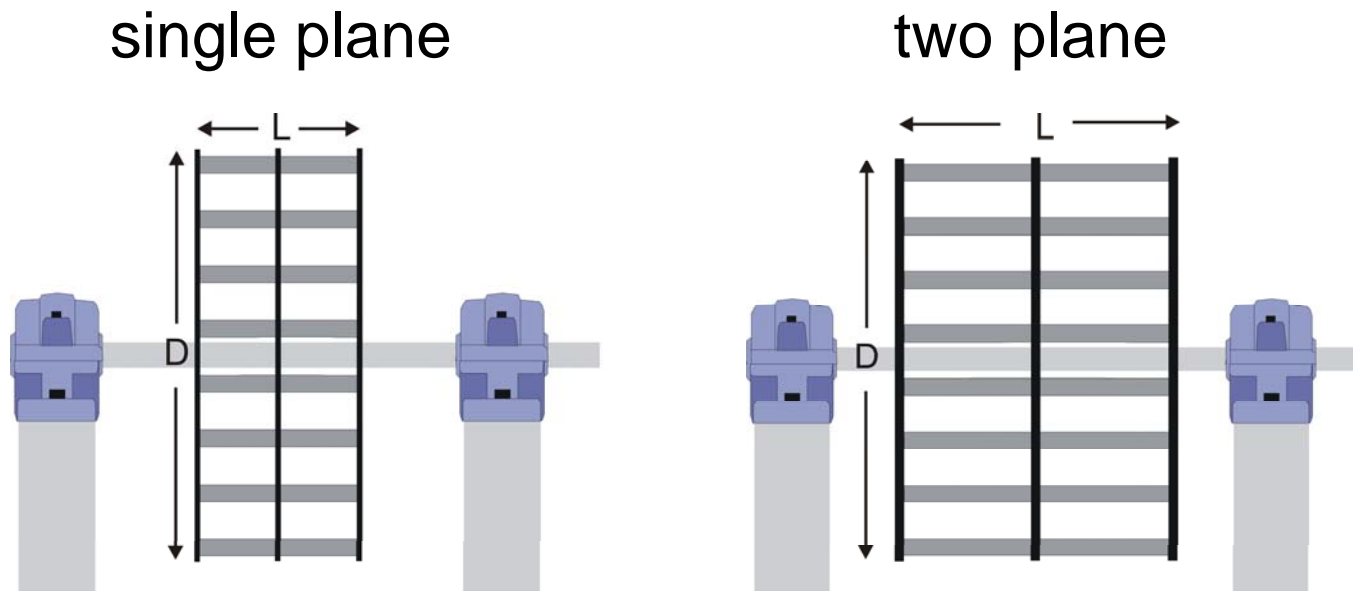


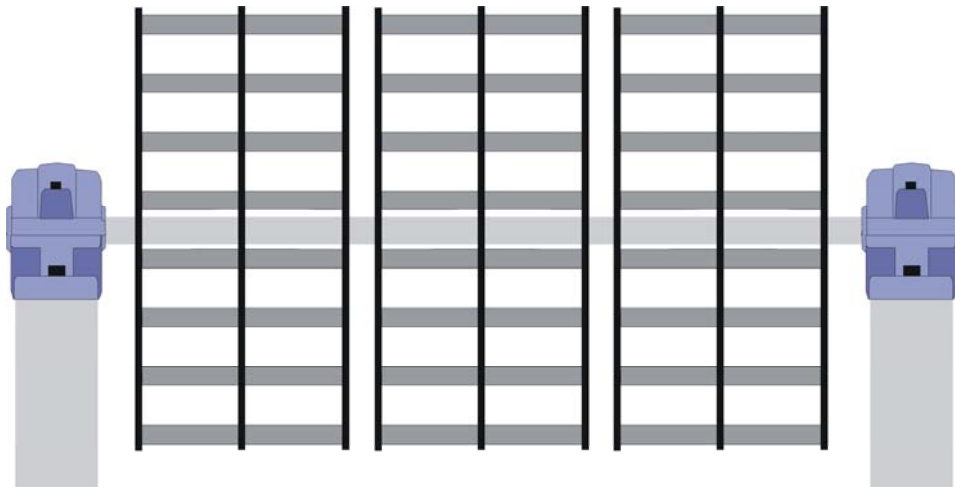
# Balancing Center Hung Fans

- ⊕ Determine single or two plane.
- ⊕ If  $L/D < 0.50$ , single plane.
- ⊕ If  $L/D$  is greater than .50, two plane.



# Balancing Center Hung Fans

- ⊕ A fan rotor with several wheels is treated as ONE fan.
- ⊕ Most likely two plane.

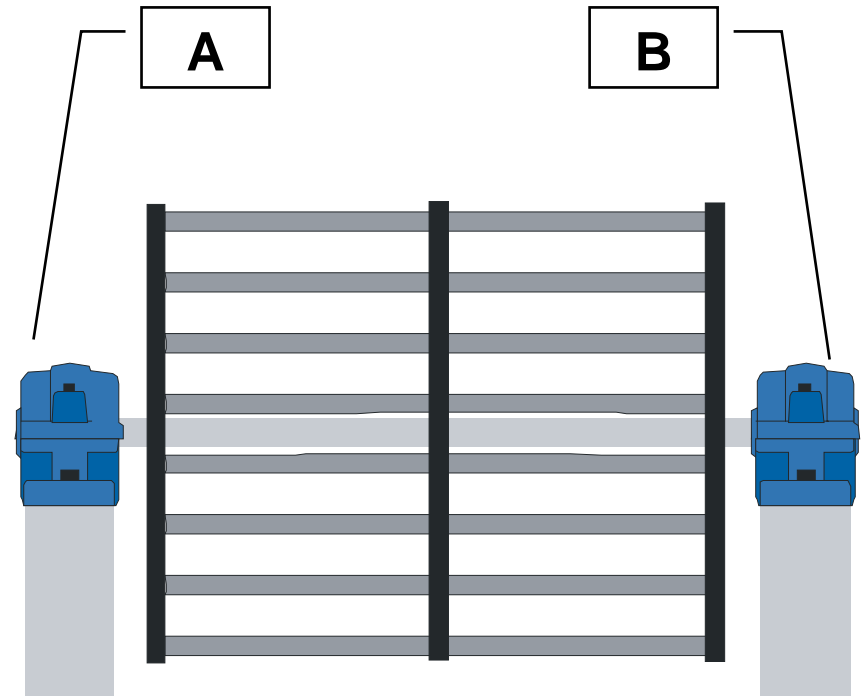


# Two Plane Balancing

## General Concepts

### Measurement Points

- You will take data on each bearing.

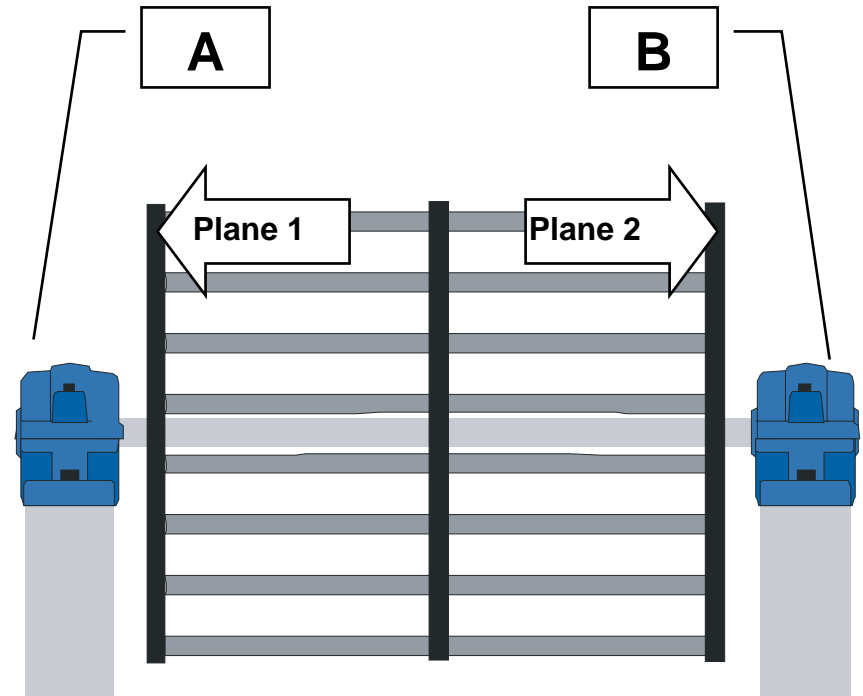


# Two Plane Balancing

## General Concepts

### Balance Planes

- You will add or subtract weight in the balance planes
- Plane separation is good!



# Two Plane Balancing

## General Concepts

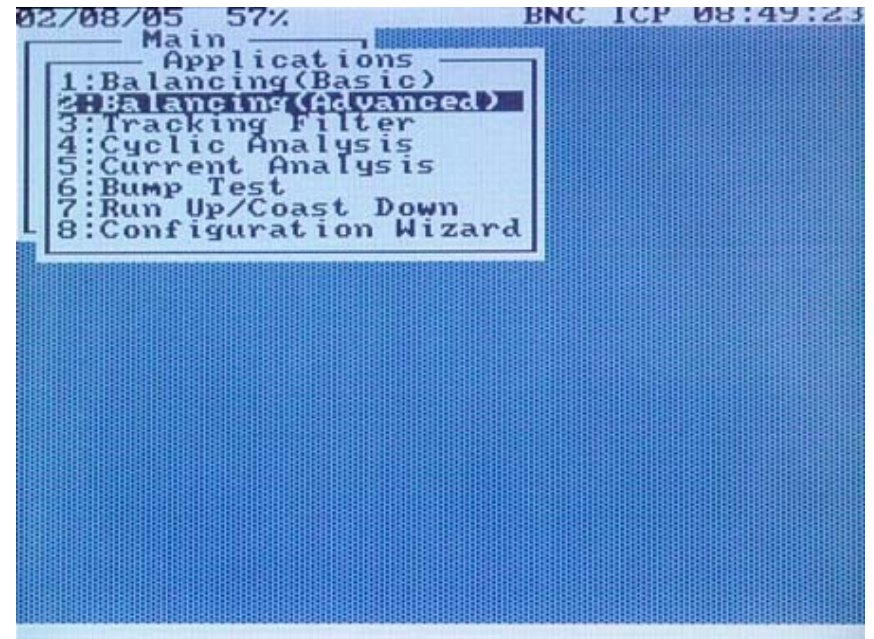
### **Angles and weight placement**

- Degrees increase in a direction opposite rotation.

# Two Plane Balancing

## General Concepts

### Main Screen



# Two Plane Balancing

## General Concepts

### Setup

```
02/08/05 57% BNC ICP 08:49:43
Balance Setup
ID: NEW BALANCE JOB
Type: Acc to Vel
Full scale: 5.0 IPS
Detection: Peak
Input: 100.0 mv/EU
Bandwidth: Normal
Average Type: Sync Time
Number of Averages: 5
Trigger Slope: +
Planes: 2
Units for Weights: OZ
Weights Left In Forever: No

Enter unique name for this job
```

# Two Plane Balancing General Concepts

## Reference Run

- The reference run is the initial set of balance data.
- ***All subsequent data is compared to the reference run.***



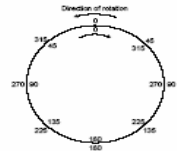
### Dual Plane Balancing Worksheet

Degrees per blade =  $360/\# \text{ of blades}$  \_\_\_\_\_ = \_\_\_\_\_

#### Reference Run

Measurement Position A      Measurement Position B

1x Amp \_\_\_\_\_ IPS      1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °      1x Phase \_\_\_\_\_ °



#### Trial Run #1

Add the trial weight in Plane A and collect data for both position A and B.

#### Plane A trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude. If not, shift trial weight 180° or increase weight by 50% and retake readings*

#### Trial Run #2

Remove the trial weight from Plane A and add the trial weight to Plane B. Collect data for both position A and B.

#### Plane B trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude from reference run. If not, shift trial weight 180° or increase weight by 50% and retake readings.*

**REMEMBER TO ENTER TRIAL WEIGHT DATA!**

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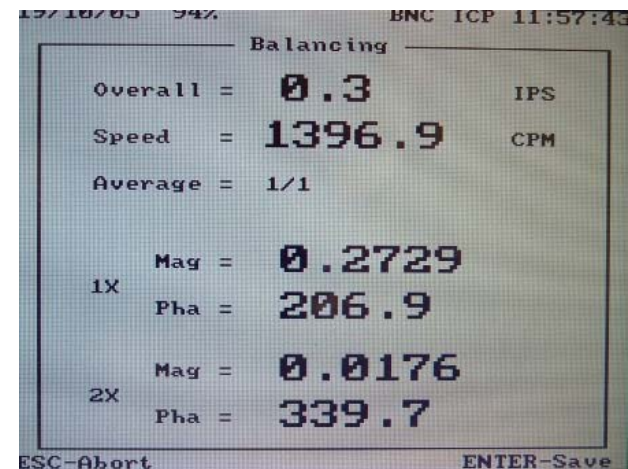
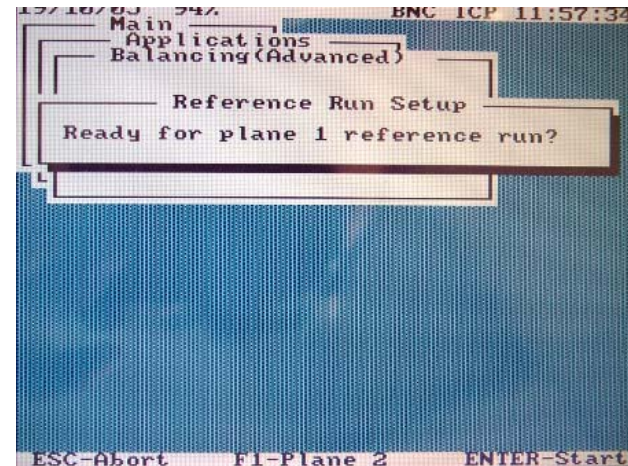


# Two Plane Balancing

## General Concepts

### Reference Run

- Measurement Position A

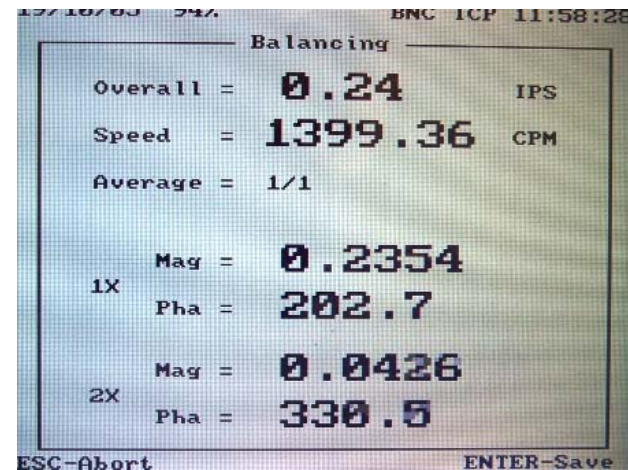
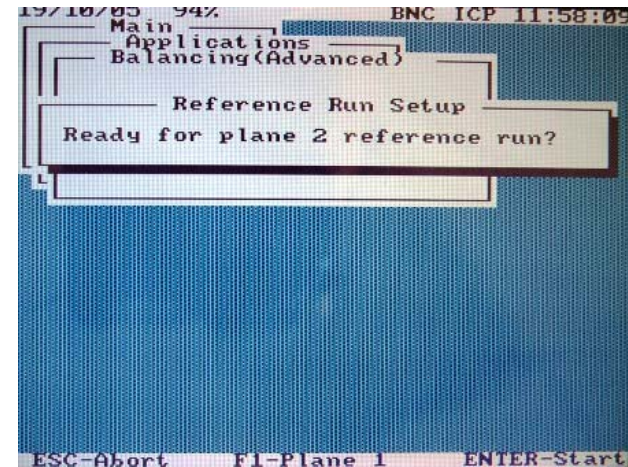


# Two Plane Balancing

## General Concepts

### Reference Run

- Measurement Position B



# Two Plane Balancing General Concepts

## Trial Run #1

- A trial weight is added to the fan in plane 1.
- Record the trial weight you use.
- Data is recollected at BOTH measurement positions.
- The data is compared to the reference run.
- ***You must make a 60 degree OR a 30% change in amplitude.***
- If not, trial weight is added doubled and the trial run data is re-taken.



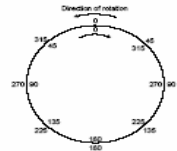
### Dual Plane Balancing Worksheet

Degrees per blade =  $360/\# \text{ of blades}$  \_\_\_\_\_ = \_\_\_\_\_

#### Reference Run

Measurement Position A      Measurement Position B

1x Amp \_\_\_\_\_ IPS      1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °      1x Phase \_\_\_\_\_ °



#### Trial Run #1

Add the trial weight in Plane A and collect data for both position A and B.

#### Plane A trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude. If not, shift trial weight 180° or increase weight by 50% and retake readings*

#### Trial Run #2

Remove the trial weight from Plane A and add the trial weight to Plane B. Collect data for both position A and B.

#### Plane B trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude from reference run. If not, shift trial weight 180° or increase weight by 50% and retake readings.*

**REMEMBER TO ENTER TRIAL WEIGHT DATA!**

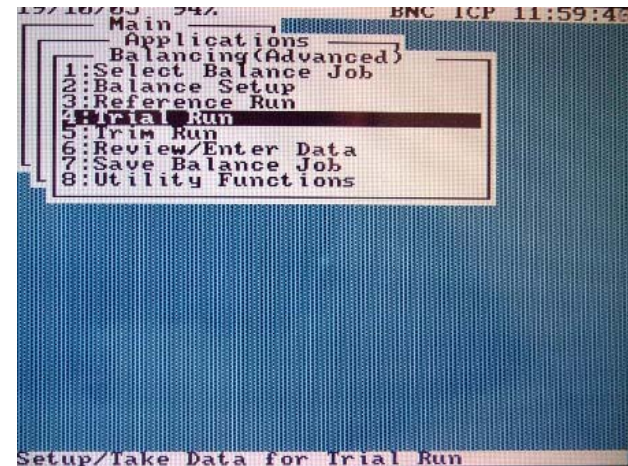
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# Two Plane Balancing

## General Concepts

### Trial Run #1

- A trial weight is added to the fan in plane 1.
- Record the trial weight you use.
- Data is recollected at BOTH measurement positions.
- The data is compared to the reference run.
- ***You must make a 60 degree OR a 30% change in amplitude.***
- If not, trial weight is added doubled and the trial run data is re-taken.





# Two Plane Balancing

## General Concepts

### Trial Run #1

- Measurement Position A

```
13/10/03 94% BNC ICP 12:01:04
Main
Applications
Trial Run
1: Estimate Trial Weight
2: Trial Weight Setup
3: Take TW1 Data - Point A
4: Take TW1 Data - Point B
5: Take TW2 Data - Point A
6: Take TW2 Data - Point B
7: Correction Weight
8: Take CW Data - Point A
9: Take CW Data - Point B
Weight in Plane 1. take Point A data
```

```
13/10/03 94% BNC ICP 12:01:15
Balancing
Overall = 0.35 IPS
Speed = 1397.98 CPM
Average = 1/1
1X Mag = 0.3538
Pha = 252.9
2X Mag = 0.0533
Pha = 43.8
ESC-Abort ENTER-Save
```

# Two Plane Balancing

## General Concepts

### Trial Run #1

- Measurement Position B

```
19/10/05 94% BNC ICP 12:01:47
Main
Applications
Trial Run
1: Estimate Trial Weight
2: Trial Weight Setup
3: Take TW1 Data - Point A
4: Take TW1 Data - Point B
5: Take TW2 Data - Point A
6: Take TW2 Data - Point B
7: Correction Weight
8: Take CW Data - Point A
9: Take CW Data - Point B
Weight in Plane 1. take Point B data
```

```
19/10/05 94% BNC ICP 12:02:32
Balancing
Overall = 0.27 IPS
Speed = 1398.13 CPM
Average = 1/1
1X Mag = 0.2479
Pha = 247.2
2X Mag = 0.0948
Pha = 60.5
ESC-Abort ENTER-Save
```

# Two Plane Balancing General Concepts

## Trial Run #2

- **The trial weight is removed from plane 1.**
- A trial weight is added to the fan in plane 2.
- Data is recollected at BOTH measurement positions.
- The data is compared to the reference run.
- **You must make a 60 degree OR a 30% change in amplitude.**
- If not, trial weight is added doubled and the trial run data is re-taken.



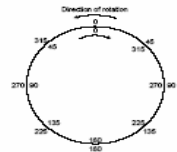
### Dual Plane Balancing Worksheet

Degrees per blade =  $360/\# \text{ of blades}$  \_\_\_\_\_ = \_\_\_\_\_

#### Reference Run

Measurement Position A      Measurement Position B

1x Amp \_\_\_\_\_ IPS      1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °      1x Phase \_\_\_\_\_ °



#### Trial Run #1

Add the trial weight in Plane A and collect data for both position A and B.

#### Plane A trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude. If not, shift trial weight 180° or increase weight by 50% and retake readings*

#### Trial Run #2

Remove the trial weight from Plane A and add the trial weight to Plane B. Collect data for both position A and B.

#### Plane B trial weight

Trial weight \_\_\_\_\_ oz/g's  
Angle \_\_\_\_\_ °

#### Position A

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

#### Position B

Overall \_\_\_\_\_ IPS  
1x Amp \_\_\_\_\_ IPS  
1x Phase \_\_\_\_\_ °

*Should have at least a 60° phase shift or a 30% change in 1x amplitude from reference run. If not, shift trial weight 180° or increase weight by 50% and retake readings.*

**REMEMBER TO ENTER TRIAL WEIGHT DATA!**

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# Two Plane Balancing

## General Concepts

### Trial Run #2

- Measurement Position A

```
157/18/83 94% BNC ICP 12:19:00
Main
Applications
Trial Run
1: Estimate Trial Weight
2: Trial Weight Setup
3: Take IW1 Data - Point A
4: Take IW1 Data - Point B
5: Take IW2 Data - Point A
6: Take IW2 Data - Point B
7: Correction Weight
8: Take CW Data - Point A
9: Take CW Data - Point B
Weight in Plane 2, take Point A data
```

```
157/18/83 94% BNC ICP 12:19:22
Balancing
Overall = 0.25 IPS
Speed = 1404.56 CPM
Average = 1/1
1X Mag = 0.2501
Pha = 295.4
2X Mag = 0.0114
Pha = 128.1
ESC-Abort ENTER-Save
```



# Two Plane Balancing

## General Concepts

### Trial Run #2

- Measurement Position B

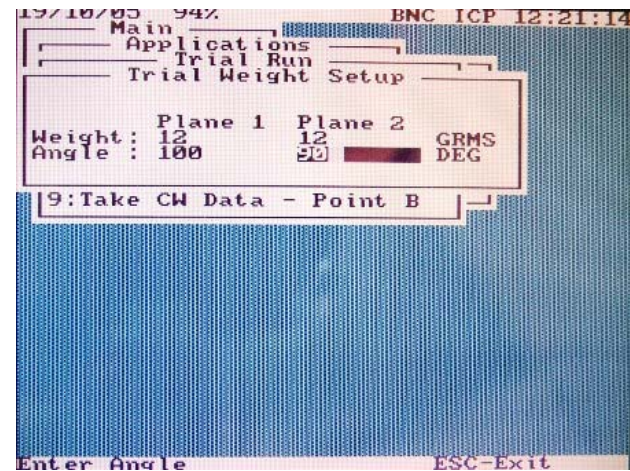
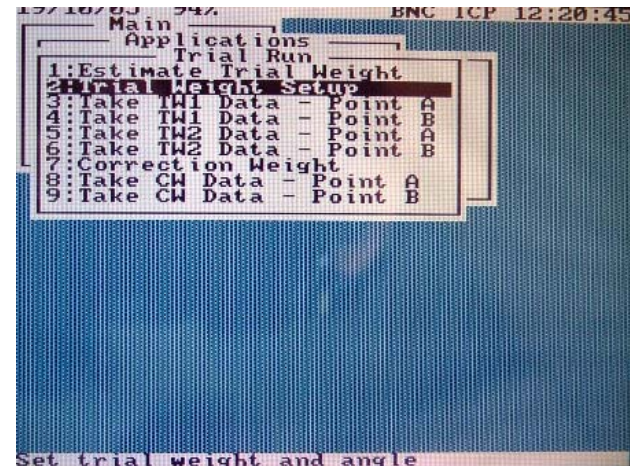
```
19/10/85  94%          BNC ICP 12:19:39
Main
Applications
Trial Run
1: Estimate Trial Weight
2: Trial Weight Setup
3: Take TW1 Data - Point A
4: Take TW1 Data - Point B
5: Take TW2 Data - Point A
6: Take TW2 Data - Point B
7: Correction Weight
8: Take CW Data - Point A
9: Take CW Data - Point B
Weight in Plane 2. take Point B data
```

```
19/10/85  94%          BNC ICP 12:19:59
Balancing
Overall =  0.25      IPS
Speed   = 1404.49   CPM
Average = 1/1
1X      Mag =  0.241
        Pha = 282.6
2X      Mag =  0.0214
        Pha = 178.9
ESC-Abort          ENTER-Save
```

# Two Plane Balancing

## General Concepts

### Trial Weight Setup

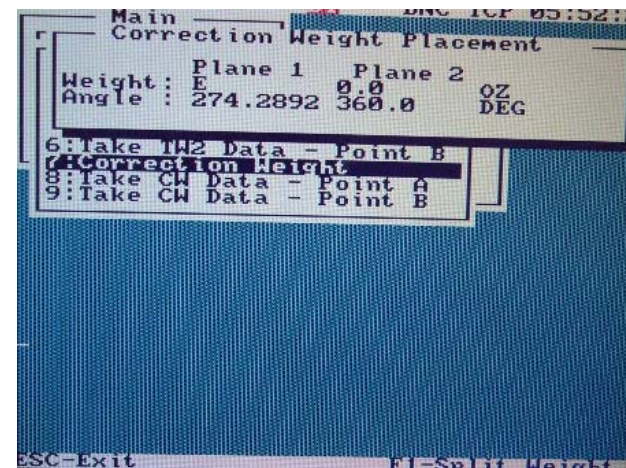
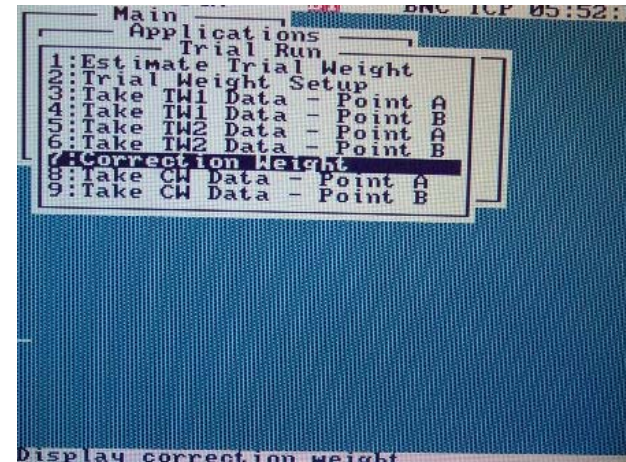


# Two Plane Balancing

## General Concepts

### Correction Weights

- Trial Weights are used to effect changes in amplitude **OR** phase.
- Correction Weights are calculated by the Microlog.
- The Microlog will specify a weight and angle for each plane.
- ***The trial weight is removed from plane 2.***
- Correction Weights are intended to stay on the fan.





# Two Plane Balancing General Concepts

## Trim Run

- The trim run measurement is used as the final data set.
- Trim weights are added in addition to the correction weights
- ***If the correction weights have not made a significant improvement, there is not much point in using the trim weight calculation.***



### Trim Run #1

Remove the trial weights and add the correction weights to Plane A and Plane B at the specified angles and collect data at both position A and B.

Plane A  
Correction weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Plane B  
Correction weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Position A  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

Position B  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

### Trim Run #2

Plane A  
Trim weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Plane B  
Trim weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Position A  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

Position B  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

### Trim Run #3

Plane A  
Trim weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Plane B  
Trim weight \_\_\_\_\_  
Angle \_\_\_\_\_°

Position A  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

Position B  
Overall \_\_\_\_\_IPS  
1x Amp \_\_\_\_\_IPS  
1x Phase \_\_\_\_\_°

Target value for 1x amplitude is 0.075IPS

# Two Plane Balancing

## General Concepts

### Trim Run

- Measurement Position A

```
137/10/03 94% BNC ICP 12:28:37
Main
Applications
Trim Run
1: Calculate Trim Weight
2: Take Data - Point A
3: Take Data - Point B
4: Display Trim Data
5: Log Data
Trim Weights on. take Point A data
```

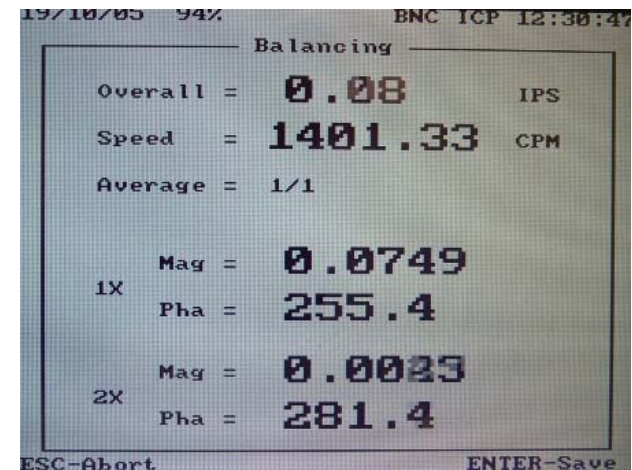
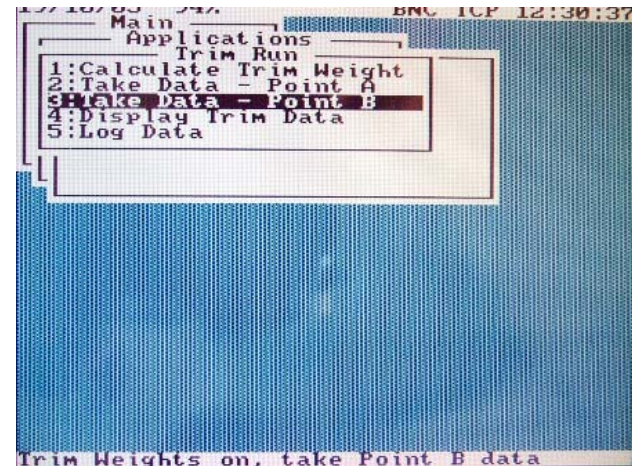
```
137/10/03 94% BNC ICP 12:28:53
Balancing
Overall = 0.08 IPS
Speed = 1402.65 CPM
Average = 1/1
1X Mag = 0.0595
Pha = 253.1
2X Mag = 0.0011
Pha = 349.6
ESC-Abort ENTER-Save
```

# Two Plane Balancing

## General Concepts

### Trim Run

- Measurement Position B



# Two Plane Balancing

## General Concepts

### Trim Run

```
19/10/05 94% BNC ICP 12:32:07
Main
Applications
Trim Run
1: Calculate Trim Weight
2: Take Data - Point A
3: Take Data - Point B
4: Display Trim Data
5: Log Data

```

Display trim current & log data

```
19/10/05 94% BNC ICP 12:32:13
Main
Applications
Trim Run Data
Current trim values:
Plane 1 Plane 2
Speed : 1403.559 1401.448 CPM
Mag : 0.0618 0.0746 IPS
Phase : 256.3 259.8 DEG
Weight : 0 0 GRMS
Angle : 0 0 DEG
Trim Run Log(old to new):
Mag : 0 0 IPS
Phase : 0 0 DEG
Weight : 0 0 GRMS
Angle : 0 0 DEG
-----
Mag : 0 0 IPS
Phase : 0 0 DEG
Weight : 0 0 GRMS
Angle : 0 0 DEG

```

Press ESCAPE to exit