VIBRALIGN

The V180 Laser Alignment System

Figure 1- 1

System Components

❶ Display Unit

❷ Laser Units

❸ Accessories

Alignment Procedure

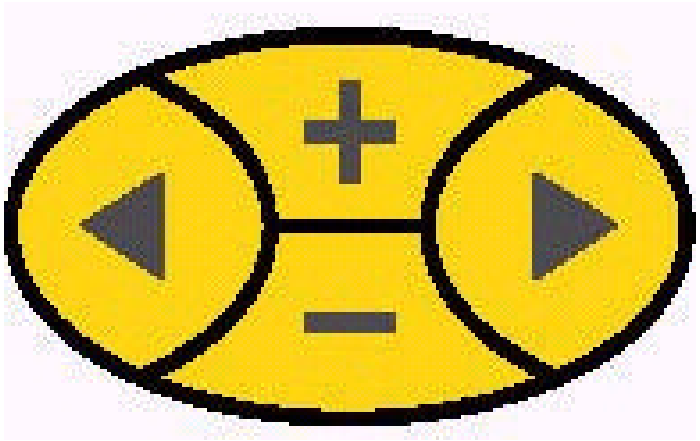
❶ Display Unit Operation
❷ Set-up
❸ Aim the Lasers
❹ Entering Machine Dimensions
❺ Taking Readings
❻ Evaluate and Adjust: Vertical Plane
❼ Evaluate and Adjust: Horizontal Plane
❽ Check and Re-adjust
❾ Document

1

Alignment Procedure

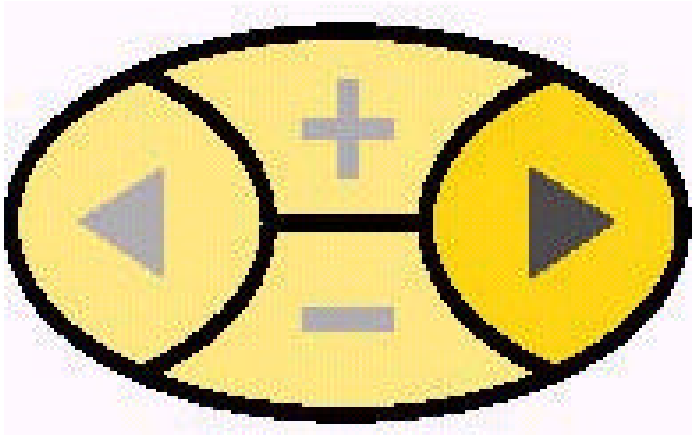
Display Unit Operation

In addition to the On / Off button, only 4 buttons are required to operate the V180.



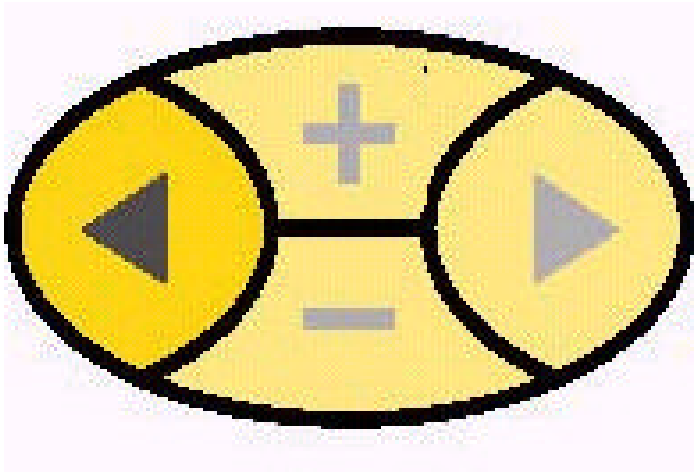
Display Unit Operation

The forward arrow button steps you through the alignment process.



Display Unit Operation

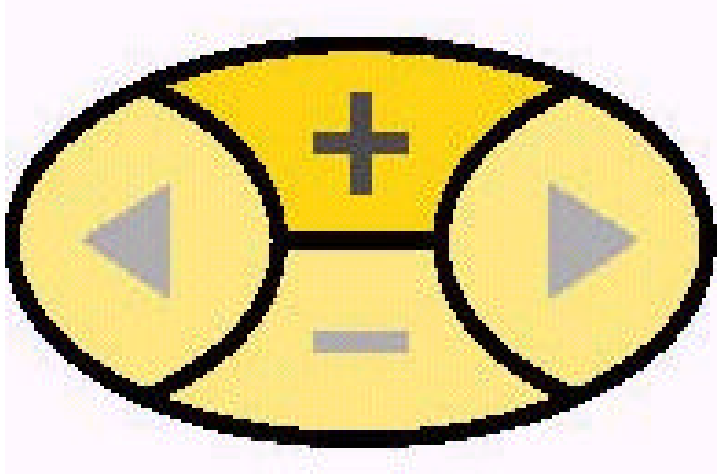
The back arrow button let's you go back to correct entry errors, or go back to an earlier step in the alignment.



Display Unit Operation

The + button:

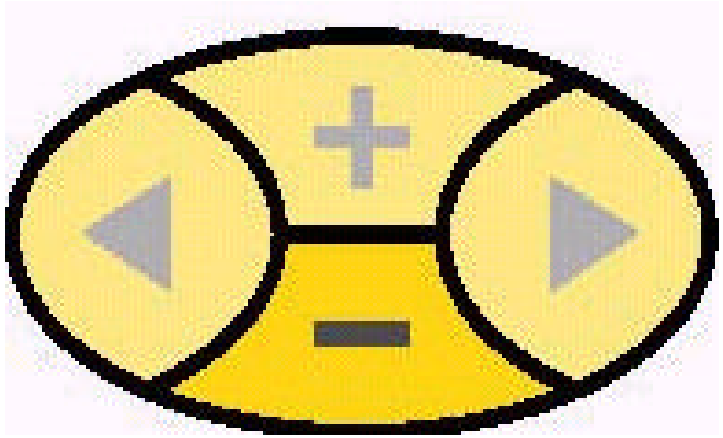
- Used to enter values for machine dimensions.
  - Used to switch between Coupling Values Screen to Feet Values Screen.



Display Unit Operation

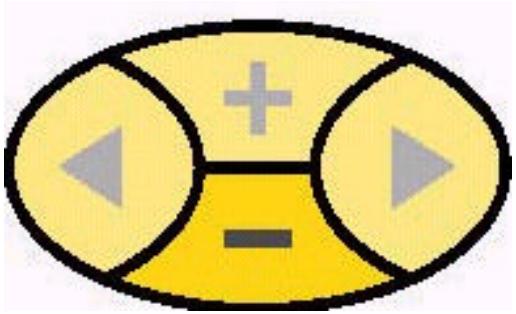
The - button:

- Used to adjust machine dimensions entered.
- Used to set the default to English Units.



Display Unit Operation

Setting measurement values in English units:



+

Display Unit Operation

Setting measurement values in English units:

“/mils

will be displayed in the upper right corner of the screen.

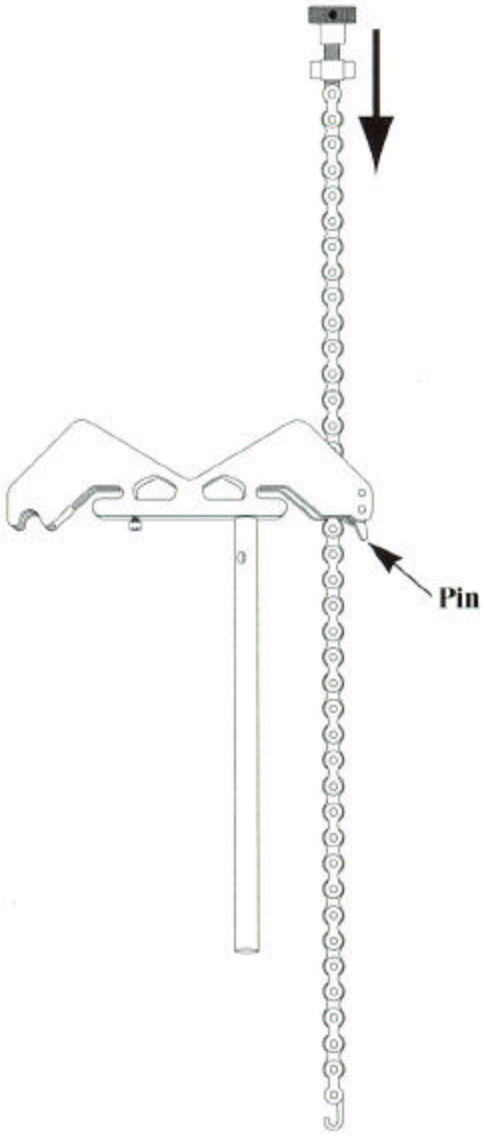
❷

Alignment Procedure

Set-up

Mount brackets on Shaft:

❶ Drop chain into upside-down bracket.



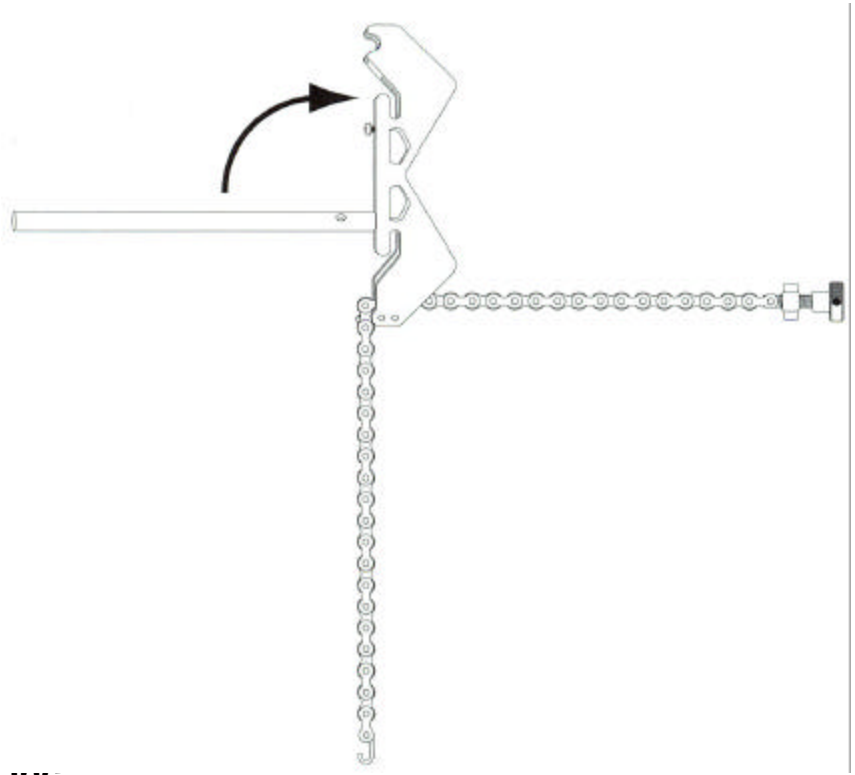
❷

Alignment Procedure

Set-up

Mount brackets on Shaft:

❷ Flip bracket catching a chain link on the pin.



❷

Alignment Procedure

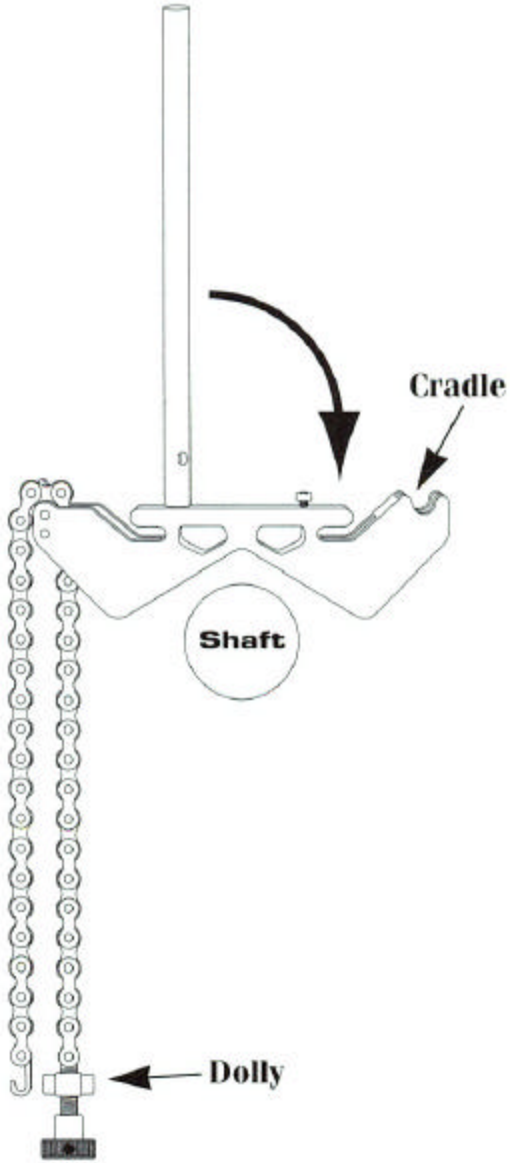
Set-up

Mount brackets on Shaft:

❸ Flip bracket and set on shaft.

❹ Bring chain around shaft.

❺ Set dolly in the cradle.



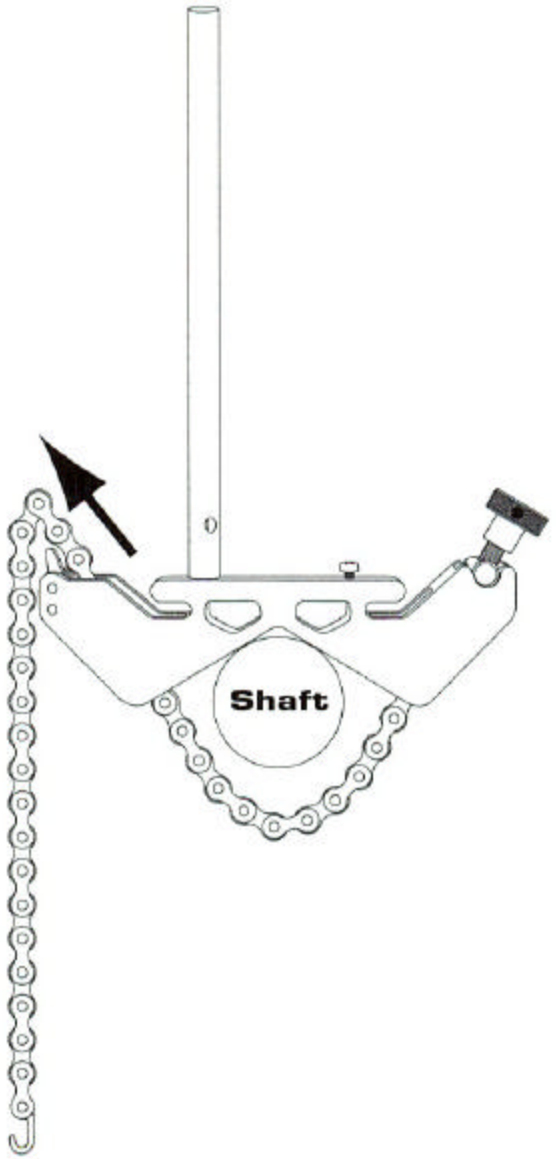
❷

Alignment Procedure

Set-up

Mount brackets on Shaft:

❻ Pull loose end of the chain tight around the shaft and re-seat the pin.



❷

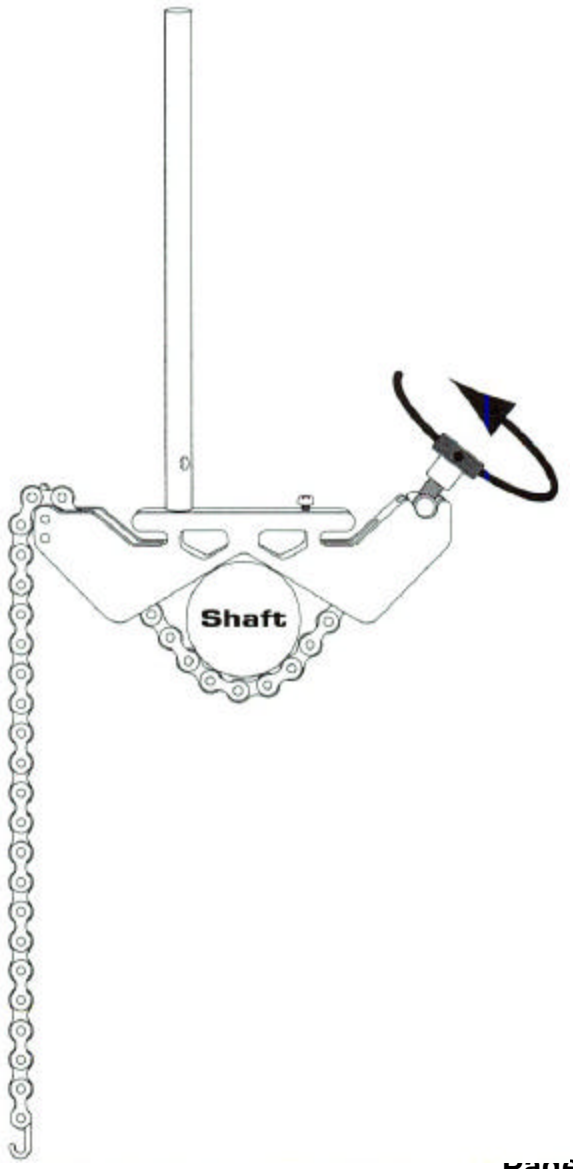
Alignment Procedure

Set-up

Mount brackets on Shaft:

❼ Tighten locking bolt.

❽ Tighten 1/4 turn using Tightening Tool.



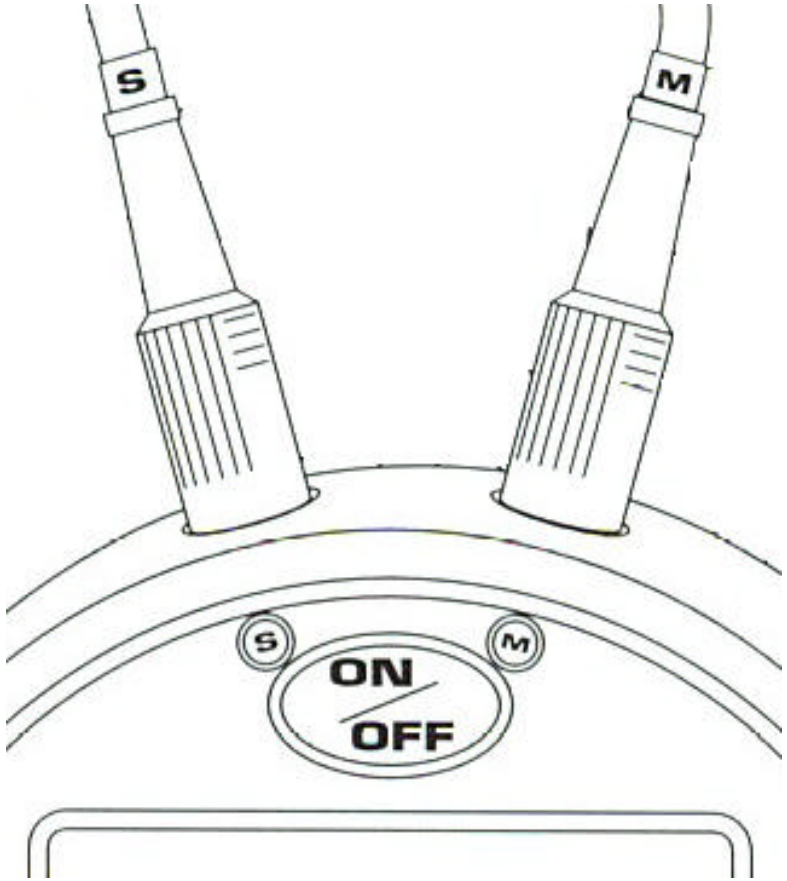
❷

Alignment Procedure

Set-up

❾ Connect cables from the Laser Units to the Display Unit.

S to S



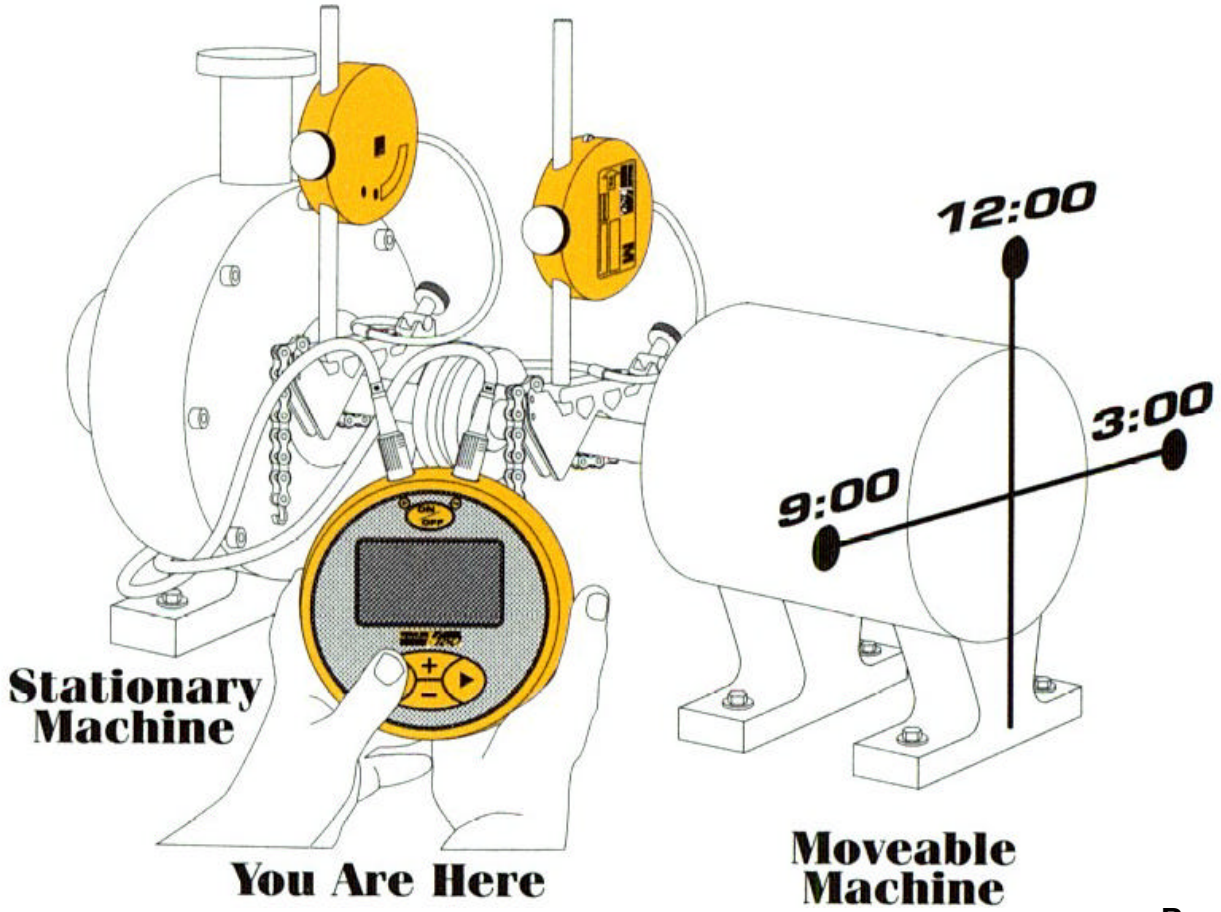
M to M

2

Alignment Procedure

Set-up

Orientation



❸

Alignment Procedure

Aim the Lasers

❶ The laser units should be in the 12:00 position with detector covers closed exposing the targets.

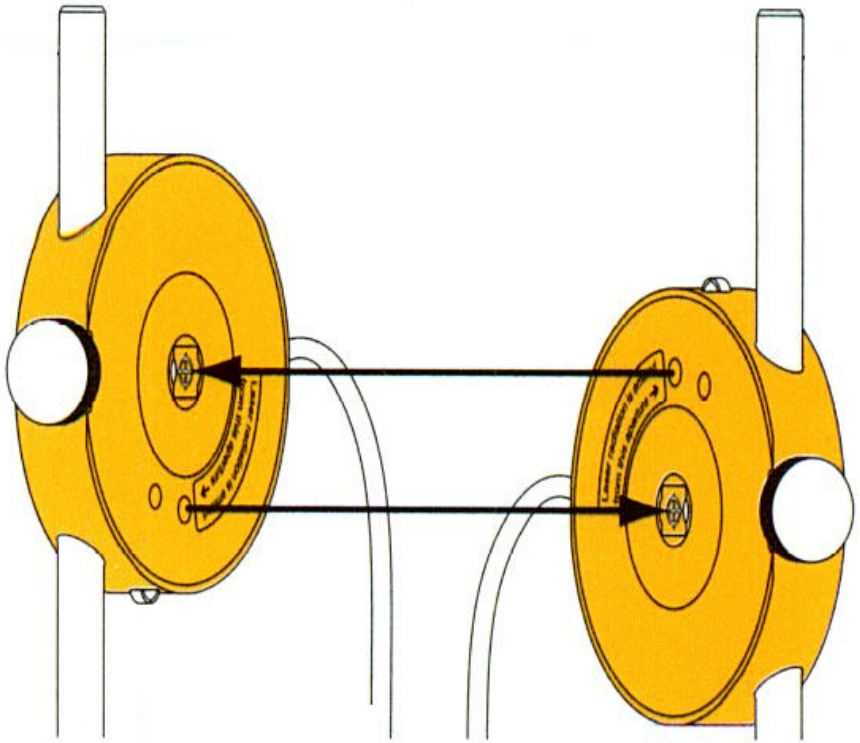
❷ Turn the display unit on.

❸

Alignment Procedure

Aim the Lasers

❸ Adjust the laser units until the laser beam from each unit hits near the center of the target on the opposite unit.



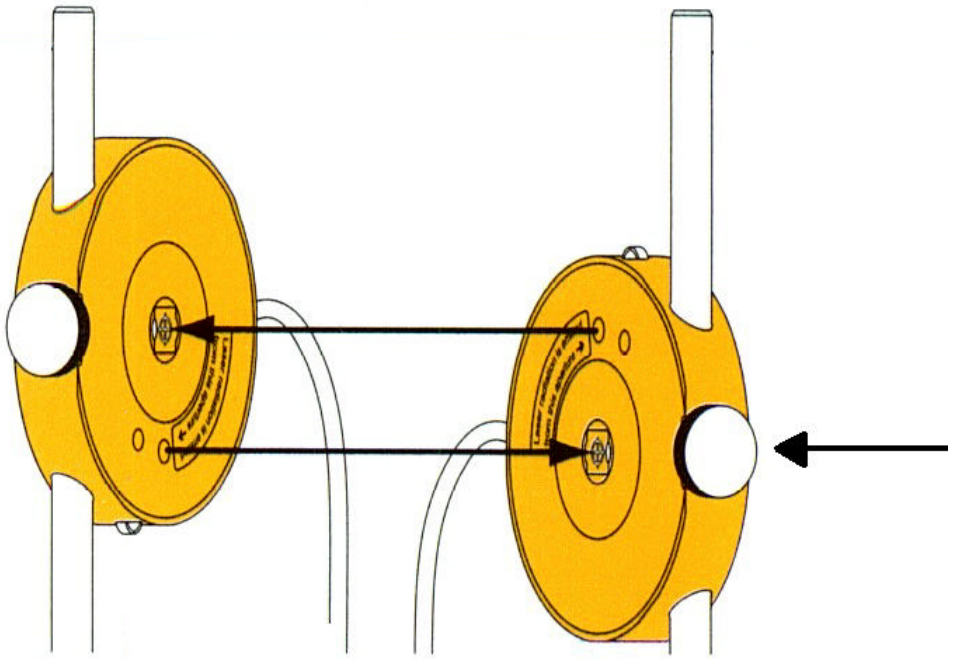
❸

Alignment Procedure

Aim the Lasers

❹ To adjust the beams side to side, pivot the laser units on the rods.

❺ To adjust the beams up and down, move the laser units up or down on the rods.

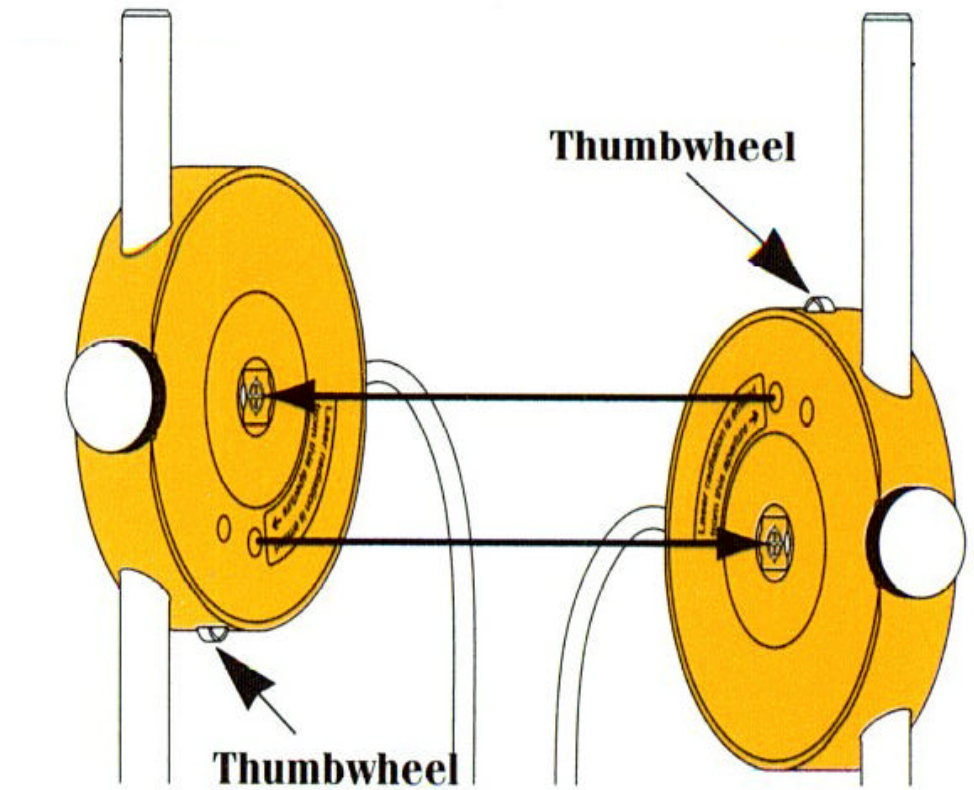


❸

Alignment Procedure

Aim the Lasers

❻ Fine adjust with thumbwheel.

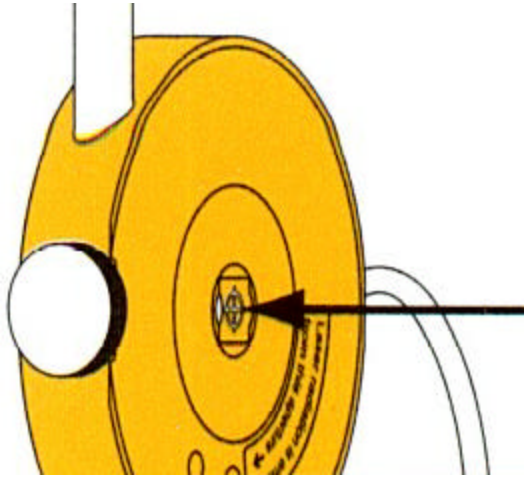


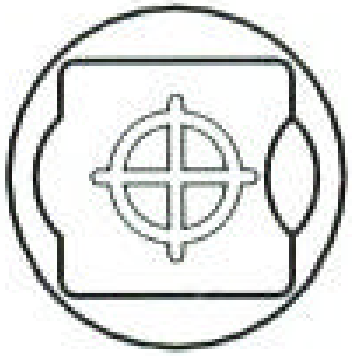
❸

Alignment Procedure

Aim the Lasers

❼ Slide open the detector covers.

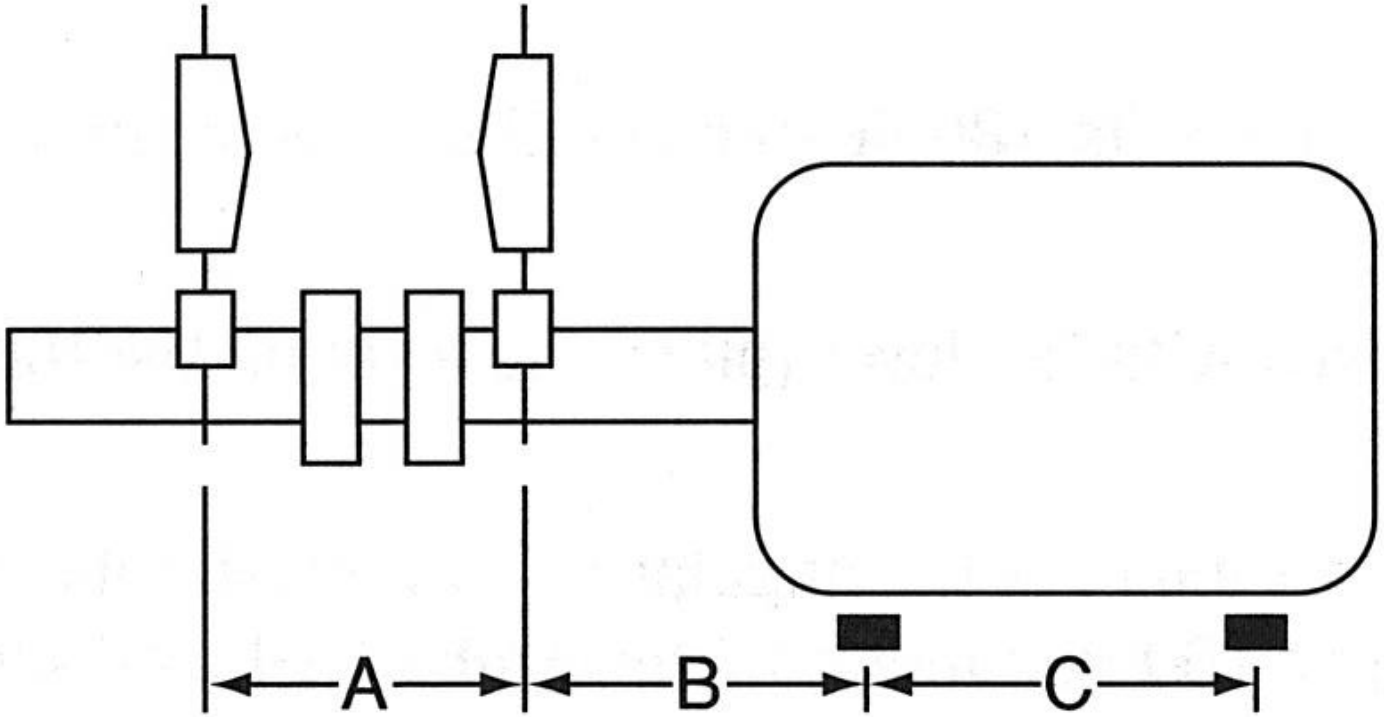




4

Alignment Procedure

Entering Machine Dimensions

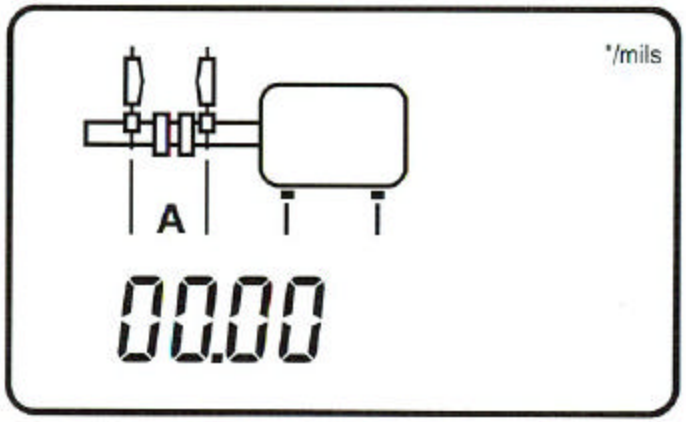


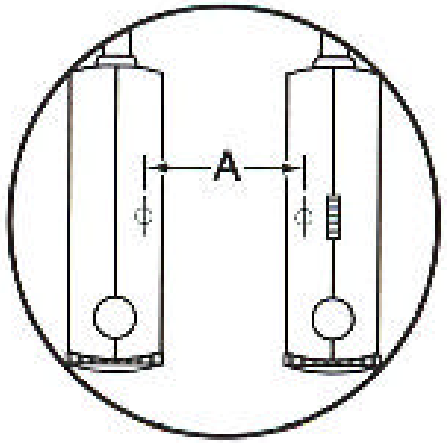
4

Alignment Procedure

Entering Machine Dimensions

❶ The “A” dimension will begin blinking on screen. This is the distance between score marks on top of the laser units. Measure the “A” dimension.



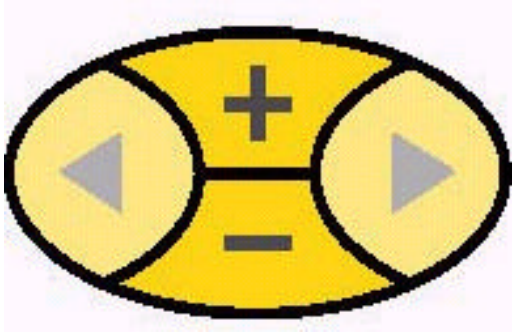


4

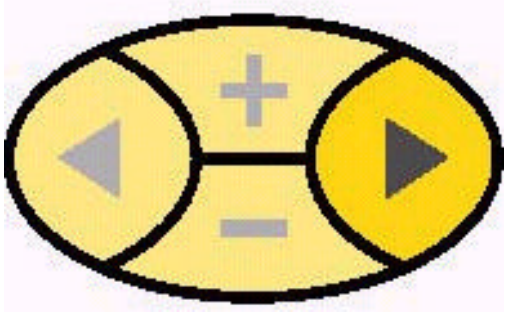
Alignment Procedure

Entering Machine Dimensions

❷ Enter the “A” dimension using the + / - buttons.



❸ Press the forward arrow button.

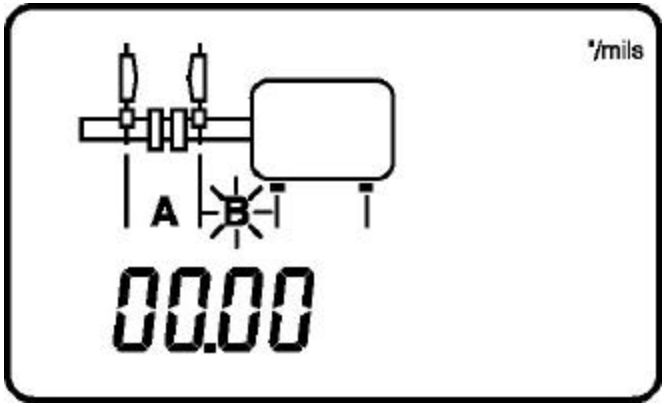


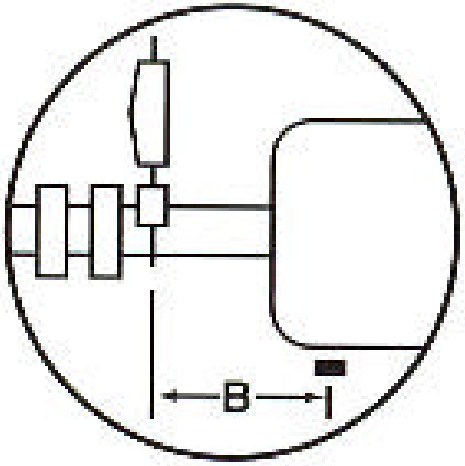
4

Alignment Procedure

Entering Machine Dimensions

❹ The “B” dimension will blink on the screen. This is the distance between score mark on top of the <u>movable</u> laser unit and the front feet of the movable machine. Measure the “B” dimension.



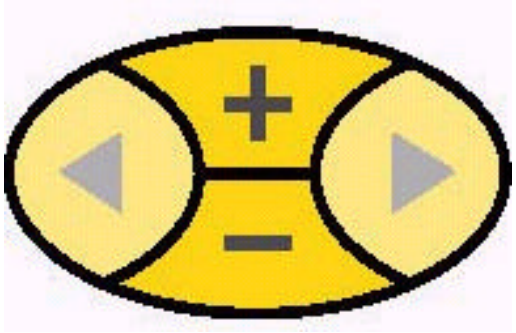


4

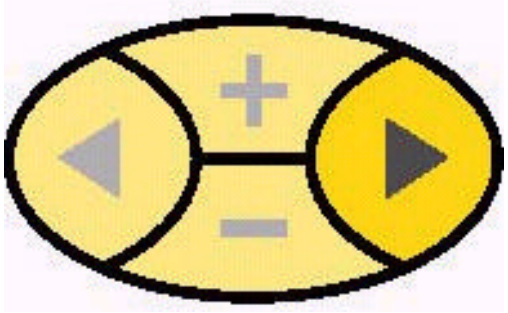
Alignment Procedure

Entering Machine Dimensions

❺ Enter the “B” dimension using the + / - buttons.



❻ Press the forward arrow button.

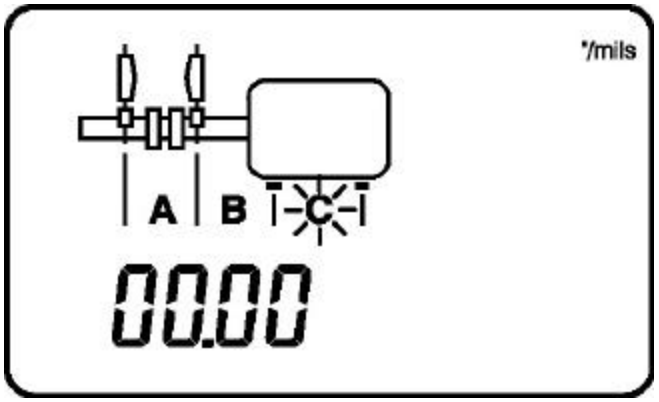


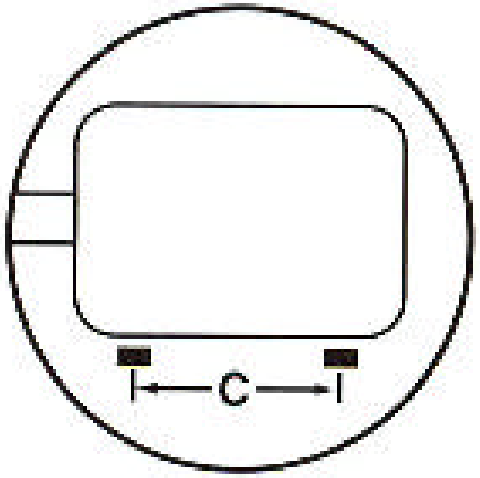
4

Alignment Procedure

Entering Machine Dimensions

❼ The “C” dimension will blink on the screen. This is the distance between the feet of the movable machine. Measure the “C” dimension.



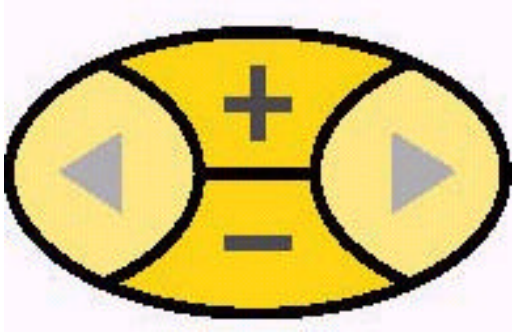


4

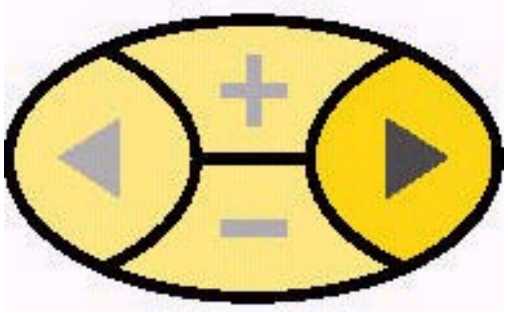
Alignment Procedure

Entering Machine Dimensions

❽ Enter the “C” dimension using the + / - buttons.



❾ Press the forward arrow button.

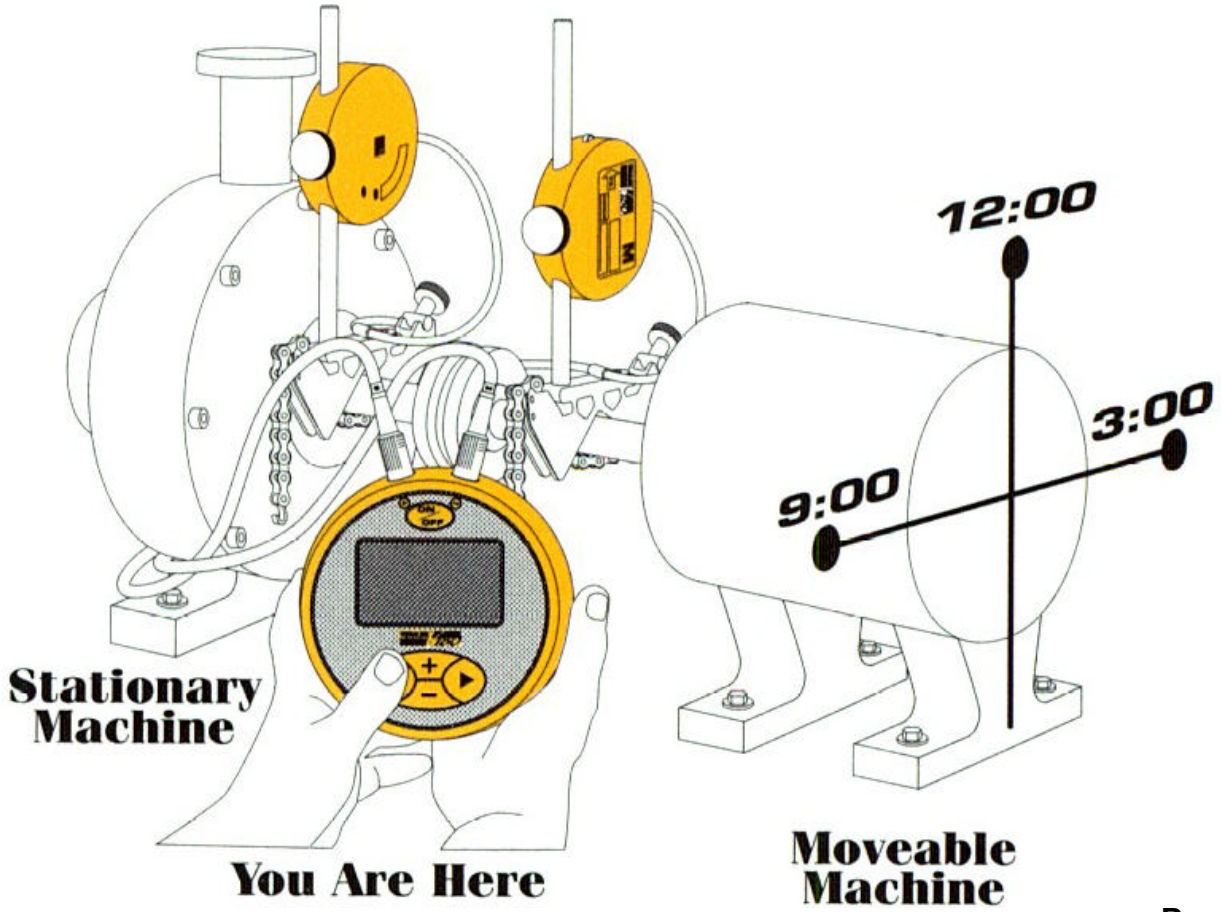


5

Alignment Procedure

Taking Readings

9, 3, 12 o'clock

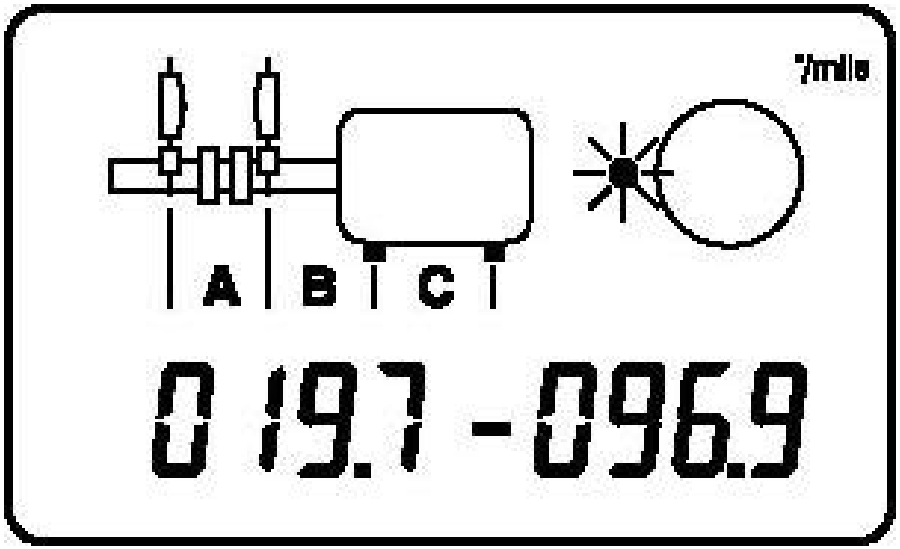


5

Alignment Procedure

Taking Readings

❶ A clock face appears on screen with a blinking dot at the 9:00 position. Rotate the shafts so the laser units are positioned at 9:00. Use the level to ensure the rods are horizontal.

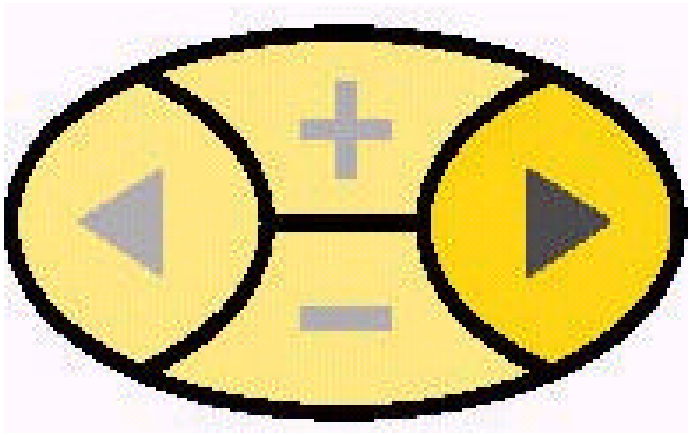


5

Alignment Procedure

Taking Readings

❷ Push the forward arrow button.

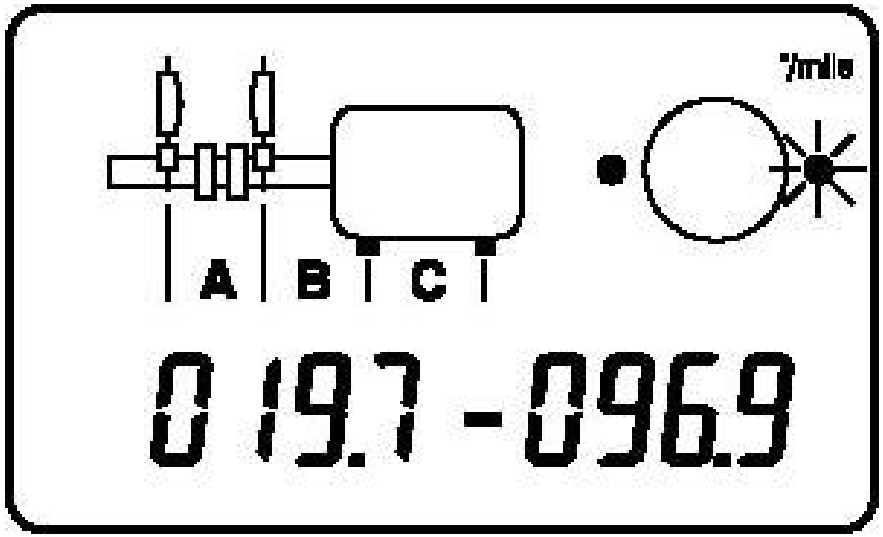


5

Alignment Procedure

Taking Readings

❸ You will see a blinking dot at the 3:00 position by the clock face. Rotate the shafts 180 degrees until the laser units are positioned at 3:00. Use the level to ensure the rods are horizontal.

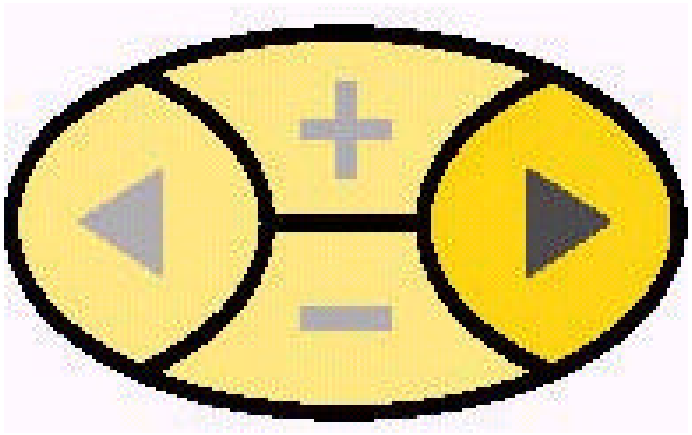


❺

Alignment Procedure

Taking Readings

❹ Push the forward arrow button.

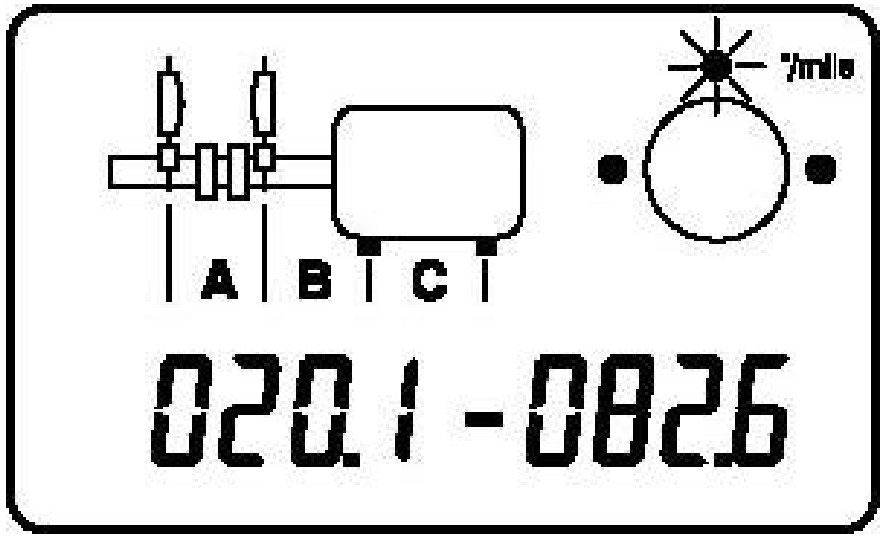


❺

Alignment Procedure

Taking Readings

❺ You will see a blinking dot at the 12:00 position by the clock face. Rotate the shafts to bring the laser units to 12:00. Use the level to ensure the rods are vertical.

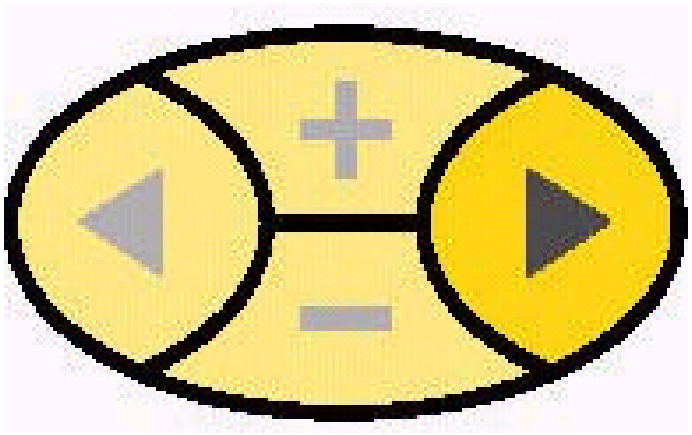


5

Alignment Procedure

Taking Readings

❻ Push the forward arrow button.

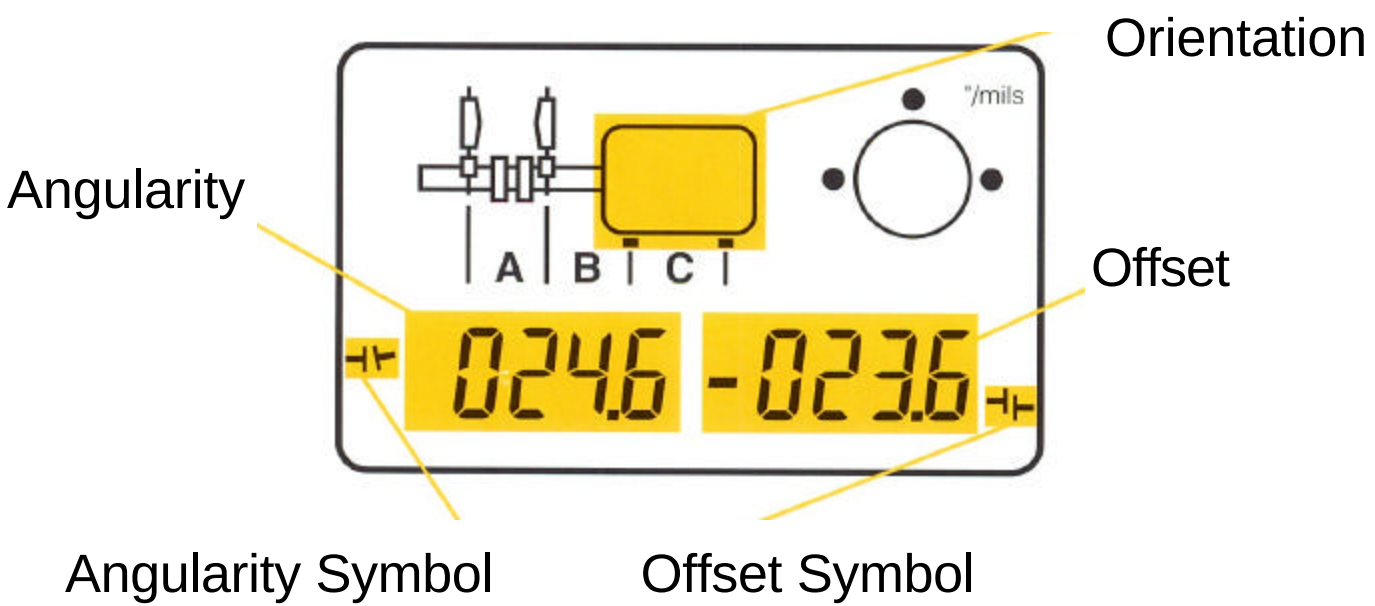


6

Alignment Procedure

Evaluate and Adjust: Vertical Plane

❶ The Coupling Values Screen for the vertical plane is now displayed.

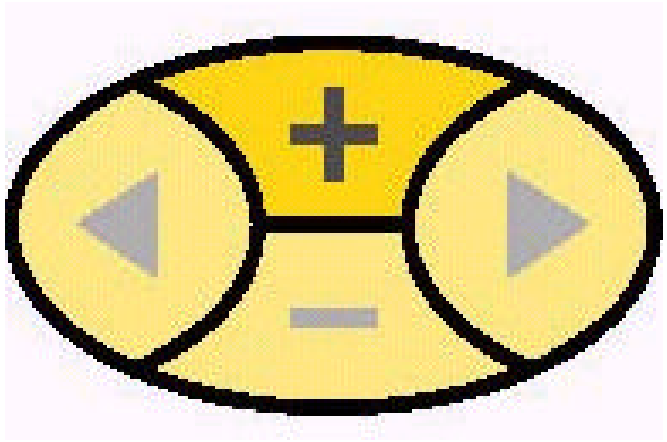


⑥

Alignment Procedure

Evaluate and Adjust: Vertical Plane

❷ Press the + button for the feet values screen.

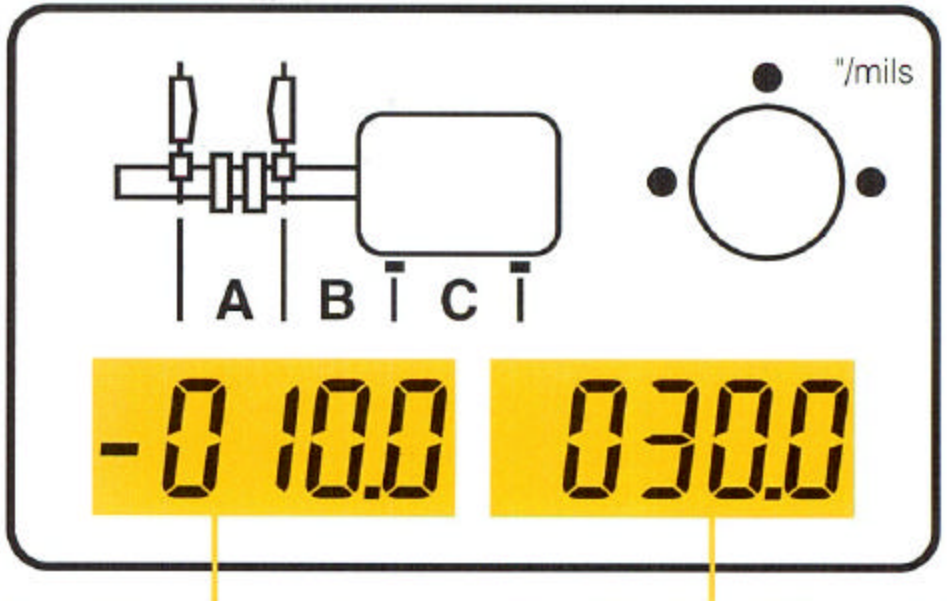


❻

Alignment Procedure

Evaluate and Adjust: Vertical Plane

❸ The Feet Values Screen for the vertical plane is now displayed.



<u>Front feet</u> are low, add 10 mil (0.010”) shim.

<u>Back feet</u> are high, remove 30 mil (0.030”) shim.

6

Alignment Procedure

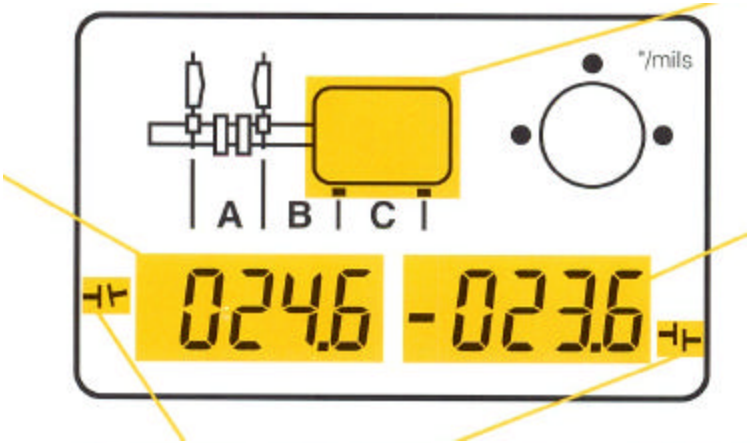
Evaluate and Adjust: Vertical Plane

- Positive values at the feet mean that the movable machine is high.
- Negative values at the feet mean that the movable machine is low.

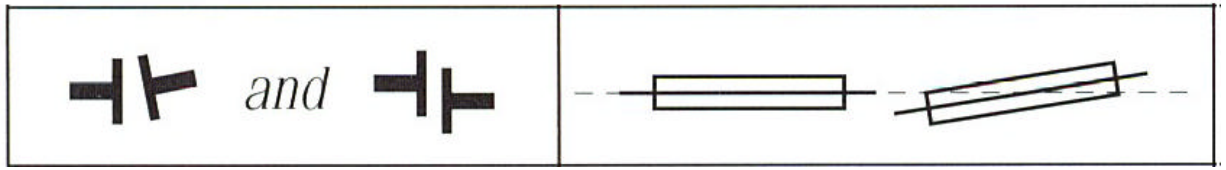
6

Alignment Procedure

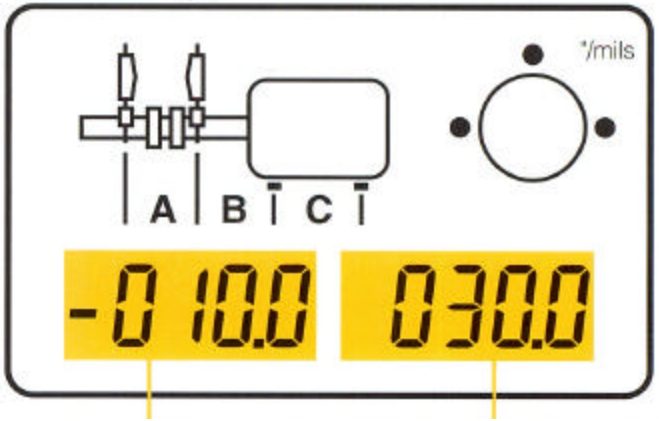
Evaluate and Adjust: Vertical Plane



Coupling Values



Feet Values

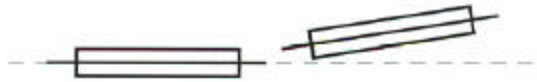
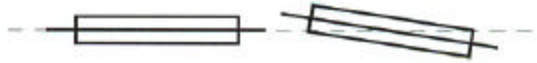
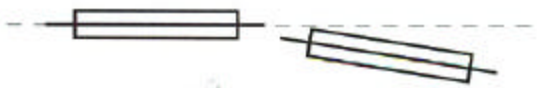


❻

Alignment Procedure

Evaluate and Adjust: Vertical Plane

❹ Evaluating angularity and offset.

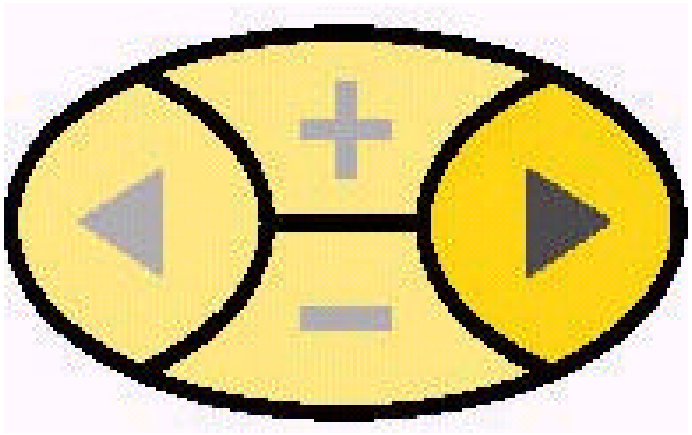
Coupling Value Symbols		*Shaft Centerlines*		*Feet Position*	
Angularity	*Offset*	*Stationary*	*Moveable*	*Front*	*Rear*
⊣⊢ *and* ⊣⊢				High	High
⊣⊢ *and* ⊣⊢				High or Low*	High or Low*
⊣⊢ *and* ⊣⊢				High or Low*	High or Low*
⊣⊢ *and* ⊣⊢				Low	Low

7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❶ Push the forward arrow button.

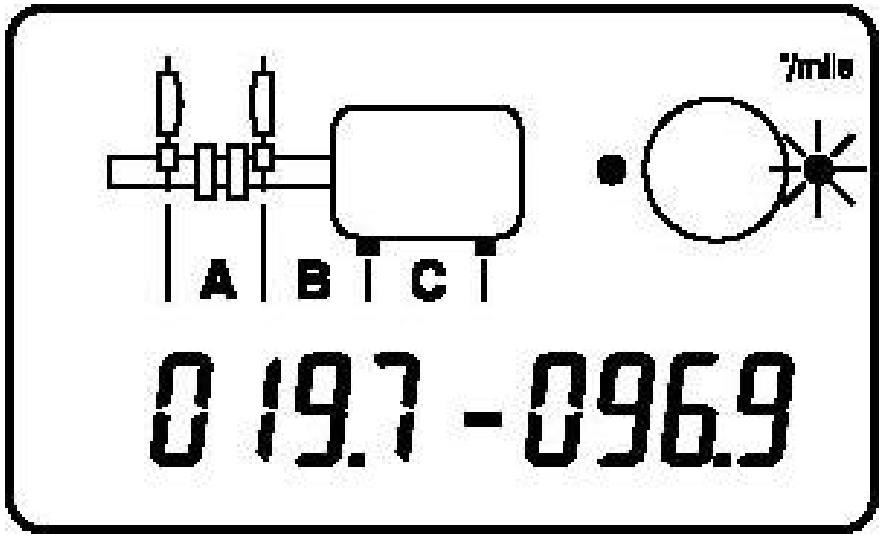


7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❷ You will see a blinking dot at the 3:00 position by the clock face. Rotate the shafts 90 degrees until the laser units are positioned at 3:00. Use the level to ensure the rods are horizontal.

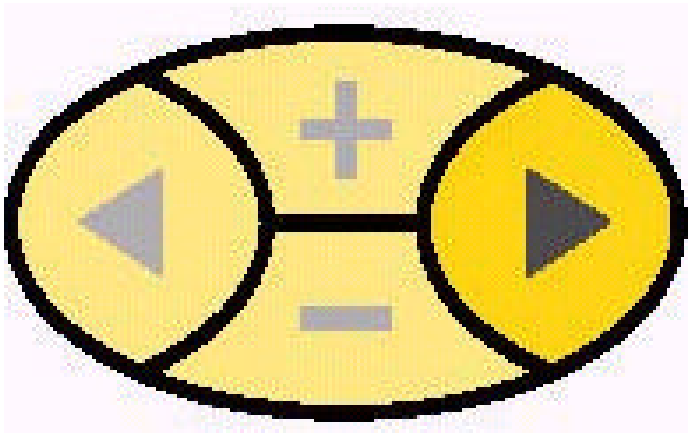


7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❸ Push the forward arrow button.

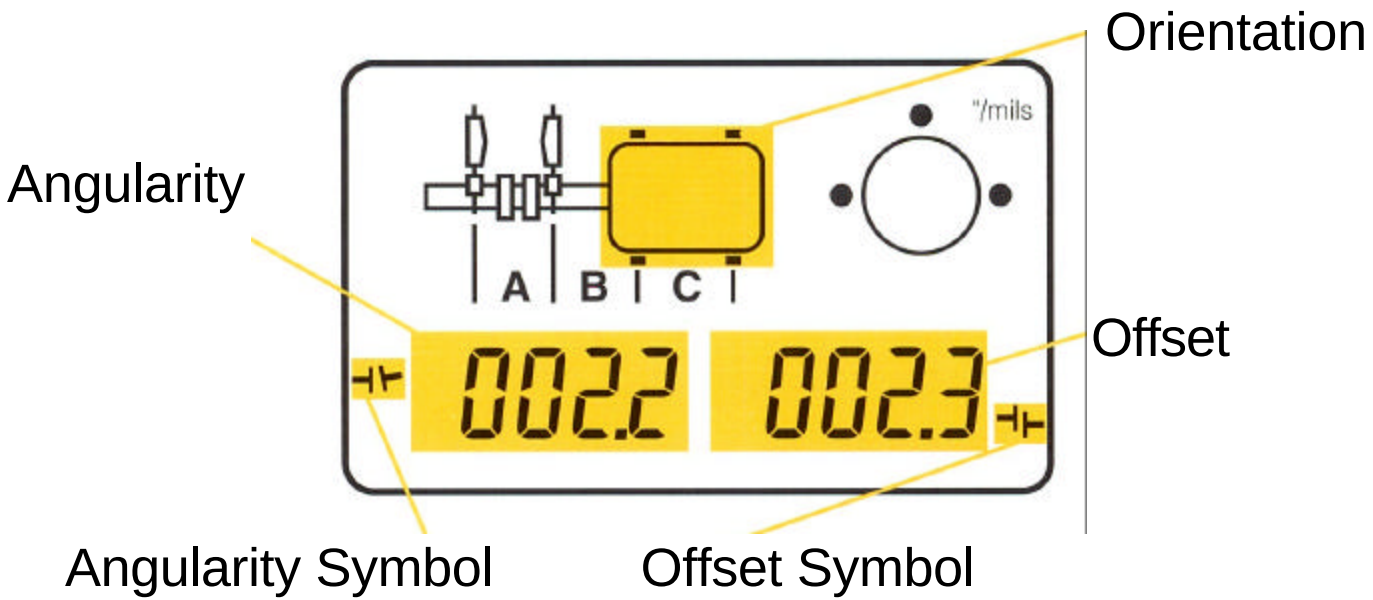


7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❹ The Coupling Values Screen for the horizontal plane is now displayed.

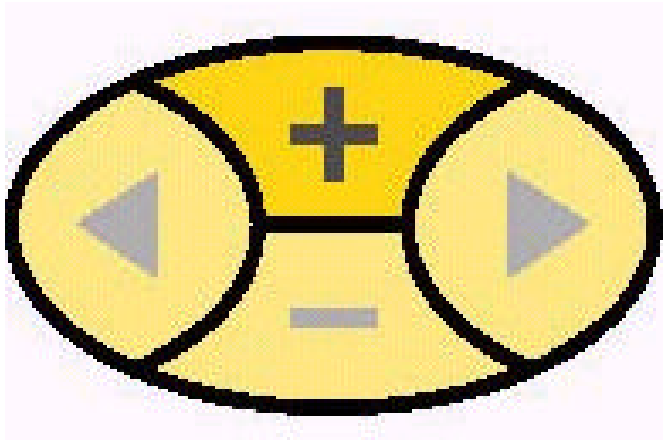


7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❺ Press the + button for the feet values screen.

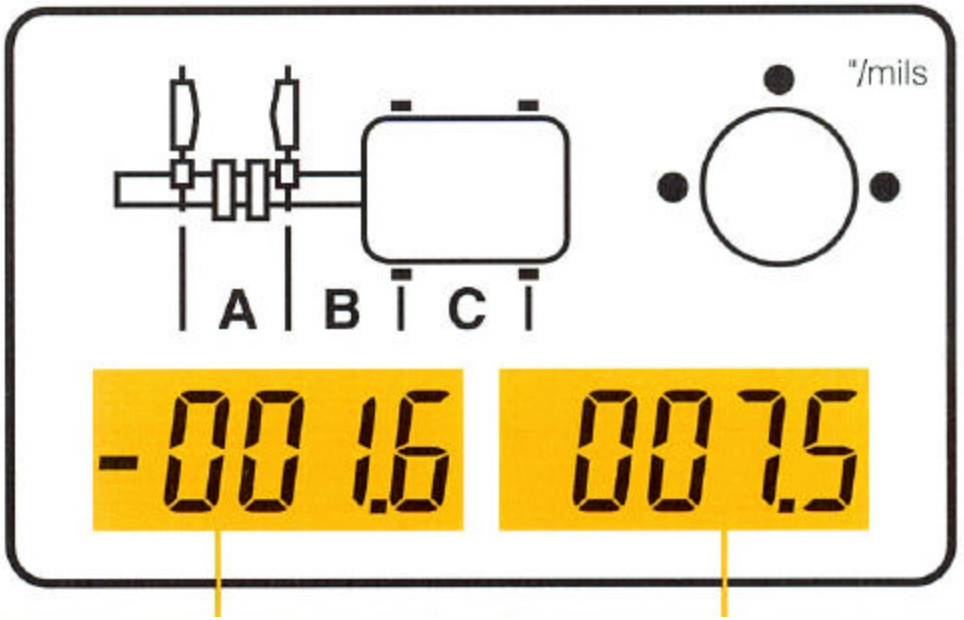


7

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❻ The Feet Values Screen for the horizontal plane is now displayed.



Front feet: move away from the operator 1.6 mils.

Back feet: move towards the operator 7.5 mils.

7

Alignment Procedure

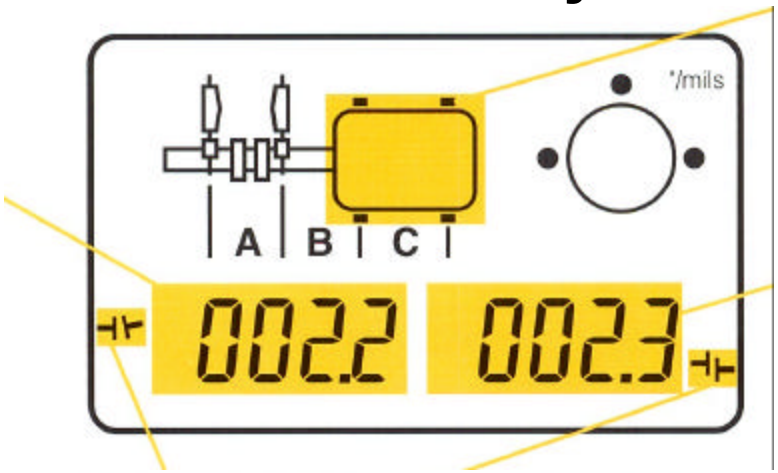
Evaluate and Adjust: Horizontal Plane

- Positive values at the feet mean that the movable machine is away from the operator.
- Negative values at the feet mean that the movable machine is towards the operator.

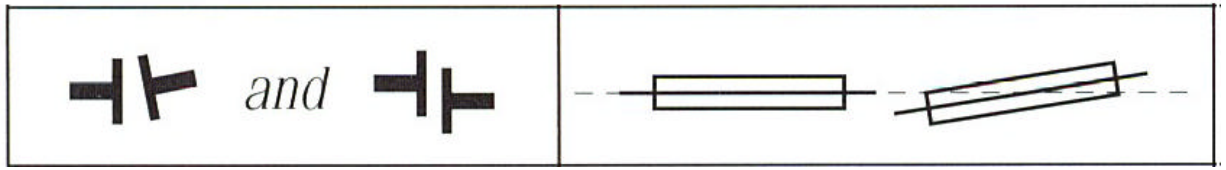
7

Alignment Procedure

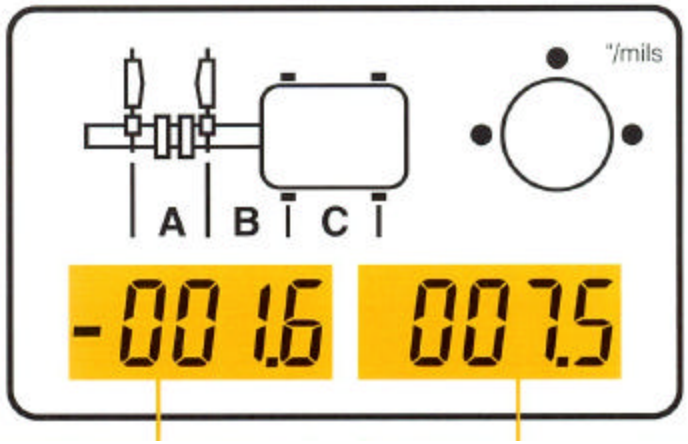
Evaluate and Adjust: Horizontal Plane



Coupling Values



Feet Values

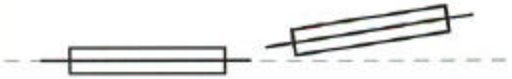
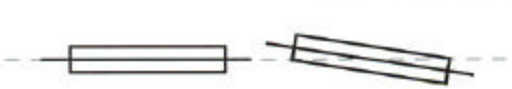
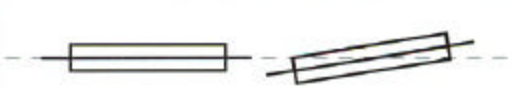


❼

Alignment Procedure

Evaluate and Adjust: Horizontal Plane

❼ Evaluating angularity and offset.

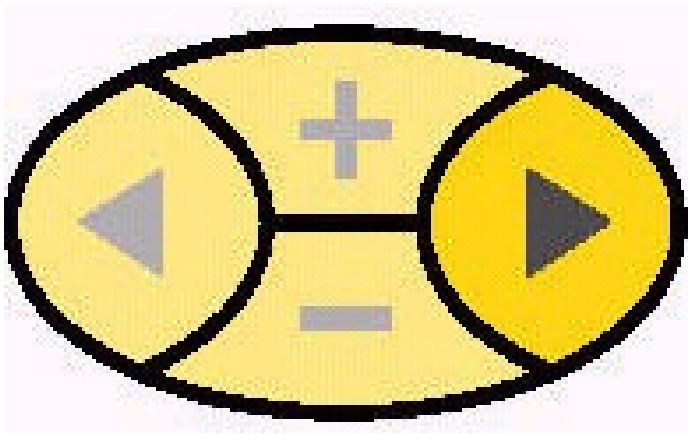
Coupling Value Symbols		Shaft Centerlines		Feet Position	
Angularity	Offset	Stationary	Moveable	Front	Rear
				Away	Away
				Away or Towards*	Away or Towards*
				Away or Towards*	Away or Towards*
				Towards	Towards

8

Alignment Procedure

Check and Re-adjust

❶ Push the forward arrow button.

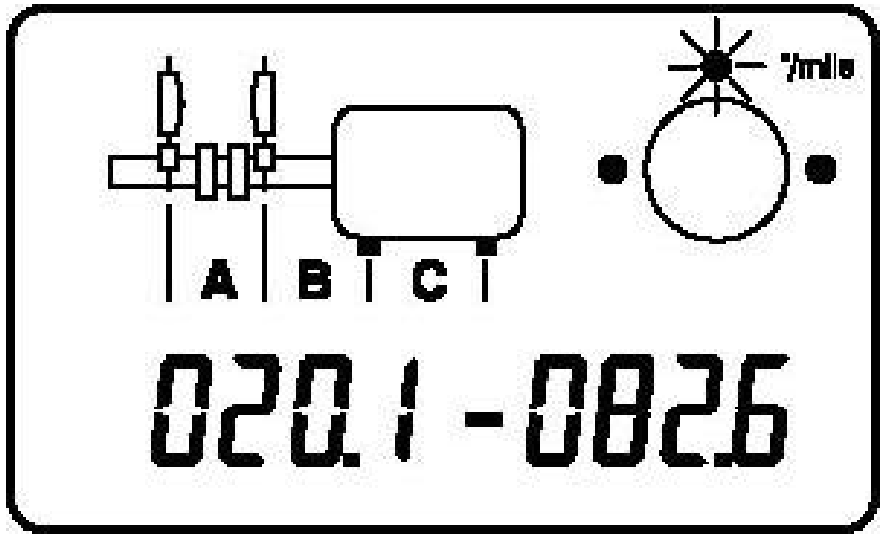


8

Alignment Procedure

Check and Re-adjust

❷ You will see a blinking dot at the 12:00 position by the clock face. Rotate the shafts to bring the laser units to 12:00.

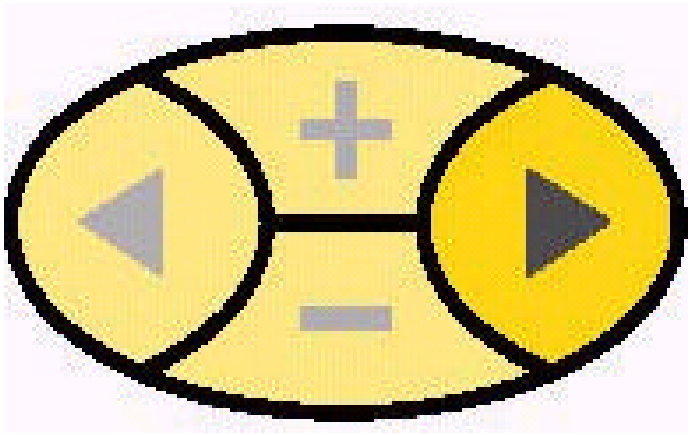


❽

Alignment Procedure

Check and Re-adjust

❸ Push the forward arrow button.



8

Alignment Procedure

Check and Re-adjust

- The Coupling Values Screen for the vertical plane re-appears with the angularity and offset values now changed to reflect any machine moves.
- You can now proceed through the alignment screens to check and re-adjust as necessary.
- You can also use the forward and backward arrow buttons to toggle back and forth between horizontal and vertical readings.
- The laser units have to be oriented accordingly at 12:00 or 3:00. Follow the on-screen clock face indicator.

9

Alignment Procedure

Document

❶ Use the V180 Laser Alignment Report form to document your alignment findings

❾

Alignment Procedure

Document

❷ Date / Time / Machine / Dimensions.

VIBRALIGN V180

Laser Alignment Report

Date/Time: _____

Equipment Name: _____ Identification: _____

Location: _____ RPM/HP: _____

Aligned By: _____

Enter Dimensions: A = _____ B = _____ C = _____

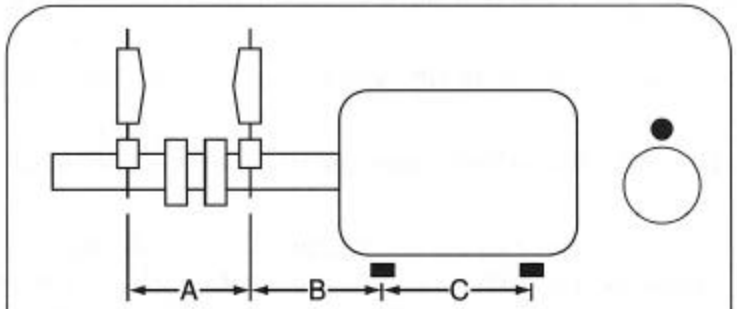
❾

Alignment Procedure

Document

❸ Initial condition.

INITIAL CONDITION

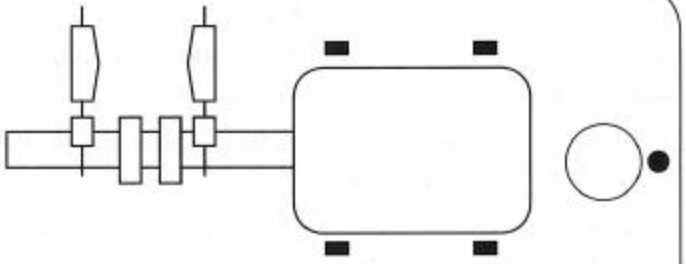


Initial Vertical Values

Check Symbol:	Angularity (Mils/In.):	Offset (Mils):	Check Symbol:
☐ ⊣⊢			☐ ⊣⊢
☐ ⊣⊢	_____	_____	☐ ⊣⊢

Foot Positions:

Front Feet: _____ *Mils.* Rear Feet: _____ *Mils.*



Initial Horizontal Values

Check Symbol:	Angularity (Mils/In.):	Offset (Mils):	Check Symbol:
☐ ⊣⊢			☐ ⊣⊢
☐ ⊣⊢	_____	_____	☐ ⊣⊢

Foot Positions:

Front Feet: _____ *Mils.* Rear Feet: _____ *Mils.*

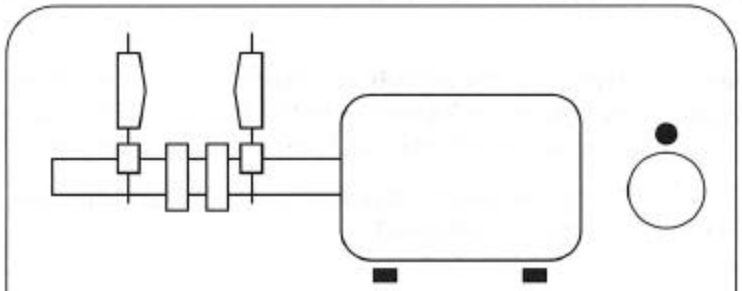
9

Alignment Procedure

Document

❹ Final (Aligned) Condition.

FINAL (ALIGNED) CONDITION

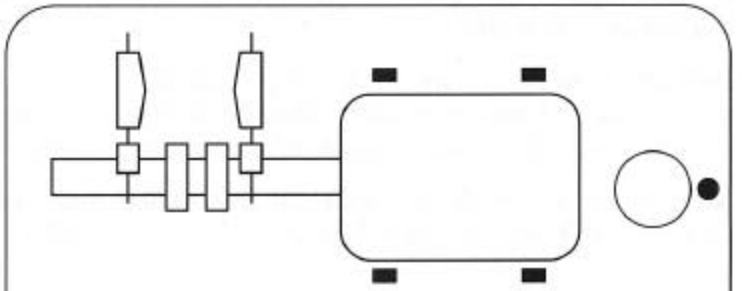


Final Vertical Values

Check Symbol:	Angularity (Mils/In.):	Offset (Mils):	Check Symbol:
☐			☐
☐			☐

Foot Positions:

Front Feet: _____ *Mils.* Rear Feet: _____ *Mils.*



Final Horizontal Values

Check Symbol:	Angularity (Mils/In.):	Offset (Mils):	Check Symbol:
☐			☐
☐			☐

Foot Positions:

Front Feet: _____ *Mils.* Rear Feet: _____ *Mils.*

1

System Components

Display Unit

1

System Components

Display Unit

Contains the alignment computer

1

System Components

Display Unit

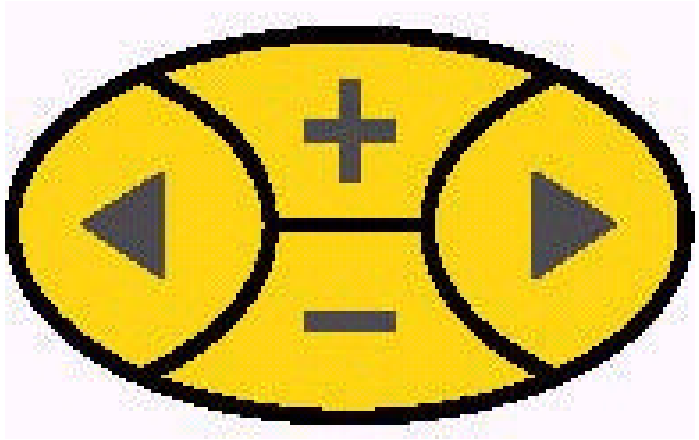
On / Off button

1

System Components

Display Unit

Keypad for data entry

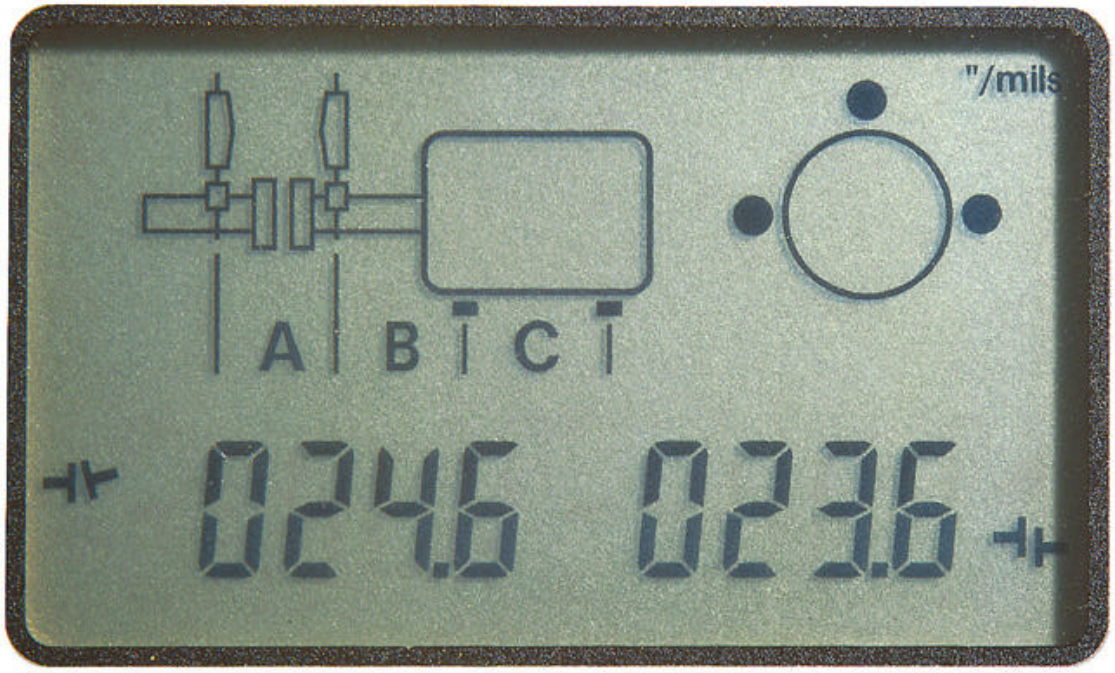


1

System Components

Display Unit

LCD Display

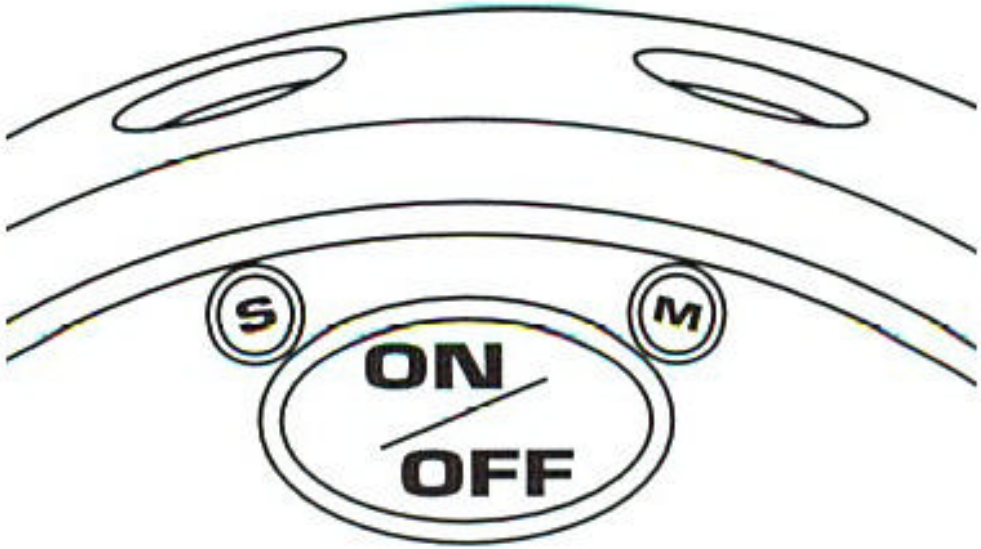


1

System Components

Display Unit

Stationary and Movable Cable Ports



1

System Components

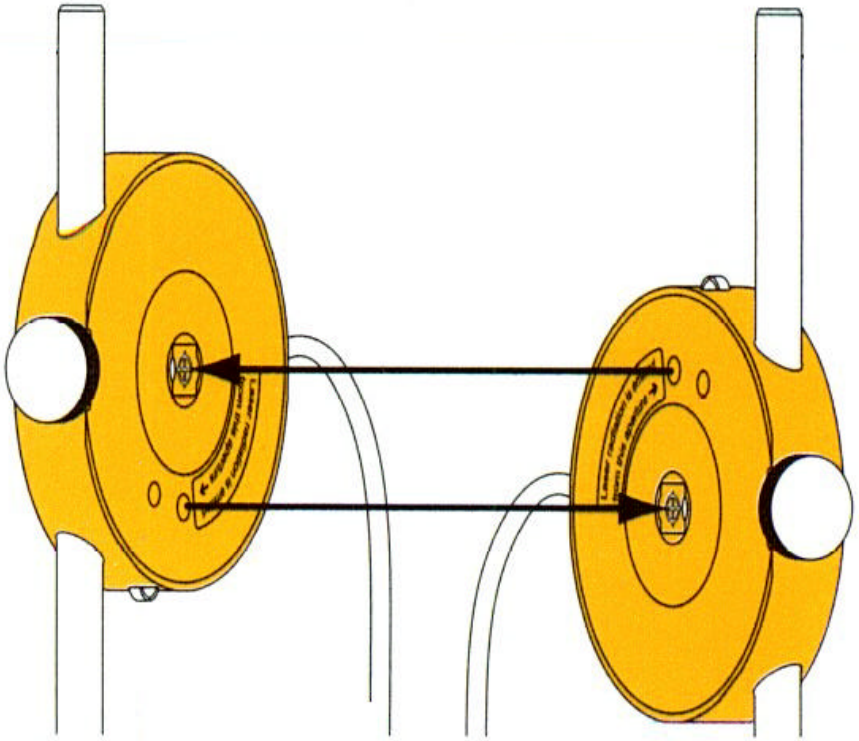
Display Unit

- Runs on 3 C-cell batteries
- Is rugged, but:
  - ✓Care must be taken not to drop the Display Unit
  - ✓Do not get the Display Unit wet

2

System Components

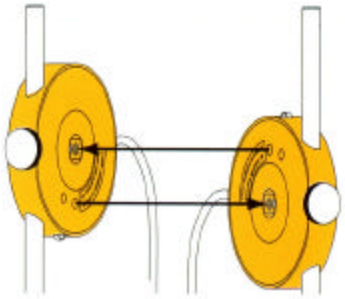
Laser Units



2

System Components

Laser Units



Stationary

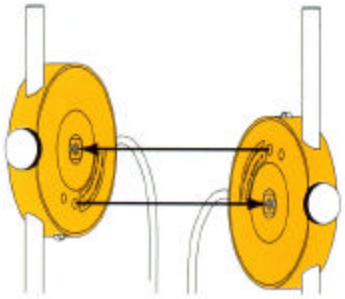
Movable

VIBRALIGN

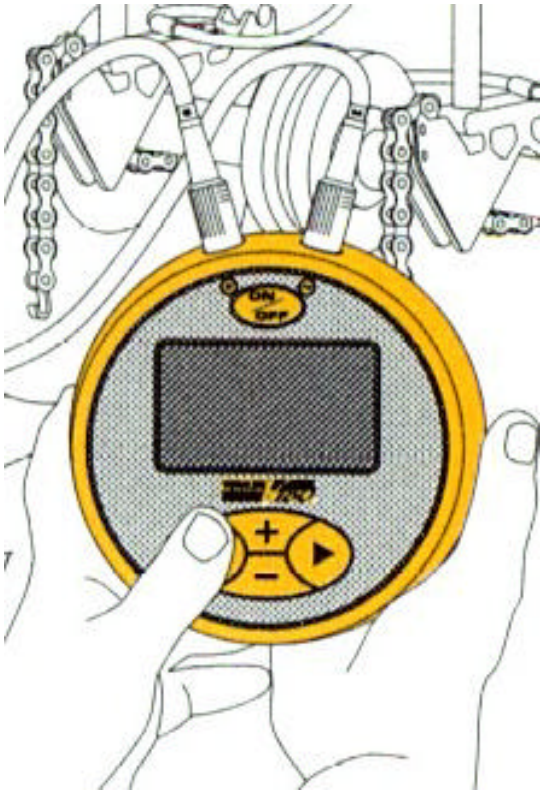
2

System Components

Laser Units



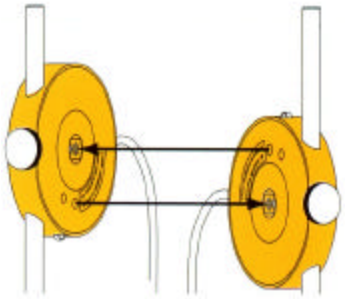
Laser Unit cables attach to the Display Unit



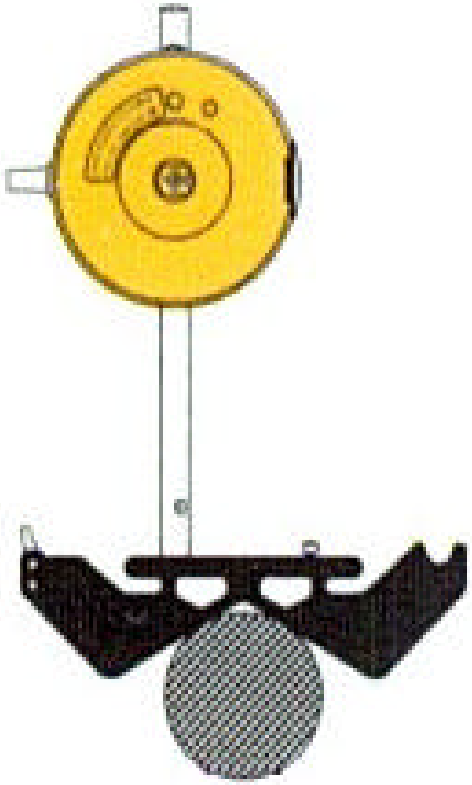
2

System Components

Laser Units



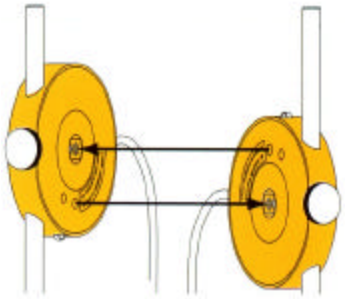
- Attach to the Brackets
- Brackets attach to the machine shaft



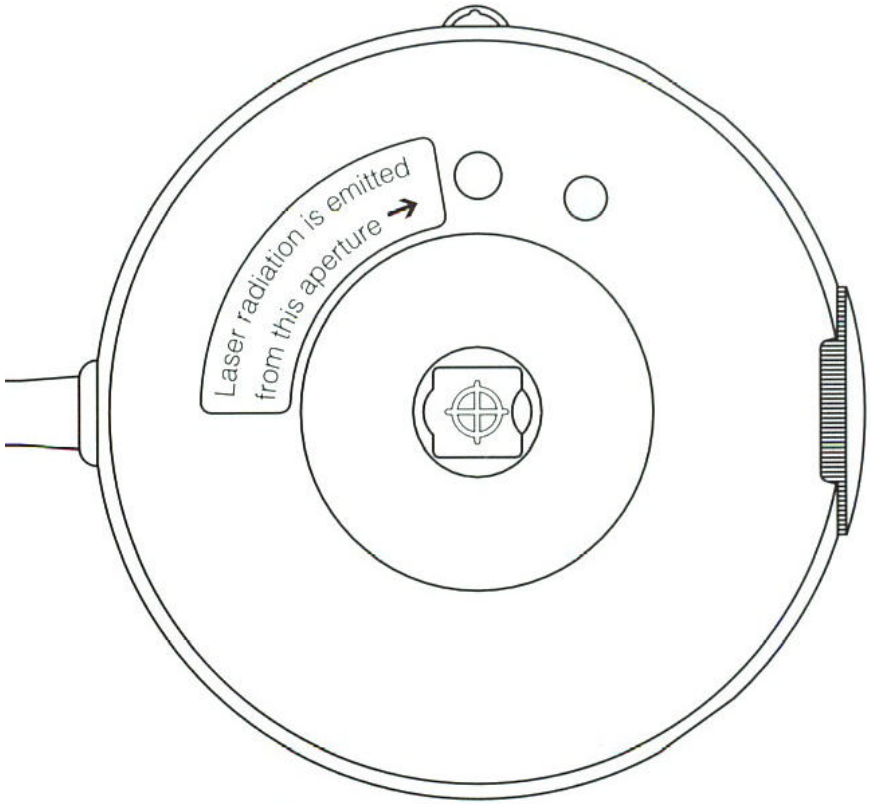
2

System Components

Laser Units



Protective Cover

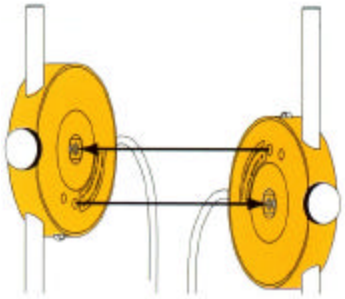


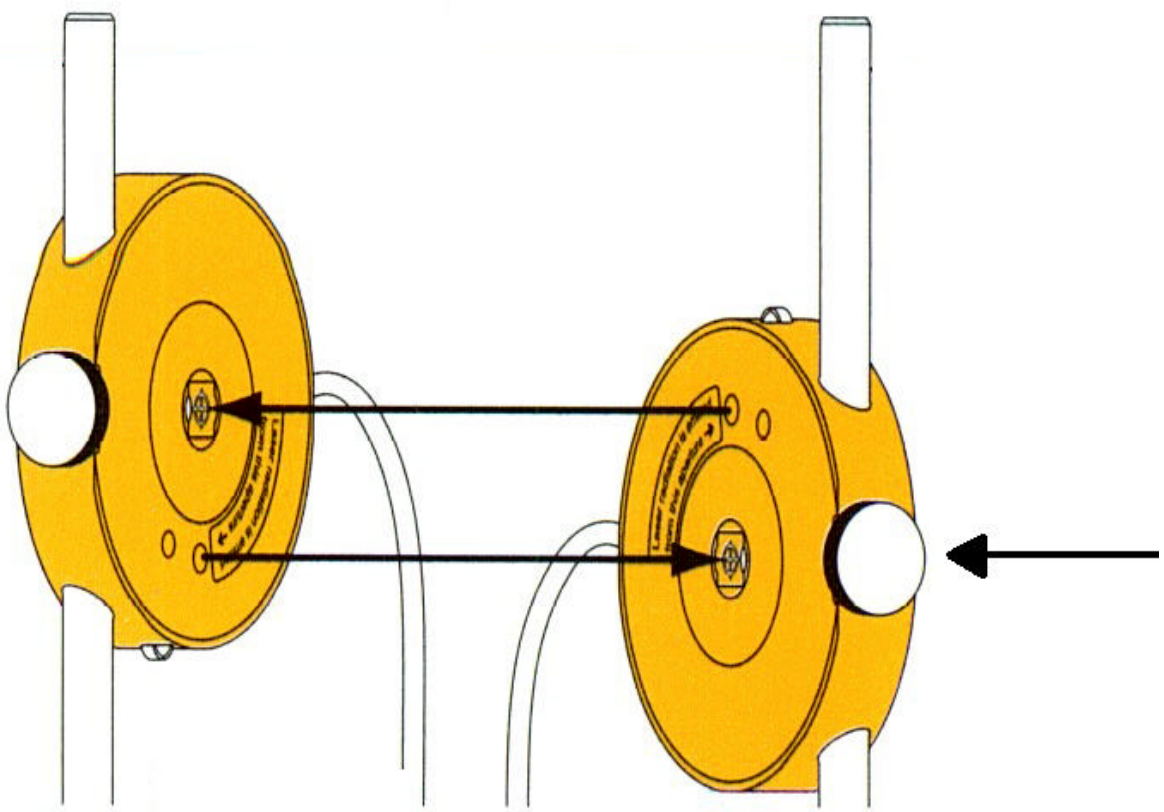
2

System Components

Laser Units

Coarse Adjustment



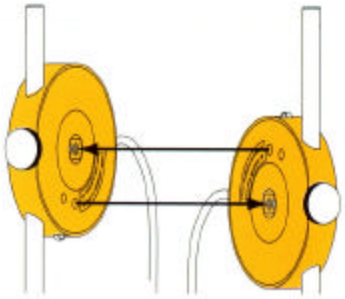


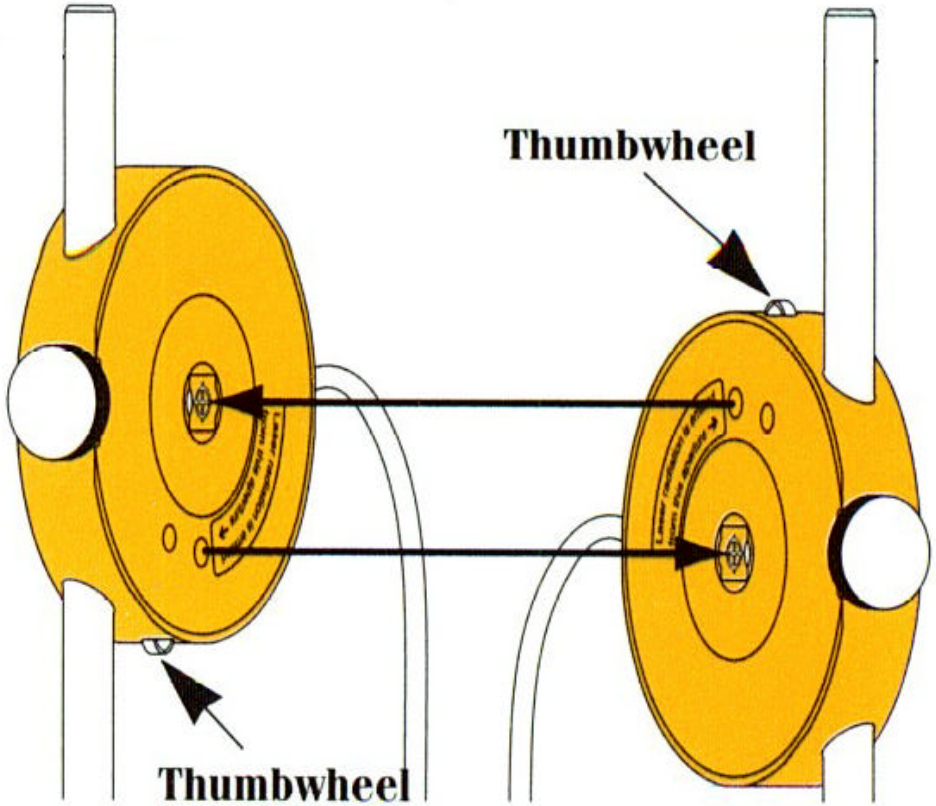
2

System Components

Laser Units

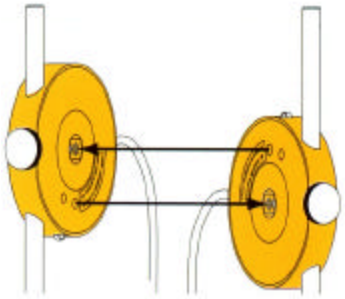
Fine Adjustment





Laser Units

Emit Laser Radiation

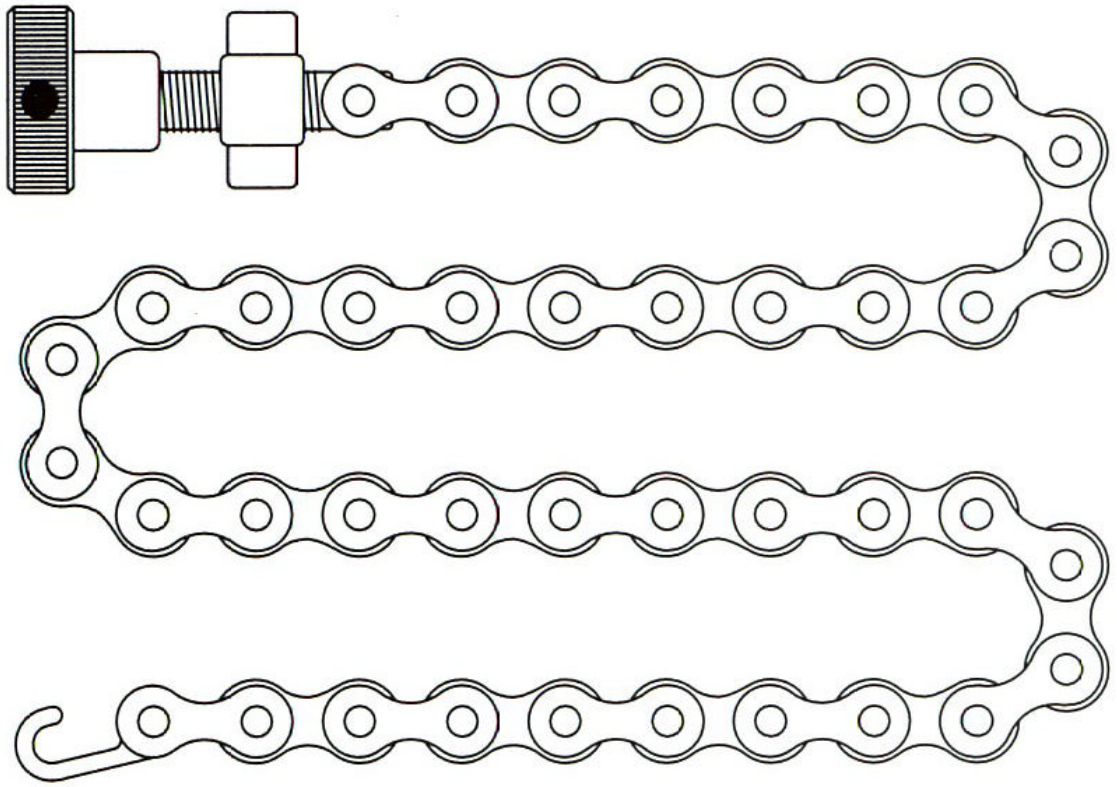


3

System Components

Accessories

19” Chain with Tightening Nut

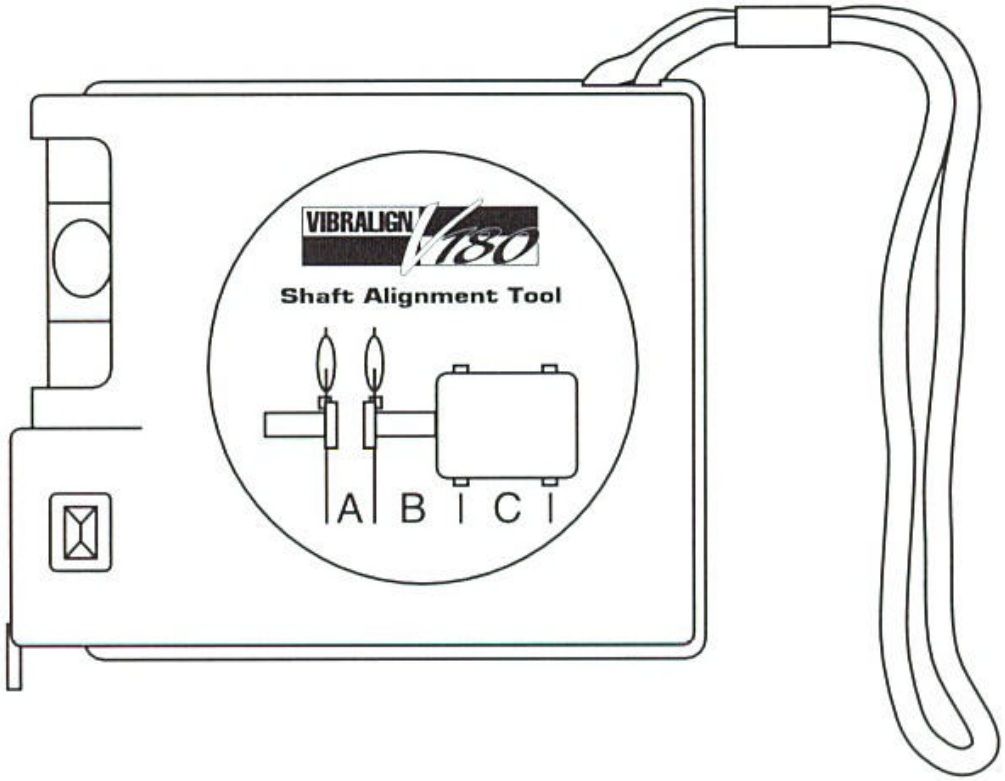


3

System Components

Accessories

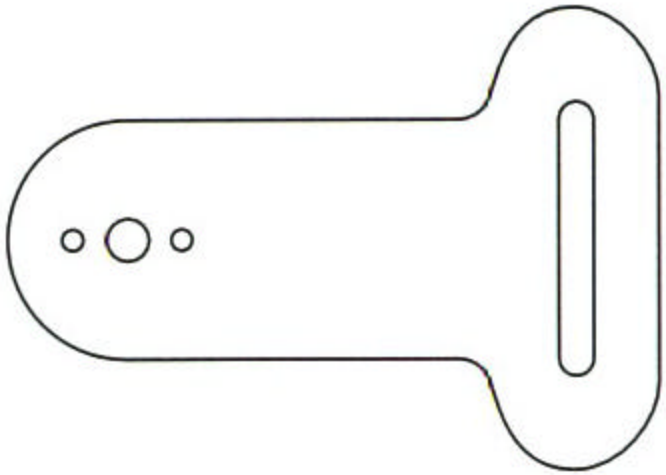
Measuring Tape with Level



Accessories

Tightening Tool

Rubber Cable Holder



3

System Components

Accessories

CD ROM Training Program

Pre-Alignment

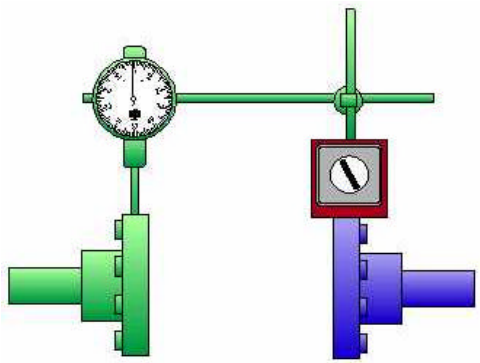
❶ Check run out
❷ Check pipe strain
❸ Correct gross soft foot
❹ Rough alignment
❺ Check hub separation
❻ Record tightening sequence

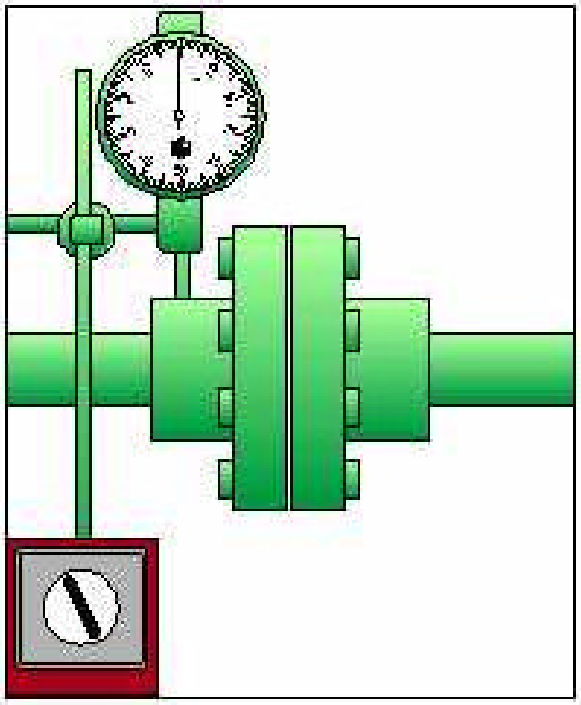
❶

Pre-Alignment

Check run out

❶ Set up the dial indicator





The dial indicator plunger contacts the hub or shaft to be checked.

It is affixed to any point in space: the machine base,a bearing housing, the adjacent coupling hub (if the coupling is “broken”).

❶

Pre-Alignment

Check run out

❷ Measure run out

The shaft to be checked is rotated until the dial indicator reaches a maximum: (+ or -).

The dial indicator is adjusted to zero.

The shaft is rotated again until the dial indicator reaches a maximum: (+ or -). This is the run out value.

Checking Run Out	If	Then
Driven Side		
coupling run out	.002" or less	Driven side OK, go to driver side coupling
	greater than .002"	Check shaft run out
shaft run out	.001" or less	Shaft OK, coupling is eccentric
	greater than .001"	Shaft is bent
Driver Side		
coupling run out	.002" or less	Run out check completed.
	greater than .002"	Check shaft run out
shaft run out	.001" or less	Shaft OK, coupling is eccentric
	greater than .001"	Shaft is bent

❷

Pre-Alignment

Check pipe strain

❶ Dial indicator set up as in checking run out.

❷ Loosen flange bolts to check the effect of pipe strain.

Checking Pipe Strain	If	Then
Suction Flange	Dial indicator changes at 12:00 or 3:00 are:	
	.002" or less	Check discharge flange
	greater than .002"	Excessive pipe strain
Discharge Flange	Dial indicator changes at 12:00 or 3:00 are:	
	.002" or less	Pipe strain check completed.
	greater than .002"	Excessive pipe strain

VIBRALIGN

❸

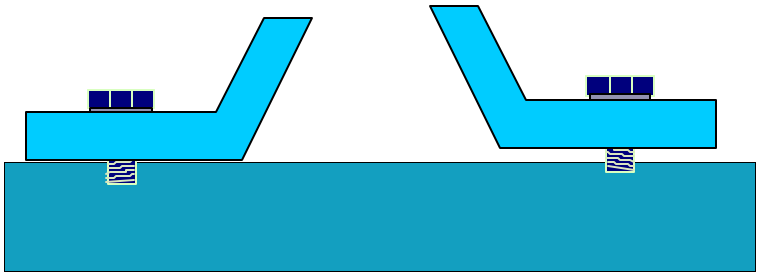
Pre-Alignment

Soft foot

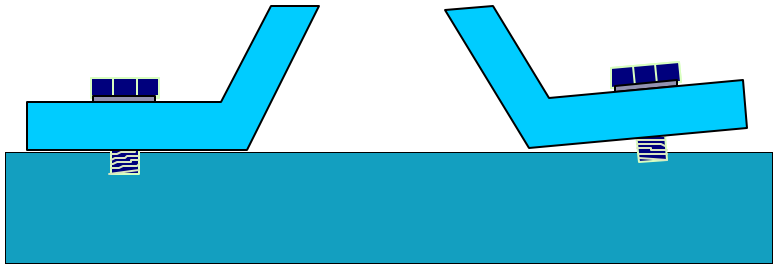
Soft foot occurs when machine feet do not rest flatly on the machine base.

Soft foot is caused by deformed machine base plates or by deformed machine feet.

Short foot



Angled foot

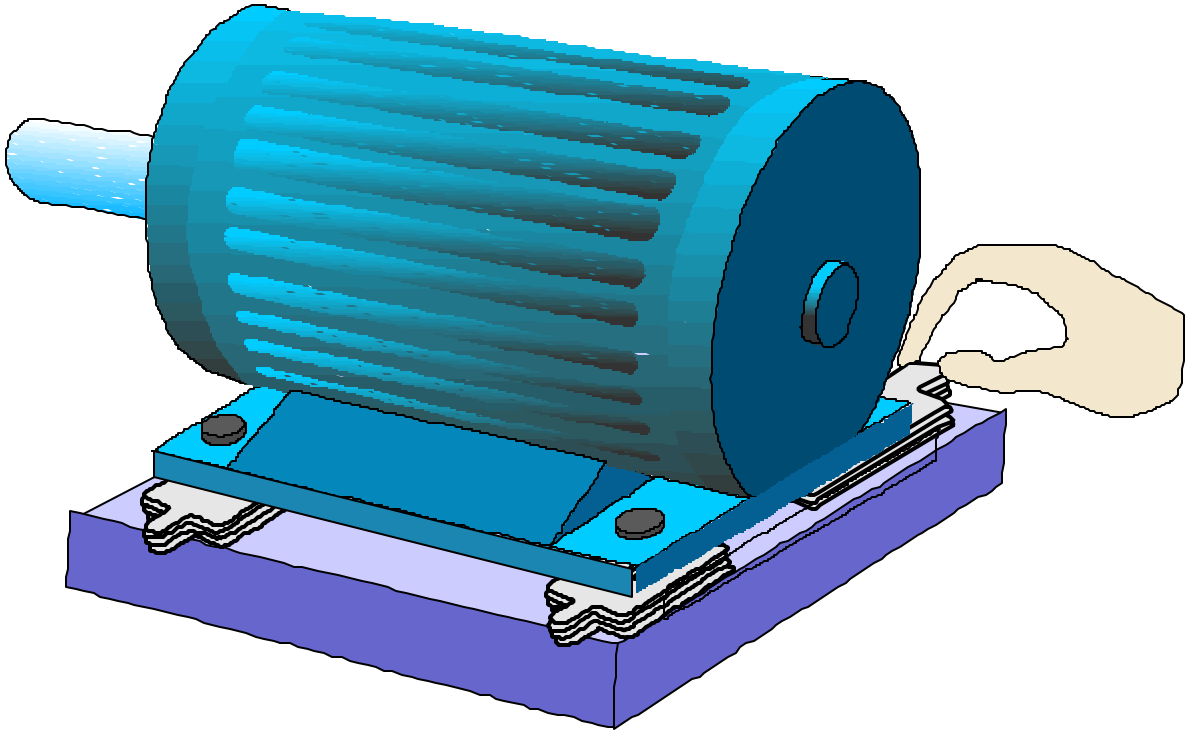


❸

Pre-Alignment

Correct gross soft foot

❶ Loosen <u>all</u> mounting bolts.
❷ Find any loose shim packs.
❸ Correct by adding to loose shim packs.



4

Pre-Alignment

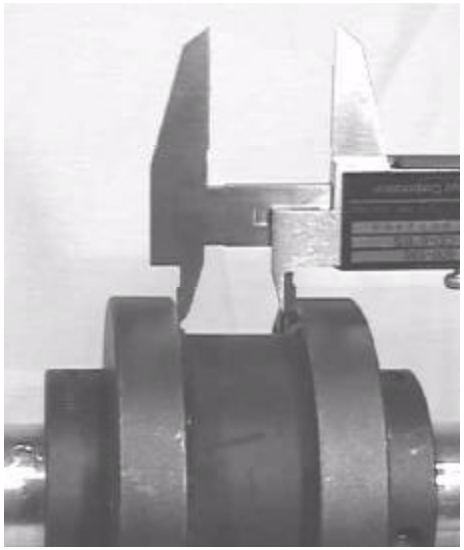
Rough alignment

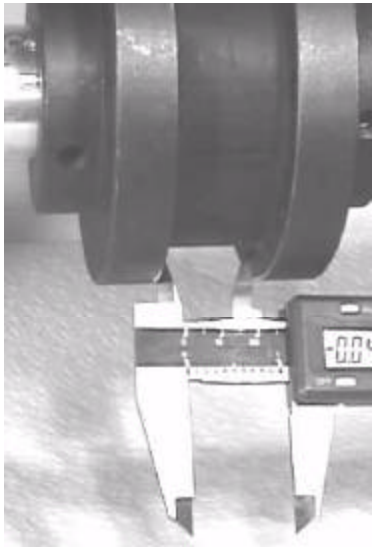
Angular misalignment

Find the gap difference.

Vertical misalignment:
measure gap difference top and bottom.

Horizontal misalignment:
measure side to side.





You may use calipers, an inside micrometer, feeler gauges, or an indicator on the coupling face.

4

Pre-Alignment

Rough alignment

Angular misalignment

Calculate the correction

Angular correction:

$$\frac{\text{gap difference}}{\text{coupling diameter}} \times \text{distance between bolt centers}$$

Vertical misalignment

- If the gap is wider at the top:
  remove shims from front feet **or** add to the rear feet.
- If gap is wider at bottom:
  Add to front feet or remove from rear feet..

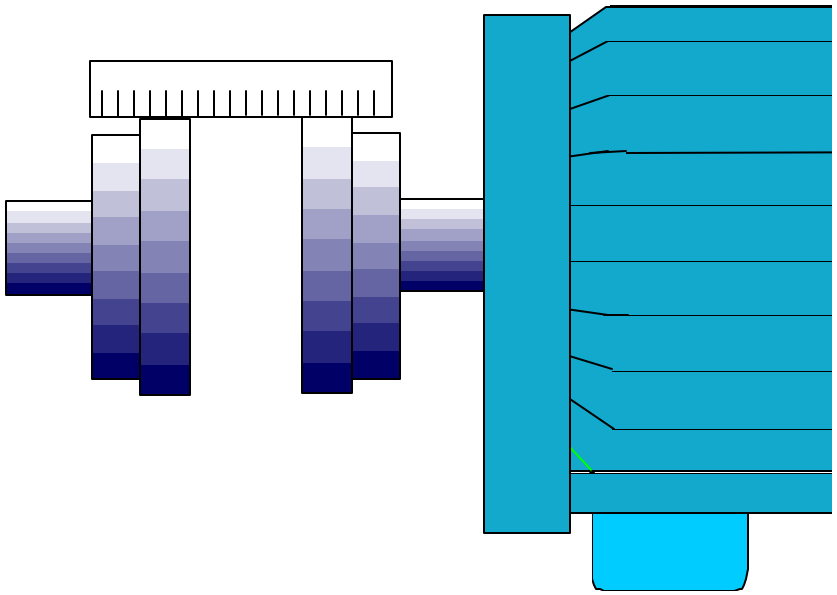
4

Pre-Alignment

Rough alignment

Offset misalignment

Use a straight edge to correct vertical and horizontal offset misalignment.

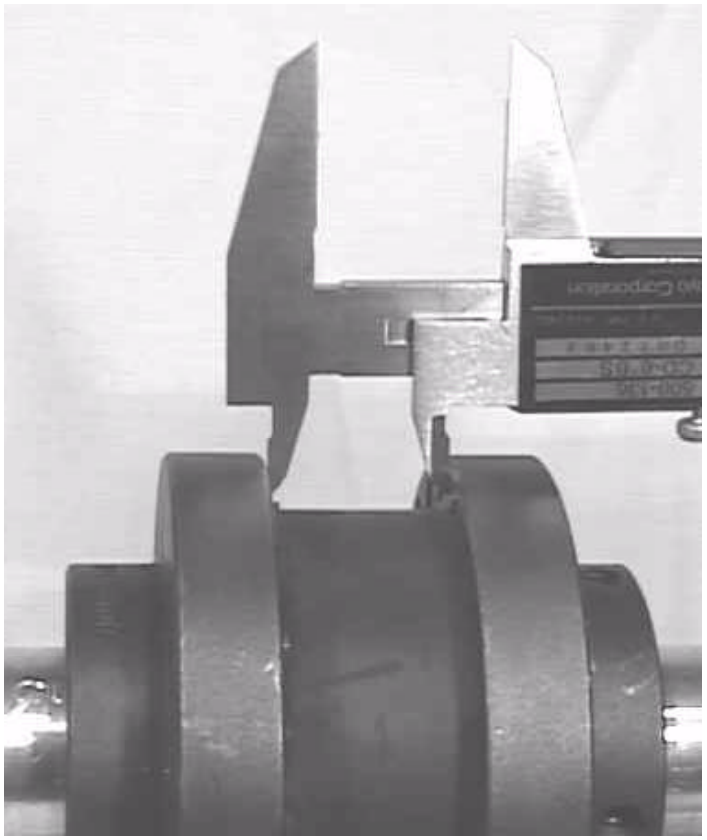


5

Pre-Alignment

Check hub separation

Compare the final gap reading (last section) to the coupling manufacturer's tolerance.

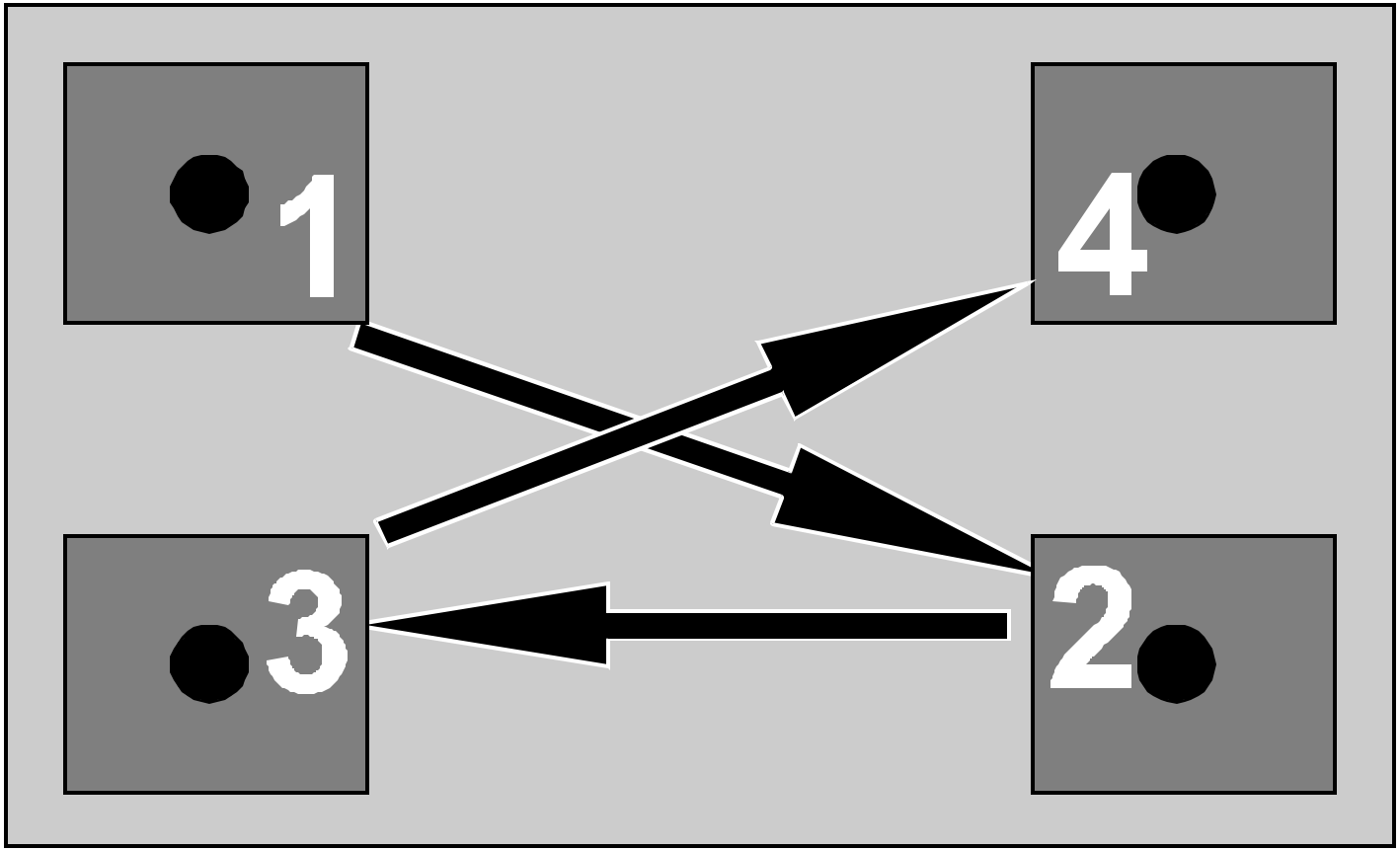


⑥

Pre-Alignment

Record tightening sequence.

Follow the sequence throughout the alignment.



The V180 Laser Alignment System

Figure 1- 2

Introduction

❶ *Measurement Principles*

❷ *Laser Accuracy and Sensitivity*

❸ *The Alignment Process*

Measuring Principles

Designed to achieve precision alignment of two horizontally mounted machines

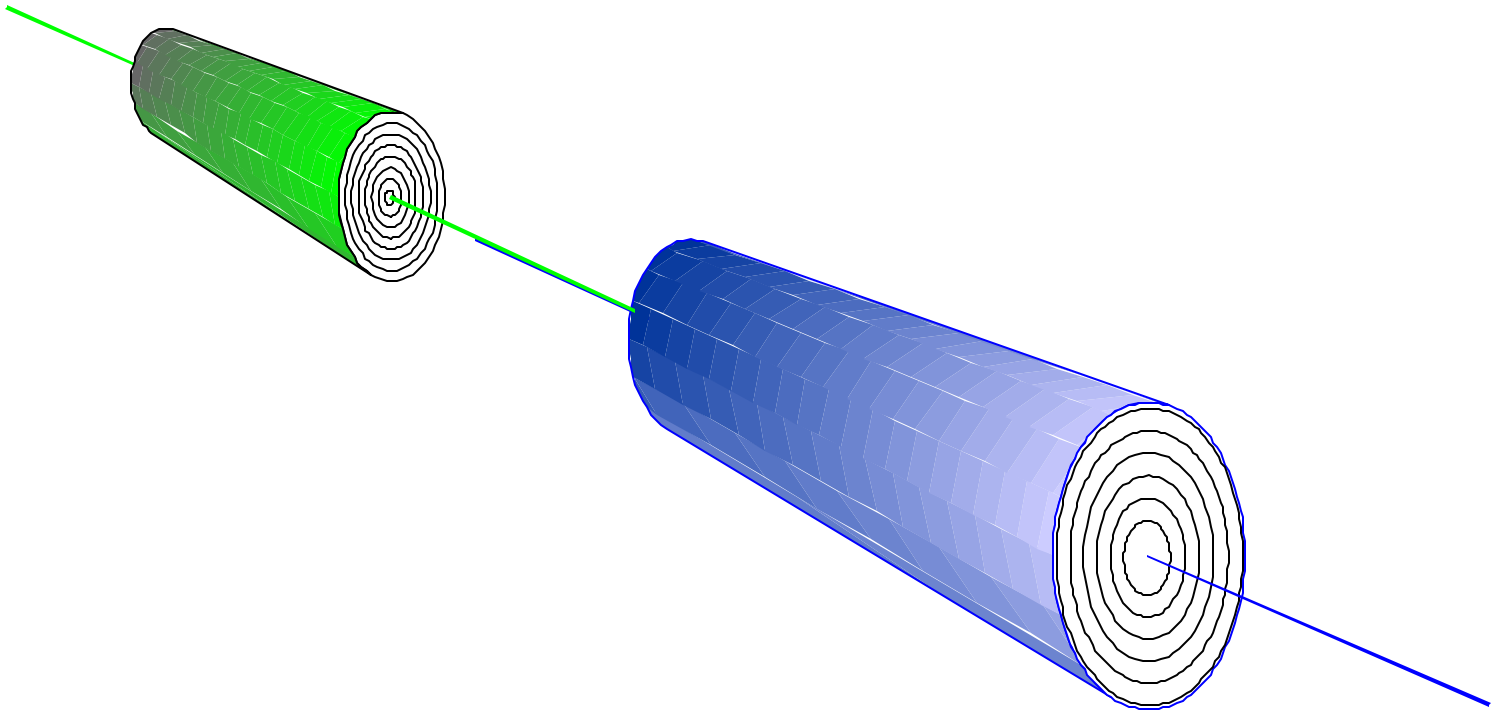
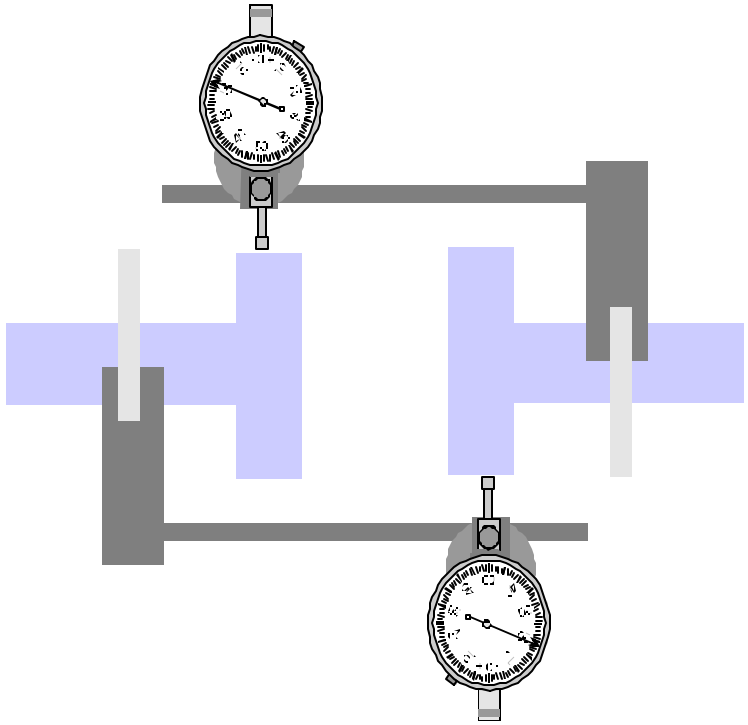


Figure 1- 4

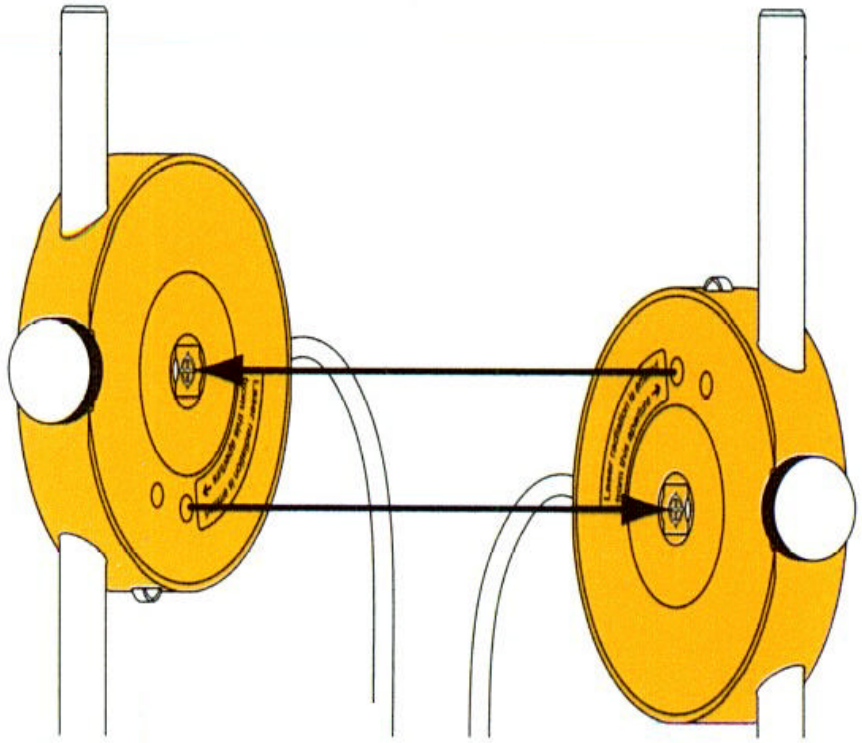
Measuring Principles

Based on the reverse indicator alignment method



Measuring Principles

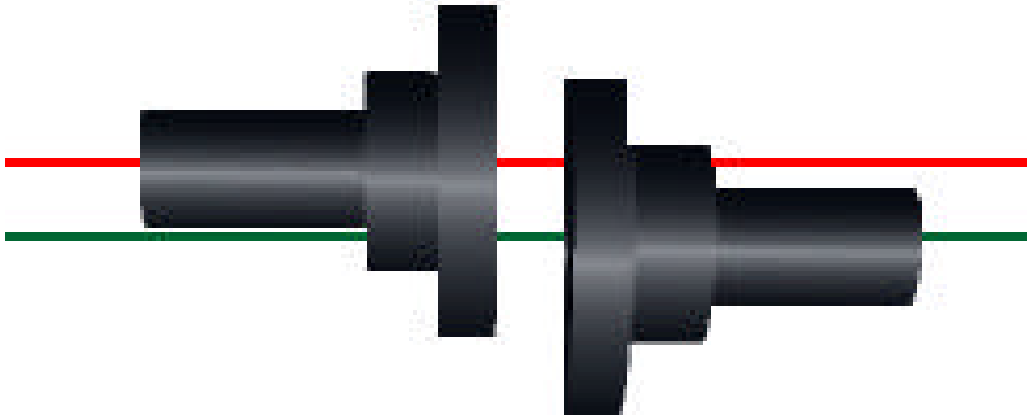
Based on the reverse indicator alignment method



Measuring Principles

Shaft positions are expressed in two measurements:

Offset misalignment



Measuring Principles

Angular misalignment

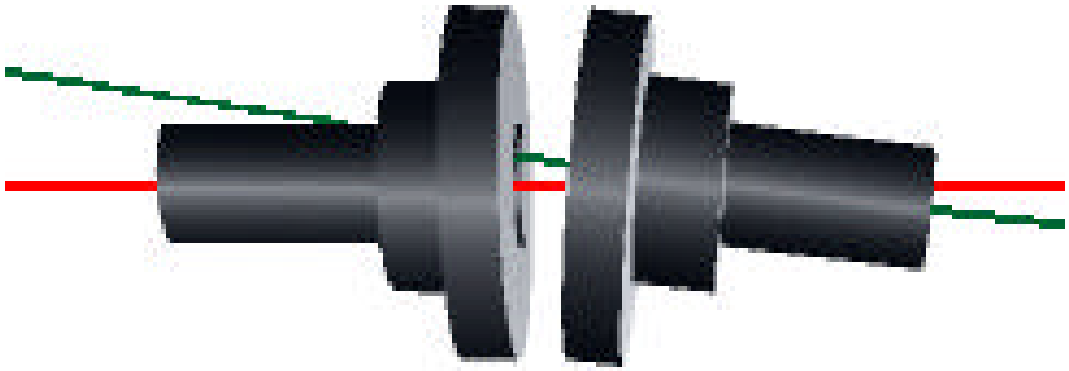
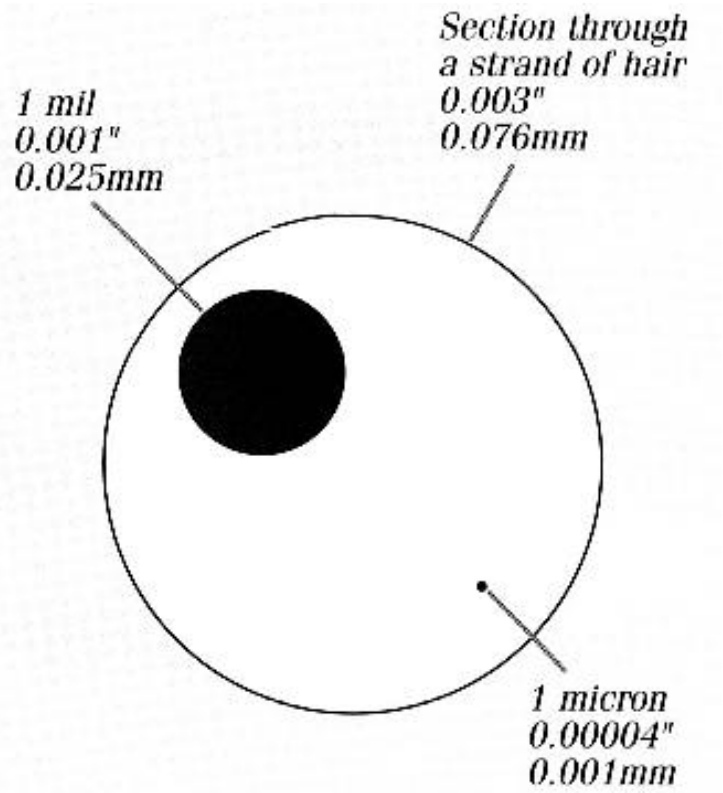


Figure 1- 8

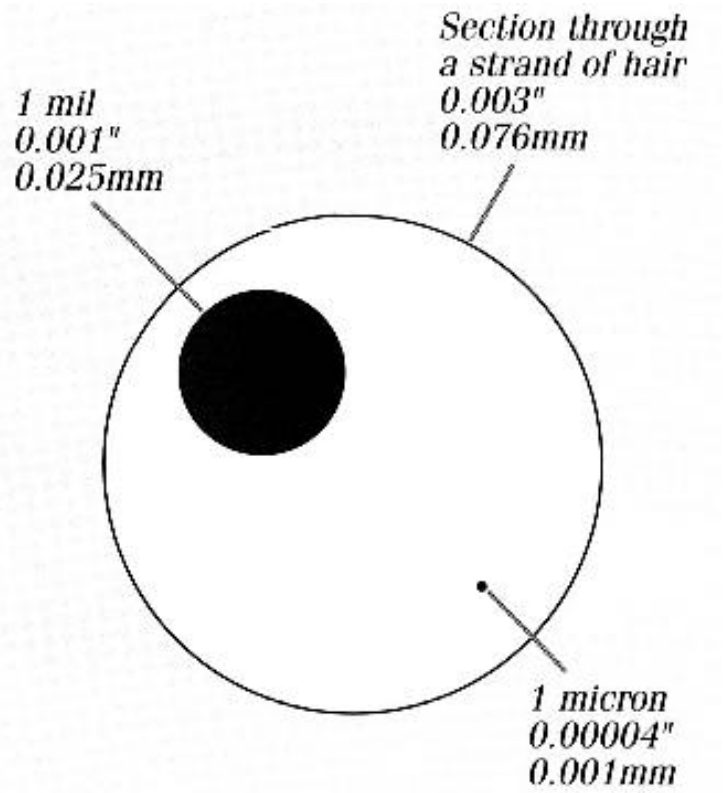
Laser accuracy and Sensitivity

Can measure deviation as small as 1 micron



Laser accuracy and Sensitivity

The V180 displays values in 1/10,000 of an inch



The Alignment Process

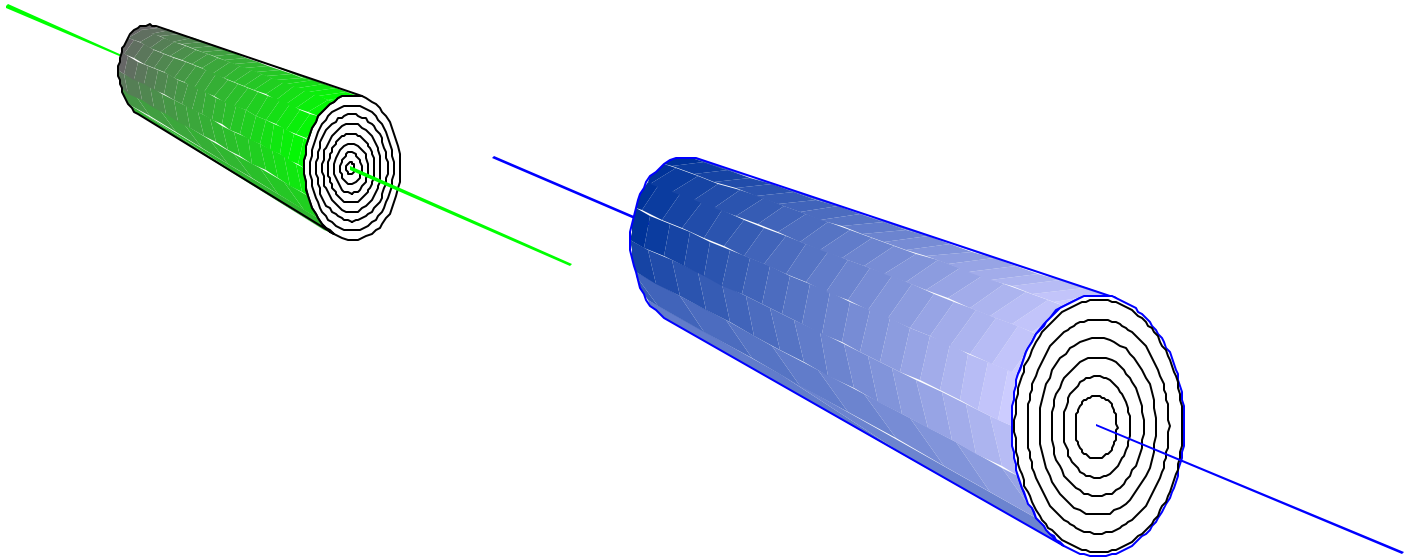
•Measurement

❷Alignment

❸Documentation

The Alignment Process

Measurement…determines the existing position of the two shafts to be aligned.



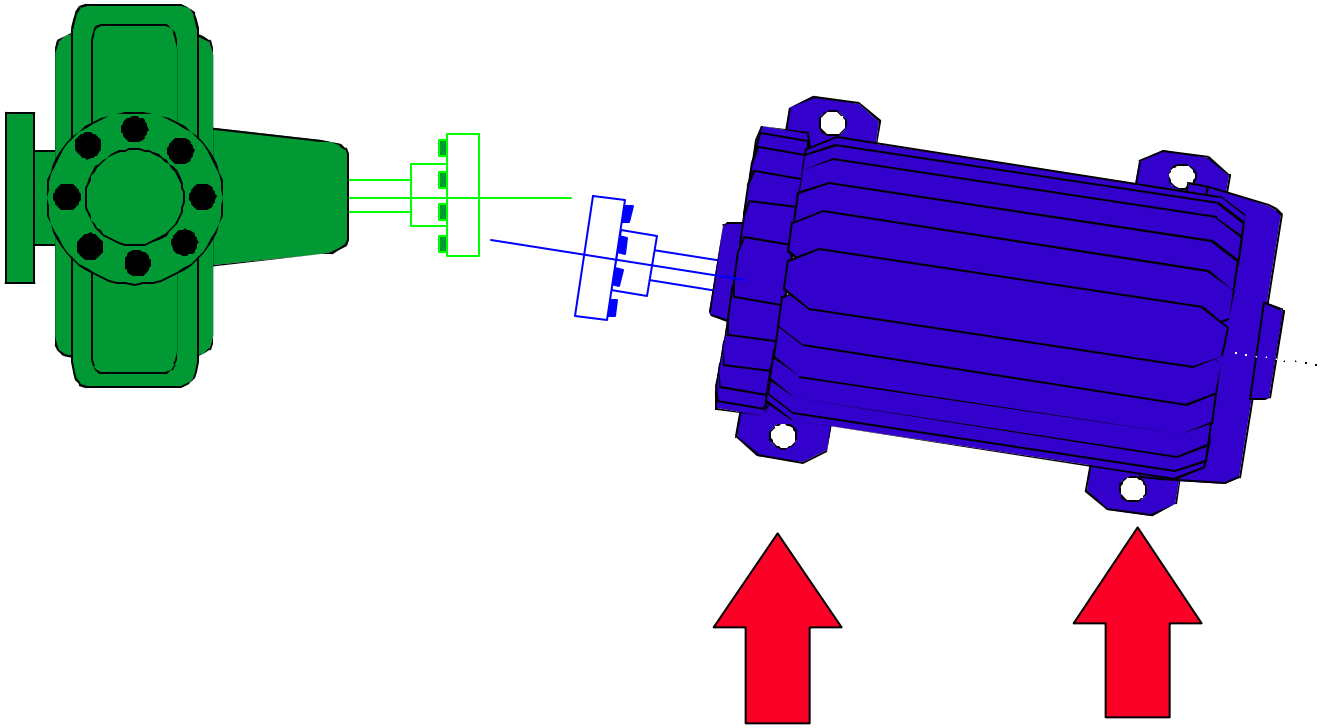
The Alignment Process

Measurement with the V180:

- Both angularity and offset are expressed as numerical values.
- The V180 requires no graphing or calculating.
- The technician inputs movable machine dimensions.
- Then takes three readings (at 9, 3 and 12:00)
- The V180 precisely measures angularity and offset at the coupling in both vertical and horizontal planes.

The Alignment Process

Alignment…moving the moveable machine to bring the shafts into alignment.



The Alignment Process

- The V180 calculates the angularity and offset readings and displays movement at the feet.
- Foot values are live on-screen. The values will change to reflect feet position as the technician moves the machine.
- As the foot values approach zero, the technician can toggle to the coupling values screen to see if the moves have brought the angularity and offset values into tolerance.

The Alignment Process

➲Manufacturers generally provide alignment tolerances for their equipment. The tolerance is dependent upon operating speed (rpm). The table provides general alignment tolerance guidelines.

Machine Speed	*Angularity in Mils/Inch (Thousandths/Inch)*	*Offset in Mils or Thousandths*
3600	.5/1"	2.0
1800	.7/1"	4.0
1200	1.0/1"	6.0
900	1.5/1"	8.0

The Alignment Process

Documentation…recording the alignment conditions before and after precision alignment.