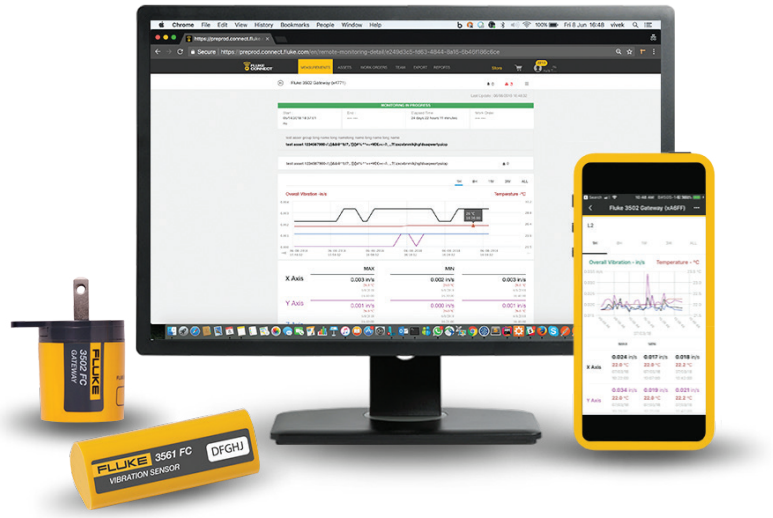
FLUKE®

Deployment Planning Guide



Deployment Planning Checklist:

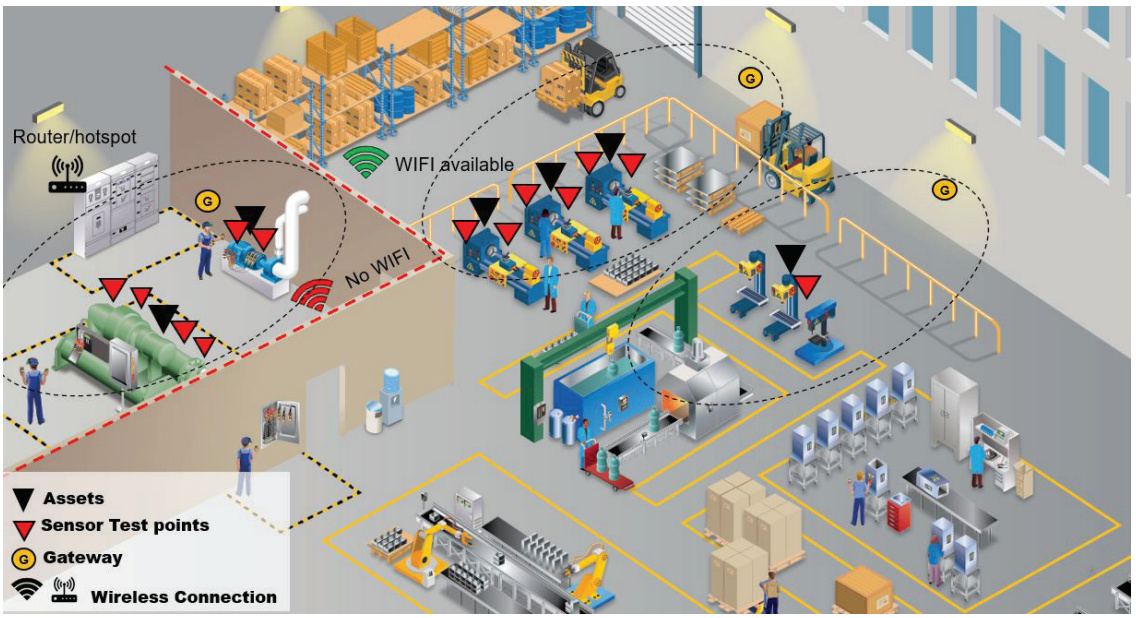
- ☑ **Step 1:** Select your assets (equipment) for remote monitoring
- ☑ **Step 2:** Determine test points for sensor installation
- ☑ **Step 3:** Determine number of gateways required
- ☑ **Step 4:** Confirm availability of wireless connectivity

3561 FC Vibration Sensor

The Fluke 3561 FC Vibration Sensor allows maintenance teams to add remote, continuous vibration monitoring to assets, maximizing equipment uptime and minimizing unnecessary routes. With a frequency range of 10 – 1,000 hertz (Hz), the 3561 FC detects and notifies users of critical faults such as imbalance, misalignment, looseness and bearing wear, providing early warning of potential equipment failure.

Simple steps for program success:

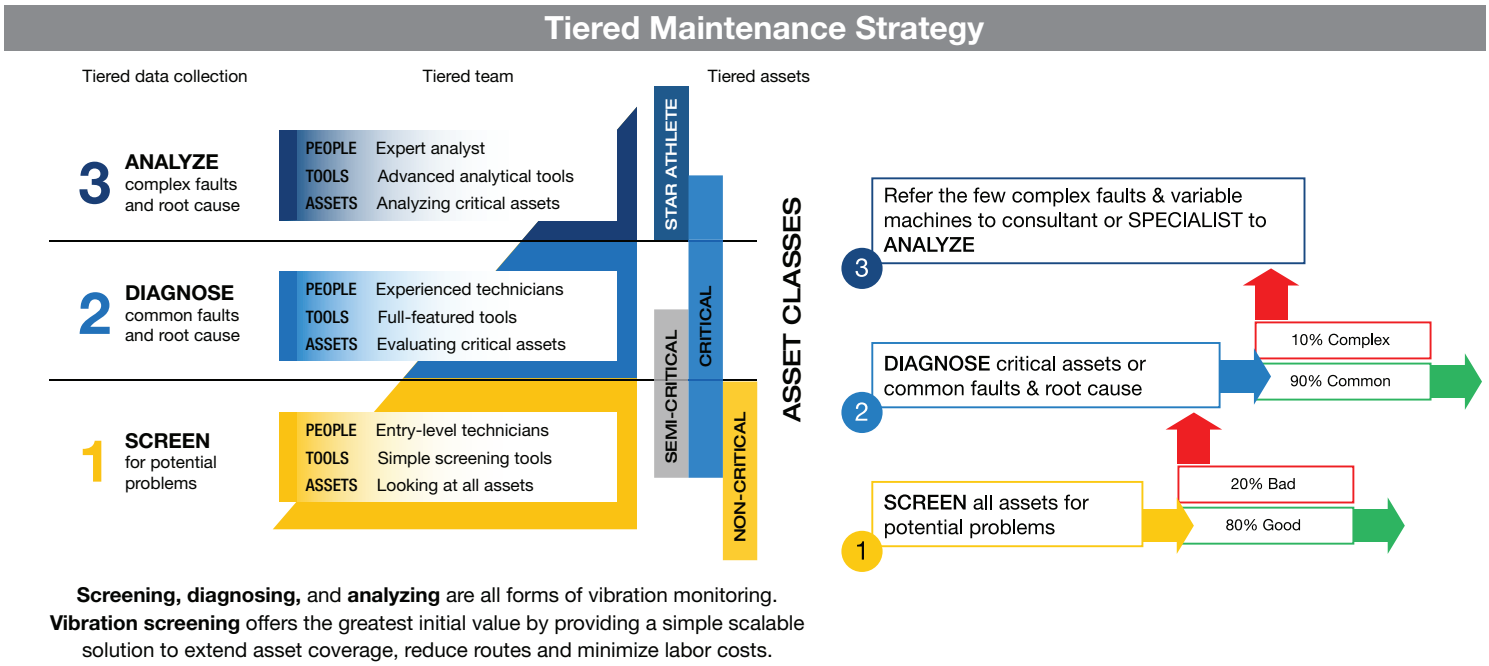
A little planning and preparation will help you smoothly install the 3561 FC Vibration Sensor. Quickly and easily plan the deployment of your wireless vibration program by following the steps in this guide. Learn how to select your assets, sensor locations, gateway locations and network connectivity options. Perform a **site survey** with the Worksheet A & B: ***Asset Information Table*** (Appendix) and sample **site map** (Appendix) to assist in gathering information needed for deployment planning, ordering the right hardware and installing sensors. Print out the Appendix for your site survey.



Step 1: Select your assets (equipment) for remote monitoring

A. Asset Selection

Survey the site where you plan to deploy the vibration sensors and select the assets to monitor. **We recommend using this sensor as a screening tool.** The sensors notify teams when faults start developing, enabling them to take further diagnosis and analysis actions.



Screening, diagnosing, and **analyzing** are all forms of vibration monitoring. **Vibration screening** offers the greatest initial value by providing a simple scalable solution to extend asset coverage, reduce routes and minimize labor costs.

B. Determine Machine Category

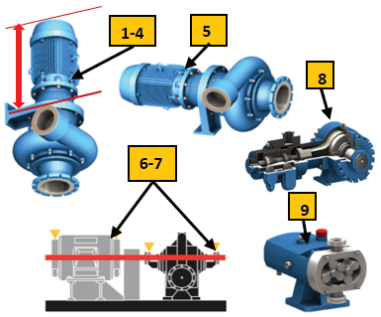
This is a critical piece of information required to screen the health of your assets and generate alarms when faults develop.

Follow the simple questions below to select the proper machine category from available flow paths:

- Select the machine category by the driven component (the motor is included with the driven component)
- Select the machine category that is the **closest** match to your machine (it is OK if it's not an exact match)

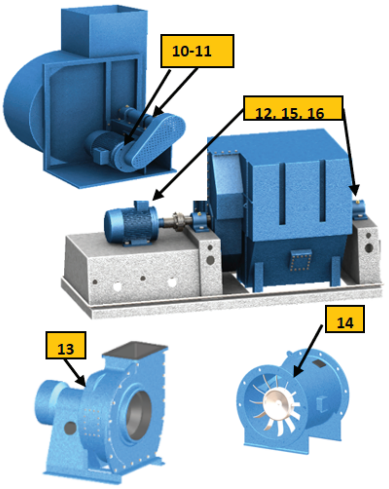
Pump? Does it have a pump impeller?

- Centrifugal pump?
  - Vertical?
    1. **Vertical pump** (12' to 20' from grade to top of motor)
    2. **Vertical pump** (8' to 12' from grade to top of motor)
    3. **Vertical pump** (5' to 8' from grade to top of motor)
    4. **Vertical pump** (0' to 5' from grade to top of motor)
  - Horizontal?
    5. **Horizontal centrifugal end suction pump** (direct coupled)
    6. **Horizontal centrifugal double suction pump** (direct coupled)
    7. **Boiler feed pump** (turbine or motor driven)
- Positive displacement pump?
  8. **Positive displacement horizontal piston pump** (under load)
  9. **Positive displacement horizontal gear pump** (under load)



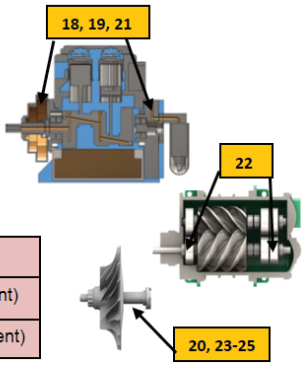
Fan? Does it have a fan blade?

- General belt-drive?
  10. **Belt-driven fan** (1800 to 3600 RPM)
  11. **Belt-driven fan** (600 to 1799 RPM)
- General direct coupled?
  12. **General direct drive fan** (direct coupled)
- Fan blade on motor shaft?
  13. **Shaft-mounted integral fan** (extended motor shaft)
- Special fans?
  - Axial flow?
    14. **Axial flow fan** (belt or direct drive)
  - Draft fans?
    15. **Large forced draft fan** (fluid film bearings)
    16. **Large induced draft fan** (fluid film bearings)
  - Vacuum blower?
    17. **Vacuum blower** (belt or direct drive) fan blades not lobes (if lobes or multi-stage impeller vanes - see blower on next page)



Compressor? Does it compress a fluid or air?

- Chiller? Refrigeration
  - Reciprocating?
    18. **Reciprocating chiller** (open motor and compressor)
    19. **Reciprocating chiller** (hermetic motor and compressor)
  - Centrifugal?
    20. **Centrifugal chiller** (hermetic or open motor)
- Air compressor?
  - Reciprocating? Screw?
    21. **Reciprocating air compressor**
    22. **Rotary screw air compressor**
  - Centrifugal?
    23. **Centrifugal air compressor** with or without gearbox
    24. **Centrifugal air compressor** – internal gear (axial measurement)
    25. **Centrifugal air compressor** – internal gear (radial measurement)



Blower? Does it blow a lot of air? (Not a fan blade)

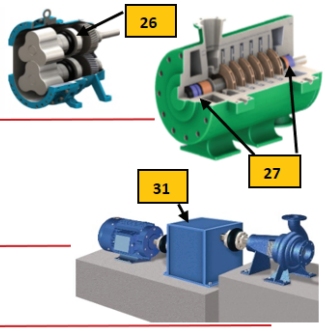
- Lobe-type?
  26. **Lobe-type rotary blower** (belt or direct drive)
- Centrifugal?
  27. **Multi-stage centrifugal blower** (direct drive)

Cooling tower drives? Motor and fan blade?

- Long shaft and large fan?
  28. **Long, hollow shaft** (motor)
- Smaller, more standard fan?
  29. **Belt-drive** (motor and fan – all arrangements)
  30. **Direct drive** (motor and fan – all arrangements)

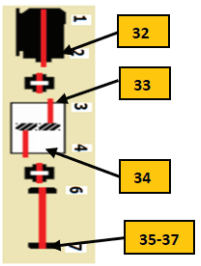
Generic gearbox? With rolling element bearings

31. **Single stage gearbox**



Machine tool? High-speed spindle?

- Test motor?
  32. **Machine tool motor**
- Test gearbox?
  33. **Machine tool gearbox** input
  34. **Machine tool gearbox** output
- Separate spindle?
  35. **Machine tool spindle** – roughing operations
  36. **Machine tool spindle** – machine finishing
  37. **Machine tool spindle** – critical finishing



C. **Record Asset Information**
With the information collected, complete the “Asset” section of the **Worksheet B: Asset Information** Table in the Appendix. Use the sample information shown in Worksheet A for your reference.

Step 2: Determine test points for sensor installation

Next, determine how many test points are required on each monitored machine for sensor installation.

Machine basics for rotating machines

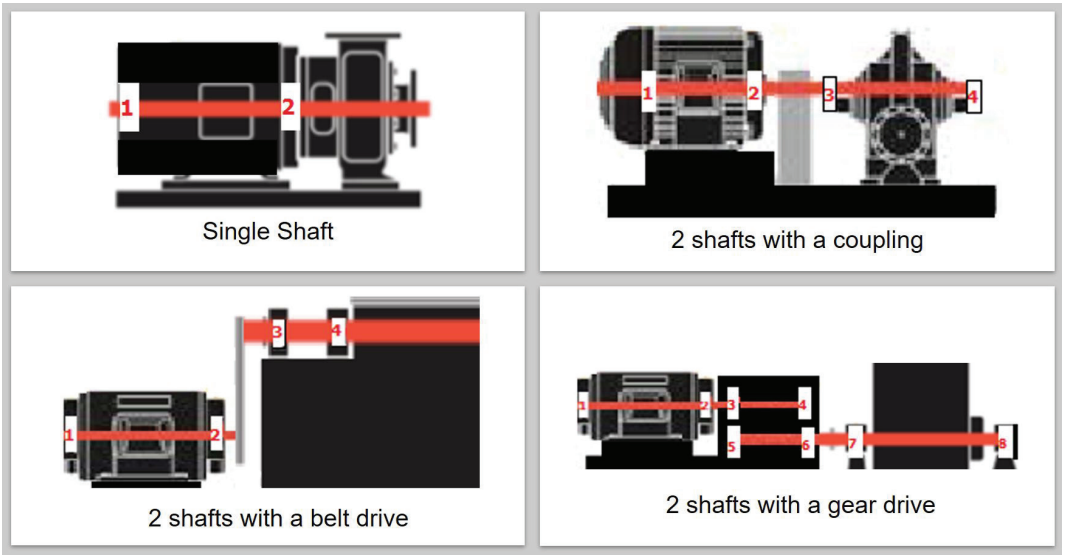
For vibration monitoring, we can simplify a machine to one or two shafts with two bearings each, something connecting the shafts and something hanging off the end. Look at your machine and identify the shaft(s), bearings, coupling and driven component. We recommend one sensor per bearing.

How to select locations for mounting sensors?

A. **Machine Survey** – break your machine down to basic parts:

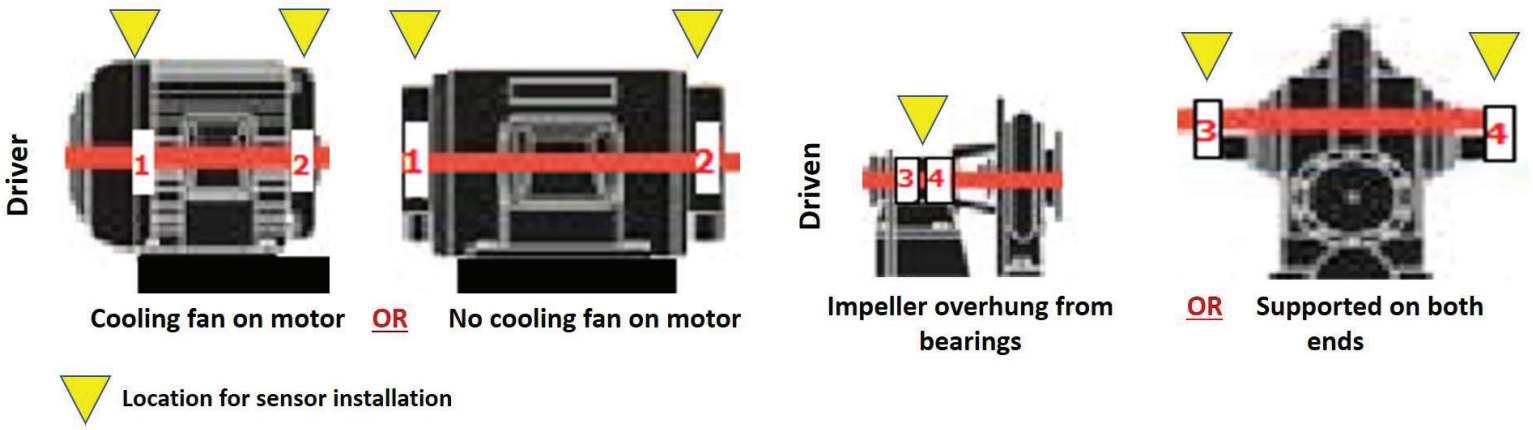
- Shaft(s)
- Bearings, coupling, belt or gearbox
- Driven element (pump, fan, compressor, blower, etc.)

Find the configuration of your machine to determine bearing location for sensor installation.



B. Sensor Location Identification

Determining the bearing location depends on the driving element (motor) type and the driven element (such as a pump).



C. Determine Number of Sensors depending on size

Vibration transmits about 36 inches (1 meter) before it is lost through the machine. There is no need to measure every bearing on small machines. Transmission path should be as short and solid as possible — from rotating shaft, to bearing, to bearing housing and into the sensor.

D. Record Sensor Information

Using the above information, determine the test points for sensor installation and fill in **Worksheet B: Asset Information Table** in Appendix. Use the sample information shown in Worksheet A for your reference.

Step 3: Determine number of gateways required

Gateways receive vibration data from 10–20 sensors via Bluetooth and send data to Fluke ConnectTM Cloud via Wi-Fi. The maximum distance between the sensors and Gateway is 65 meters (line of sight). If metal, concrete or walls blocks the signal, we suggest a distance of 25 meters or lesser.

Check for electrical service outlets close to asset and confirm the connectivity between sensor and gateway during the in-app setup process.

Gateways receive vibration data from 10–20 sensors via Bluetooth and send data to Fluke ConnectTM Cloud via Wi–Fi. The maximum distance between the sensors and Gateway is 65 meters (line of sight). If metal, concrete or walls blocks the signal, we suggest a distance of 25 meters or lesser.

Step 4: Confirm availability of wireless connectivity

The Gateway requires wireless connectivity to stream vibration data to the cloud. Ensure availability of network connectivity in the installation location.

Option 1: Use Wi-Fi connectivity (2.4 GHz) at the installation location.

For vibration monitoring, we can simplify a machine to one or two shafts with two bearings each, something connecting the shafts and something hanging off the end. Look at your machine and identify the shaft(s), bearings, coupling and driven component. We recommend one sensor per bearing.

1. Obtain the Wi–Fi network name and password.
2. Make sure your network complies with these requirements:
   - ☑ 2.4 GHz connectivity
   - ☑ WLAN Standards: 802.11 g/n GHz
   - ☑ Upload speed: 1 Mbps (Sustained)
   - ☑ Internet HTTP Proxy: Disabled
   - ☑ Supported Authentication Protocols: WEP, WPA

OR

Option 2: Use mobile router/hotspot

If the installation area does not have wireless coverage, consider using a wireless hotspot or router for network connectivity. For example: Verizon Jetpack MiFi, Cradlepoint, etc.

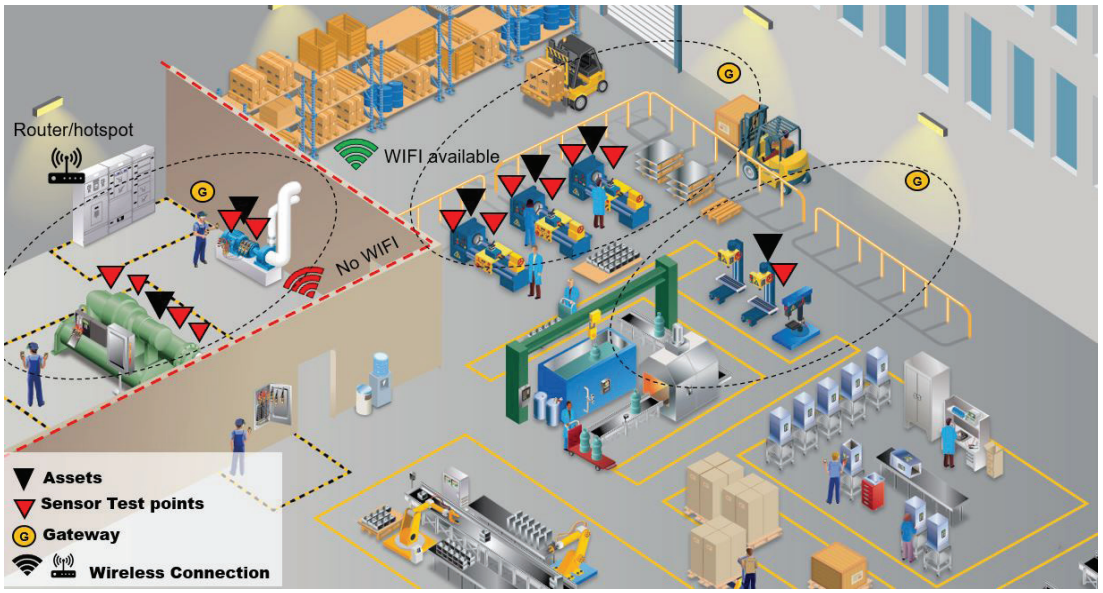
On completion of the above 4 steps, the Asset Information Table is complete for a successful installation. For the in–app setup and installation of sensors, refer to ***Getting Started Manual*** for the 3561 FC Vibration Sensor found at www.fluke.com/quickstart.

APPENDIX

Sitemap

For the area where you plan to install, refer to a sitemap to pictorially plan the deployment. If you don't have one, create a simple hand draw site map. This lets you plan gateway and network connectivity to ensure that there is optimal coverage and seamless data streaming.

Sample Site map with Deployment Planning



Do's and Don'ts

- ☑ Mount the sensor on solid metal anywhere on or near the bearings but not on thin covers
- ☑ If the machine is small, mount a sensor on one motor bearing and one pump bearing
- ☒ Do not mount sensor on motor winding box – bearings only
- ☒ Do not mount sensor in the middle of motor – bearings only
- ☒ Do not mount sensor on pump casing – bearings only (flow noise)
- ☒ Do not mount sensor on thin cooling fan cover – solid metal only
- ☒ Do not mount sensor on thin cooling fins – solid metal only
- ☒ Do not mount sensor on a coupling or belt guard
- ☒ Do not mount sensor on seals – bearings only

WORKSHEET A – Asset Information Table – Sample

Table 1: Asset Information Table - *Sample*

Asset Information			Test Point Information		3. Hardware needed			
Asset Group (Location)	Asset (Machine name)	Select Machine Category (1 of 37)	Test Point - Sensor (Bearing location)	Notes about Test Point location - obstructions / issues	Sensors	Gateway	Hotspot / Router	Sensor ID
Boiler Room	Horizontal Water Pump 1	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Top of motor bearing, no fins	1	1	1	12345
Boiler Room	Horizontal Water Pump 1	5. Horizontal centrifugal end suction pump	Pump Bearing 3	Top of pump bearing, center	1			ABCDE
Boiler Room	Horizontal Water Pump 2	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Top of motor bearing, no fins	1			67890
Boiler Room	Horizontal Water Pump 2	5. Horizontal centrifugal end suction pump	Pump Bearing 3	Top of pump bearing, center	1			FGHI2
Boiler Room	Horizontal Water Pump 3	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Top of motor bearing, no fins	1			JKLMN
Boiler Room	Horizontal Water Pump 3	5. Horizontal centrifugal end suction pump	Pump Bearing 3	Top of pump bearing, center	1			OPQRS
Boiler Room	Horizontal Water Pump 4	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Top of motor bearing, no fins	1			TUVWX
Boiler Room	Horizontal Water Pump 4	31. Single stage gearbox	Gearbox Bearing 3	Top of gearbox, motor input	1			12345
Boiler Room	Horizontal Water Pump 4	5. Horizontal centrifugal end suction pump	Pump Bearing 5	Top of pump bearing, center	1			ABCDE
Boiler Room	Vertical Water Pump 1	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Side of lower motor bearing	1	1		67890
Boiler Room	Vertical Water Pump 2	5. Horizontal centrifugal end suction pump	Motor Bearing 2	Side of lower motor bearing	1			FTH45
Boiler Room	Blower 1	13. Shaft-mounted integral fan	Motor Bearing 2	Top of motor bearing, near fan	1			J3H29
Boiler Room	Blower 2	13. Shaft-mounted integral fan	Motor Bearing 2	Top of motor bearing, near fan	1			3JK23
Boiler Room	Air Compressor 1	21. Reciprocating air compressor	Motor Bearing 2	Top of motor bearing, near belt	1			KJS49
Boiler Room	Air Compressor 1	21. Reciprocating air compressor	Compressor Bearing 3	Top of compressor bearing, near belt	1			23989
Boiler Room	Fan 1	11. Belt-driven fan (600 to 1799 RPM)	Motor Bearing 2	Top of motor bearing, near belt	1			3KJH9
Boiler Room	Fan 1	11. Belt-driven fan (600 to 1799 RPM)	Fan Bearing 3	Top of fan bearing, near belt	1			PJDS0
Boiler Room	Fan 1	11. Belt-driven fan (600 to 1799 RPM)	Fan Bearing 4	Top of fan bearing, near fan	1			989Y7
Boiler Room	Fan 2	11. Belt-driven fan (600 to 1799 RPM)	Motor Bearing 2	Top of motor bearing, near belt	1			0S9DU
Boiler Room	Fan 2	11. Belt-driven fan (600 to 1799 RPM)	Fan Bearing 3	Top of fan bearing, near belt	1			90390
Boiler Room	Fan 2	11. Belt-driven fan (600 to 1799 RPM)	Fan Bearing 4	Top of fan bearing, near fan	1			D09D9
Boiler Room	Fan 3	12. General direct drive fan (direct coupled)	Motor Bearing 1	Top of motor bearing, behind fan cover	1	1		23I23
Boiler Room	Fan 3	12. General direct drive fan (direct coupled)	Motor Bearing 2	Top of motor bearing, coupling end	1			32ND0
Boiler Room	Fan 3	12. General direct drive fan (direct coupled)	Fan Bearing 3	Top of fan bearing, coupling end	1			67890
Boiler Room	Fan 3	12. General direct drive fan (direct coupled)	Fan Bearing 4	Top of fan bearing, free end	1			WEOIS
Fan Room	Duct Fan 1	14. Axial flow fan (belt or direct drive)	Motor Bearing 2	Top of motor bearing, fan end	1	1	1	19S29
Fan Room	Duct Fan 2	14. Axial flow fan (belt or direct drive)	Motor Bearing 2	Top of motor bearing, fan end	1			12KL3
Fan Room	Duct Fan 3	14. Axial flow fan (belt or direct drive)	Motor Bearing 2	Top of motor bearing, fan end	1			TUVWX
Fan Room	Fan 4	12. General direct drive fan (direct coupled)	Motor Bearing 1	Top of motor bearing, behind fan cover	1	1		12345
Fan Room	Fan 4	12. General direct drive fan (direct coupled)	Motor Bearing 2	Top of motor bearing, coupling end	1			ABCDE
Fan Room	Fan 4	12. General direct drive fan (direct coupled)	Fan Bearing 3	Top of fan bearing, coupling end	1			67890
Fan Room	Fan 4	12. General direct drive fan (direct coupled)	Fan Bearing 4	Top of fan bearing, free end	1			09DSK
					32	**5**	**2**	

WORKSHEET B – Asset Information Table – For use

Table 2: Asset Information Table - *For Use*

Asset Information			Test Point Information		3. Hardware needed			
Asset Group (Location)	Asset (Machine name)	Select Machine Category (1 of 37)	Test Point - Sensor (Bearing location)	Notes about Test Point location - obstructions / issues	Sensors	Gateway	Hotspot / Router	Sensor ID
					0	**0**	**0**	