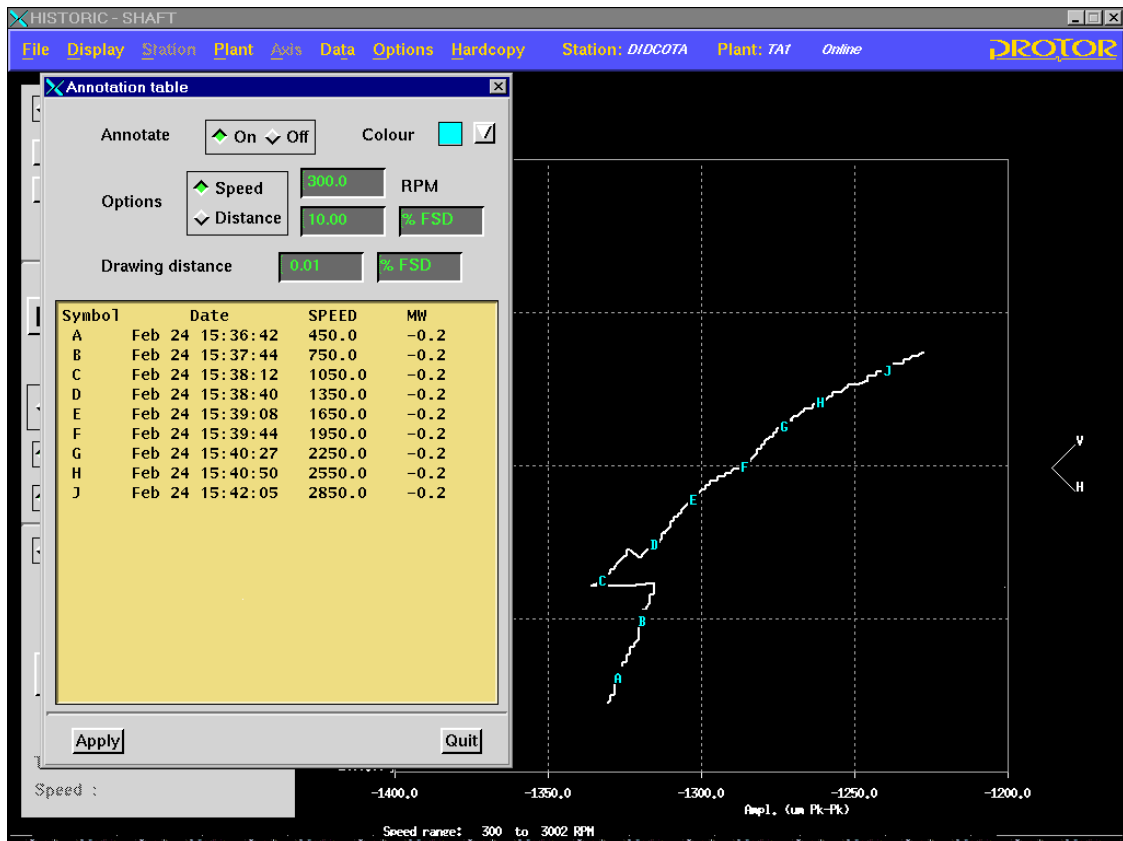


Figure HISTGAP4. Gap Display with Annotation

Cursor Function

The Gap display also supports a cursor function. Select the Cursor Output option from the Options menu and the cursor window will appear and a cross hair will be drawn on the display. Using the mouse move the cross hair close to the data curve and click the left-hand button for a reading to be taken. The reading will be shown in the cursor window for the point closest to the cursor position and will show the DC value for the X and Y channels and the Speed, Load and Time of the data point.

Shaft Zero Reference Position

The examples presented previously all show data displayed as absolute gap positions relative to the position of the probe. Often you may wish to display the gap data relative to the shaft's position when stopped. We refer to this as the Shaft Zero Reference. In order to achieve this display the absolute gap measurements when stopped must be recorded and saved. The DC component for all displacement channels is measured and stored by PROTOR when in the stopped or very low speed conditions. It is possible to manually enter this data into the Configuration details directly or to use the Historic module to save the data automatically.

To store the gap data when stopped in the historic module use a Trend display to find a portion of history data which contains some data collected when stopped. Use the cursor

function to select a particular data sample in the stopped state , as shown in the following figure.

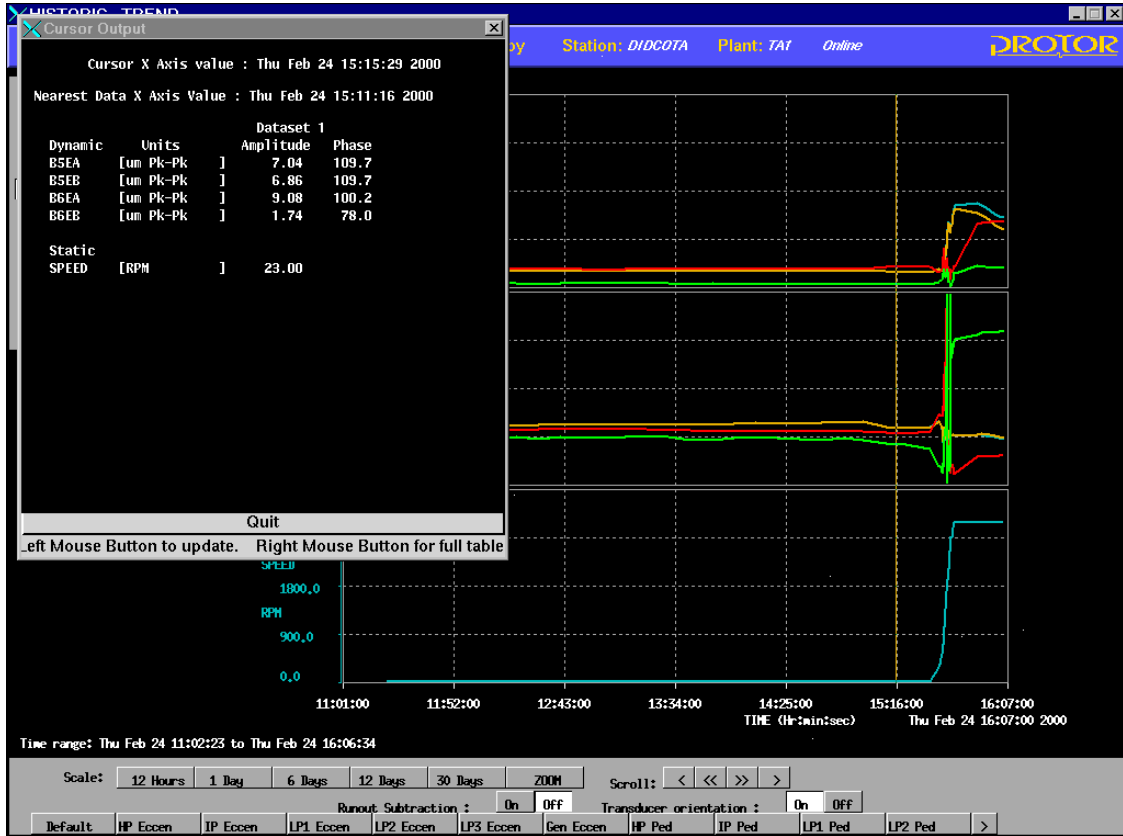


Figure HISTGAP5. Gap Data when Stopped.

With a suitable point selected click the right-hand mouse button to enter the Historical Table display. This display shows data for all channels for a particular logged sample. The following display will be produced.

Historic Table Output							
Name	Units	Overall	DC	Order 1		Order 2	
				Mod	Phase	Mod	Phase
B1EB	um Pk-Pk	13,88	-1155,79	0,00	360	0,00	360
B1EA	um Pk-Pk	11,62	-1204,61	0,00	360	0,00	360
B2EB	um Pk-Pk	5,73	-1159,75	0,00	360	0,00	360
B2EA	um Pk-Pk	6,74	-1004,06	0,00	360	0,00	360
B3EB	um Pk-Pk	26,83	-1506,75	0,00	360	0,00	360
B3EA	um Pk-Pk	32,22	-767,06	0,00	360	0,00	360
B4EB	um Pk-Pk	12,64	-1095,99	0,00	360	0,00	360
B4EA	um Pk-Pk	13,01	-1175,53	0,00	360	0,00	360
B5EB	um Pk-Pk	0,59	1,32	0,00	360	0,00	360
B5EA	um Pk-Pk	8,31	-1149,20	0,00	360	0,00	360
B6EB	um Pk-Pk	3,41	-1075,31	0,00	360	0,00	360
B6EA	um Pk-Pk	4,33	-985,59	0,00	360	0,00	360
B7EB	um Pk-Pk	5,94	-1026,49	0,00	360	0,00	360
B7EA	um Pk-Pk	3,71	-1060,80	0,00	360	0,00	360
B8EB	um Pk-Pk	10,66	-1107,17	0,00	360	0,00	360
B8EA	um Pk-Pk	8,35	-1336,70	0,00	360	0,00	360
B9EB	um Pk-Pk	6,94	-1145,24	0,00	360	0,00	360
B9EA	um Pk-Pk	8,73	-1165,30	0,00	360	0,00	360
B10EB	um Pk-Pk	21,53	-1406,48	0,00	360	0,00	360
B10EA	um Pk-Pk	40,07	-1304,83	0,00	360	0,00	360
B11EB	um Pk-Pk	24,82	-1194,40	0,00	360	0,00	360
B11EA	um Pk-Pk	13,89	-1061,09	0,00	360	0,00	360
B12EB	um Pk-Pk	10,52	-1283,77	0,00	360	0,00	360
B12EA	um Pk-Pk	0,12	-5,39	0,00	360	0,00	360
B1V	mm/s RMS	0,02	-0,03	0,00	360	0,00	360
B2V	mm/s RMS	0,01	-0,04	0,00	360	0,00	360
B3V	mm/s RMS	0,01	0,02	0,00	360	0,00	360
B4V	mm/s RMS	0,02	-0,05	0,00	360	0,00	360
B5V	mm/s RMS	0,01	-0,03	0,00	360	0,00	360
B6V	mm/s RMS	0,01	-0,05	0,00	360	0,00	360
B7V	mm/s RMS	0,06	0,32	0,00	360	0,00	360
B8V	mm/s RMS	0,02	-0,06	0,00	360	0,00	360

Speed:19 RPM Time: Wed Feb 23 23:01:41 2000

Print	Save Gap	Page Down	Order	Static	Dynamic	Previous Scan	Next Scan	Quit
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Figure HISTGAP6. Historical Table Data

On this display you may scroll forwards and backwards through the data until a suitable point is found when the shaft is at rest. In this condition the Save Gap button will become active. Click on this button to save into the configuration the DC component for all eccentricity channels.

NOTE The Save Gap button is only available when the state of the selected sample is Stopped. For States of Barring , Rundown and Rundown the button becomes Save Runout. For Onload states the button is unavailable.

When this data has been saved it may be viewed and possibly edited from within the Configuration editor by selected the Dynamic / Configuration option as shown below.

Channel	Ass Channel	Rotn(Degs)	Ass Rotn(Degs)	Shaft Gap	G/Box Flag	FiltCor
B1EB	2	-45	45	-1155.79	0	2
B1EA	1	-45	225	-1204.61	0	3
B2EB	4	-45	45	-1159.75	0	3
B2EA	3	-45	225	-1004.06	0	3
B3EB	6	-45	45	-1506.75	0	2
B3EA	5	-45	225	-767.06	0	3
B4EB	8	-45	45	-1095.99	0	2
B4EA	7	-45	225	-1175.53	0	2
B5EB	10	-45	45	1.32	0	2
B5EA	9	-45	225	-1149.20	0	2
B6EB	12	-45	45	-1075.31	0	2
B6EA	11	-45	225	-985.59	0	3
B7EB	14	-45	45	-1026.49	0	3
B7EA	13	-45	225	-1060.80	0	2
B8EB	16	-45	45	-1107.17	0	3
B8EA	15	-45	225	-1336.70	0	2

Proceed Cancel Next Page Previous Page

Figure HISTGAP7. Configuration Editor

With the shaft gap data saved , if you then select the Zero Reference option then the Gap Display will be shifted relative to the measured position when the shaft was at rest.

NOTE if you have autoscaled the data and then apply the shaft relative option the display may well become off scale. In this case , simply re-apply the autoscale option and new scales will be selected.

The following figure shows a Shaft Relative display.

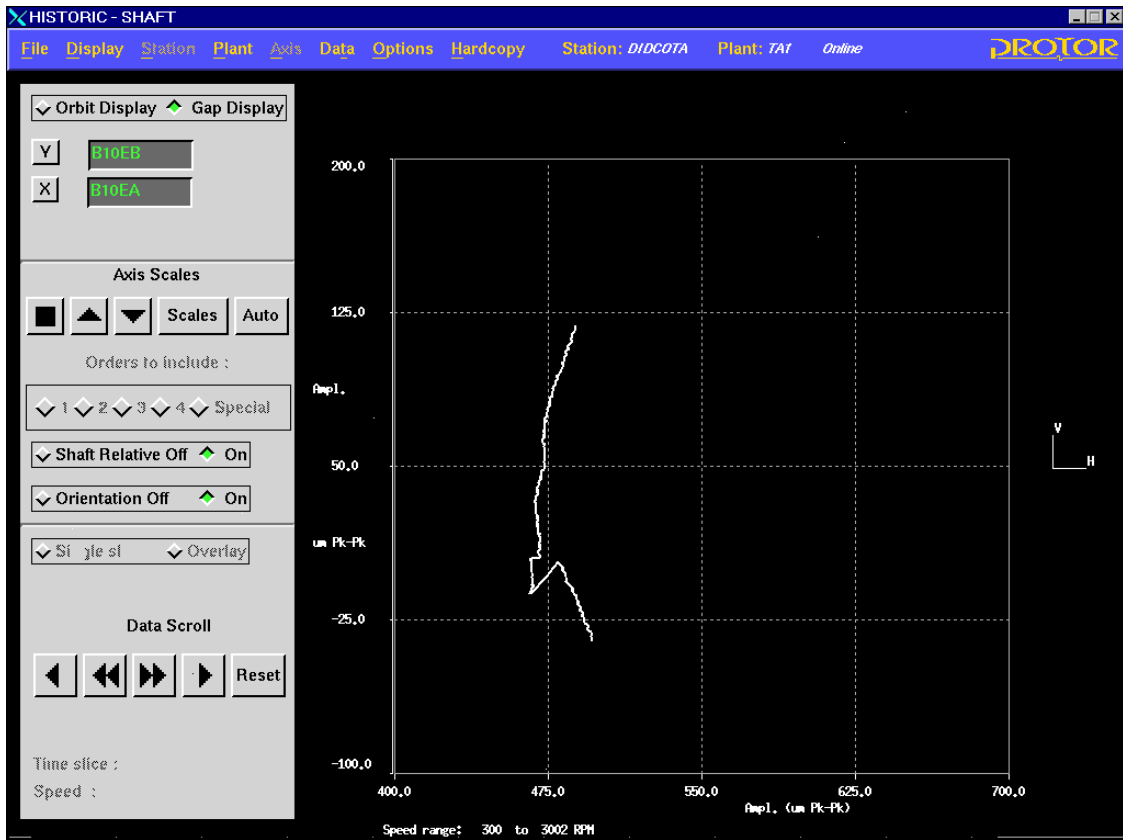


Figure HISTGAP8. Gap Display , Zero Reference Selected