Foot Pre-Check Types

Foot Pre-Check Measurement Methods – Soft Foot and Frame Distortion Index (FDI)

Soft foot is a condition where all feet (typically four) of a machine component (such as a motor or gearbox) will not rest on the same plane. This condition also exists if the machine baseplate pads (where the machine foot rests) are not on that same plane. If this condition continues to exist and is not corrected, two problems will occur.

First, it will be very difficult to align the machine. You will appear to be "going in circles" trying to move the machine into alignment. Second, but most important, the machine will not operate properly. The component was not designed to operate in a bound condition. When this happens, binding will occur causing stress at the bearings and changing the operating clearances (inside the component). To prevent binding, you must check all the feet, *even those on the machine not being moved.*

Traditional methods of measuring soft foot conditions included mounting a dial indicator at the machine foot (similar to Fig 1). The hold-down bolt was then loosened while the indicator was watched for movement. If the indicator moved more than a predetermined amount (usually 0.003 inch), the foot required correction. A shim equal to the amount of the indicator movement was then shoved under the foot.

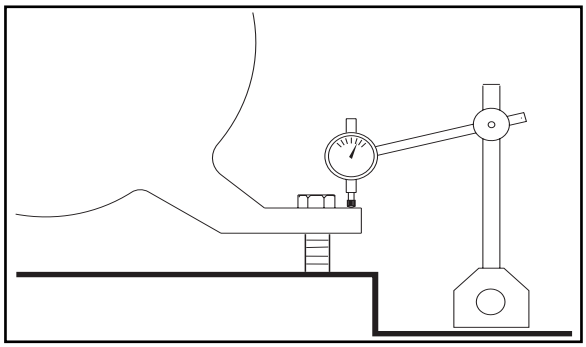


Fig 1

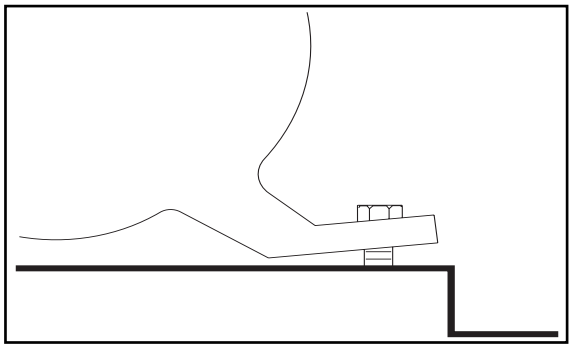


Fig 2

This method assumed that a parallel soft foot existed. However, a large percentage of problem feet are *angular soft feet* (similar to Fig 2). Correcting this type of problem with a full shim can make the condition worse (see Fig 3). Correction should be determined with a set of thickness gauges (feeler gauges). The result is usually a wedge shim similar to Fig 4.

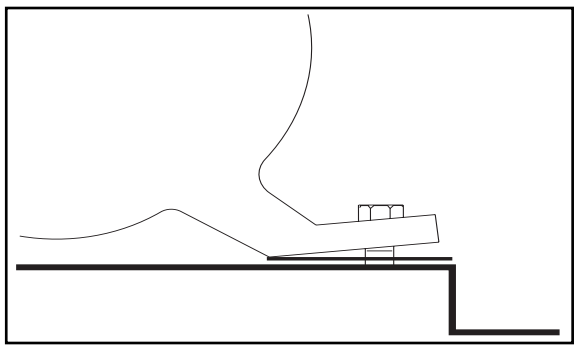


Fig 3

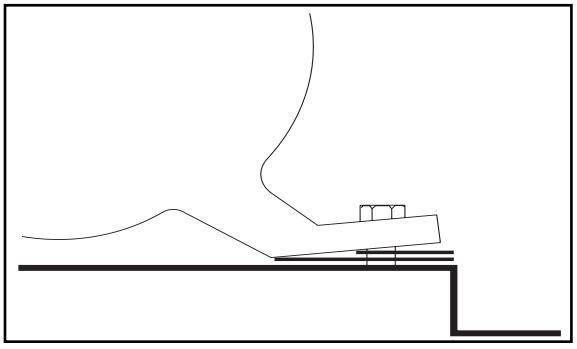


Fig 4

The laser alignment system allows you to locate the problem feet and bypass those feet that are OK. While the hold-down bolts are individually loosened and retightened, the laser system will measure the shaft to shaft position. This actually measures how much each connection affects shaft alignment. In a perfect condition, loosening bolts should not move the shafts at all.

Two different laser methods are available to evaluate the measured movement at the shafts. They are:

- Soft Foot
- Frame Distortion Index (FDI)

Although they evaluate the data differently, both methods give you a sense of soft foot severity at each location. Soft Foot results are shown by the number of X's displayed and FDI results are shown as a numerical value.

Soft Foot Evaluation

The Soft Foot evaluation provides you with a sense of severity without showing numbers. Numbers are not used because, *most of the time, they are mistaken for the value of the shims* (totally wrong). When the numbers are calculated, they are compared against the tolerance (usually 0.5 mils/inch). If a particular foot is below the tolerance, it is labeled OK. If the number is between one and two times the tolerance, it is labeled with a single X. If the number is between two and three times the tolerance, it is labeled as XX. If the number is greater than three times the tolerance, it is labeled as XXX (the more X's, the greater the severity). *The tolerance can be changed in UltraMgr and downloaded to the analyzer.*

The number is evaluated by taking the horizontal and vertical movement on each target and calculating the total movement on each target. The largest movement of the two is then divided by the distance between the heads (dimension C) to determine the angle of deflection caused by loosening a hold-down bolt. This angle is compared to the tolerance for final evaluation for that foot.

The advantage of this method is that it uses a combination of horizontal and vertical movements on the target to determine the problem feet. Experience has shown that approximately 20% of the soft foot conditions cause a horizontal move *because of a severely bent foot.*

FDI Evaluation

The Frame Distortion Index provides you with a sense of severity *with numbers.*

> ***Caution!***
> *Do not mistake these numbers for shim values.*

When the numbers are calculated, they are compared against the tolerance (*usually* excellent <2 mils and acceptable <3 mils). If a particular foot is in the excellent range, the number is plain. If the foot is acceptable, it will have a clear box around the number. If the foot is out-of-tolerance, it will have a solid box around the number. The higher the number, the greater the severity. *The tolerance values can be changed in UltraMgr and downloaded to the analyzer.*

The number is evaluated by measuring the vertical angle and applying it to an old millwright's "rule of thumb". It is:

FDI = 2 x Vertical Angle x Inboard to Outboard Foot Distance

Vertical angle is measured at the shafts when the hold-down bolts are loosened and the Inboard to Outboard Distance is the distance from the front to the back feet of the component being measured (dimensions A or E in the Machine Dimensions screen). This value is compared to the tolerance for final evaluation for that foot.

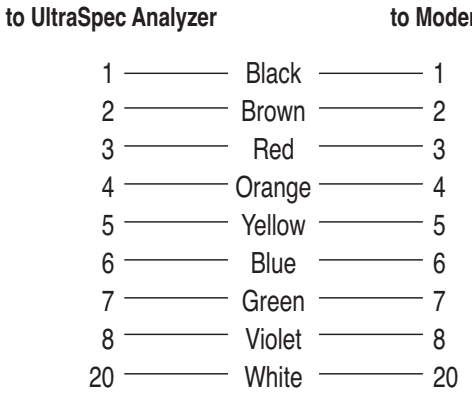
The disadvantage of this method is that it uses only vertical movement to determine the problem feet (and the numbers are commonly mistaken for shim correction values). However, *this is the only method currently used by Prüftechnic alignment products.*

Pinouts and Wiring Diagrams

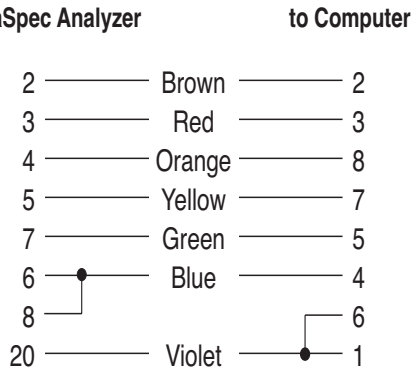
RS232 D Connector Pinouts

Pin	Description
01	Ground (connected to 7, 16, 22)
02	Transmit (RS-232)
03	Receive (RS-232)
04	Connected to 05
05	Connected to 04
06	Connected to 08 and 20
07	Ground (connected to 1, 16, 22)
08	Connected to 06 and 20
09	<Reserved>
10	<Reserved>
11	Transmit (for CSI Modem only)
12	Receive (for CSI Modem only)
13	+5.0 Volts
14	Sensor Button
15	CTS (for CSI Modem)
16	Ground (connected to 1, 7, 22)
17	<Reserved>
18	+9.5 Volts
19	<Reserved>
20	Connected to 06 and 08
21	+10 Volts — Accelerometer Signal Input
22	Ground (connected to 1, 7, 16)
23	Volts In (Signal Input)
24	-10 Volts — Accelerometer
25	<Reserved>

Model 635 Modem Cable



Model 639 Communications Cable



Technical Specifications

UltraSpec 8215/8225 Laser Alignment Fixtures Specifications

Specification	Description
Laser Diode	In-Ga-Al-P, Class II (CDRH) / Class2 (IEC), Visible
Wavelength	670 nm (typical)
Output power	Pulsed, <1.0 mW (average)
Laser Safety Class	Class II (CDRH) / Class2 (IEC) FDA 21CFR 1040.10 and 1040.11
Beam Divergence	≤ 225 µrad (8215), ≤ 30 µrad (8225),
Target Size	8215: 10 mm by 10 mm (0.394 inches by 0.394 inches) 8225: 20 mm by 20 mm (0.787 inches by 0.787 inches)
Target Range (typical)	8215: 9 mm by 9 mm (0.354 inches by 0.354 inches) 8225: 18 mm by 18 mm (0.709 inches by 0.709 inches)
Resolution	0.0000394 inches / 0.001 mm
Linearity	Better than 1.5%
Environment	Protected from ambient light interference
Laser housing	Aluminum
Inclinometer	Internal, fully automatic
Inclinometer resolution	Better than 1°
Measurement axes	6 total, 2 displacement and 1 rotational axis per laser head
Operating temperature	0° to 115° F (-17.8° C to 45° C)
Storage temperature	0° to 140° F (-17.8° C to 60° C)°

UltraSpec 8215/8225 Laser Alignment Fixtures Specifications (continued)

Specification	Description
Humidity	10 to 95%, non-condensing
Power management	Auto “sleep” and “power down” modes
Battery	Nickel cadmium
RF Operating Frequency	916.5 MHz
RF Operating Range	0 - 50 ft (0 - 15 m), typical
Battery life	3 - 4 hours continuous operation – 8 hours typical [1]
Battery charging station	Fully automatic super fast smart charger (auto-switching, 110-240 VAC, 50/60 Hz)
Battery charging time	15 minutes (zero to full charge)
Laser to analyzer communication	Cableless RF and/or direct cable connection
Minimum separation	Any positive separation (faces not touching)
Maximum separation	8215: 30 ft (9 m), 8225: 100 ft. (30.5 m)
Standard mounting bracket [2]	Carbon steel base – thickness 0.75 in (19 mm)
Minimum shaft diameter with standard bracket	0.625 in (16mm)
Maximum shaft diameter with standard bracket [2]	26 in (660 mm) – requires chain extension for shaft diameters above 8 in (200 mm)
Vertical clearance with standard brackets [2]	5.25 in (152 mm)
Calibration	Calibration to NIST traceable standards
Weight of total system	33 lbs (15 kg) – includes laser heads, brackets, analyzer and accessories
[1] Based on 25% laser operation, 25% sleep mode, and 50% analyzer only [2] Other brackets are available for special applications	

UltraSpec Analyzer General Specifications

Physical Dimensions

Height:	27 cm (10.5 inches)
Width:	17 cm (6.8 inches)
Depth:	4 cm (1.8 inches)
Weight:	2.5 kg (5.0 pounds)

Environmental Limits

Temperature:	-10° to 50° C (15° to 120° F)
Relative Humidity:	0 to 95% non-condensing

Enclosure

UltraSpec 8000 analyzer: Extruded aluminum case housed in a leather case with a clear vinyl front and flip stand.

UltraSpec 8117 analyzer: Extruded aluminum case housed in a leather case and a wrap-around clear vinyl sheath. (No flip stand.)

Power Supply

Battery:

Model 8000	rechargeable, ±12 V battery pack
Model 8117	rechargeable, ±7.2 V battery pack
Capacity:	1.2 amp-hours
Recharge time:	14 to 16 hours (fast charge)
Operation time:	Model 8000 10 hours of normal usage on a full charge Model 8117: 8 hours of normal usage on a full charge

Note

To prevent loss of memory, install a new battery within four hours after removing the old battery. An optional recharging adapter is available which will permit charging a spare battery pack external to the analyzer.

LCD Display

Viewable area: 7 x 13 cm (2.75 x 5.0 inches)

Dot resolution: 128 vertical x 256 horizontal pixels

Alphanumeric text: 8 lines x 42 characters

The text and graphic displays use “super-twist” liquid crystal technology. This technology provides a super-sharp dark screen image that you can see more easily in conditions of low ambient lighting. Electroluminescent back-lighting also enhances visibility.

UltraSpec Analyzer Input Specifications

Input Signal Types

A two milliamp ICP type power supply inside the instrument powers sensors such as accelerometers. This power supply provides a 2 milliamp constant current at 20 volts nominal. ICP power may be used or bypassed depending upon type of input selected.

- ICP Used: + 9 volts
- ICP Bypassed: + 21 volts
- Input Impedance: greater than 150 k ohms
- A/D Converter: 12 bits accuracy
- Dynamic Range: 70 dB or greater

> ***Note***
>
> Full scale vibration level depends on the type of sensor used and its sensitivity. Full scale vibration level is ± 90 g's when using an accelerometer with a sensitivity of 100 mV/g.

Autoranging

The UltraSpec analyzer automatically scans the input signal for each measurement. It sets the input range to maximize the dynamic resolution while maintaining the dynamic range of the A/D converter at 72 dB. Full-scale ranges from 21V to 8 mV are supported. The noise floor is typically less than 3 microvolts for a 400-line spectra taken using a 1000 Hz maximum frequency.

Input Sensor Types *(ProAlign Plus Only)*

Portable sensors: Laser sensor heads (Model 8215/Model 8225)

Communications

The UltraSpec analyzer can be downloaded from standard IBM PC/XT, PC/AT, or fully compatible computers that have an RS232 serial link. Baud rates may be selected up to 76.8K. Remote links via modem are fully supported.

Measurement Specifications

Data Storage Capacity

Standard memory: 1.0 Mbytes

Maximum number of stored jobs: 100 (Alignment only)

Ranges *(Alignment Only)*

Maximum PSD input for 8215: ± 170 mils (±4.318 mm); for 8225: ± 340 mils (±8.636 mm)

Maximum thermal growth input: ± 250 mils (± 6.35 mm)

Resolution *(Alignment Only)*

Manual Input: 0.1 mil (.002 mm)

Display: 0.1 mil (0.002 mm)

Machine move: 1.0 mil (.025 mm)

Notes

Total predefined/user defined notes available: 99

Maximum number of notes/job: 40

Reading Sets *(Alignment Only)*

Maximum number of reading sets per job: 20

Baud Rates

300, 1200, 2400, 4800, 9600, 19.2k, 38.4k, or 76.8k

RF Operating Frequency (Alignment Only)

916.5 MHz

Data Collection *(ProAlign Plus Only)*

Method	Mode
CSI Laser	Auto Sweep
	4 Point Auto
	Manual Sweep
	4 Point Manual
	Straightness
	Dual Pass

Accessories and Optional Products

Optional Items for Laser System

Part No.	Description
D22773	Mounting Chain extension, 2 ft (660 mm), standard mounting base
800002	with one straight and one rigid angle Lemo connectors
800003	with straight Lemo connectors
8AA50	Magnetic straightness fixtures (see 800056)
800052	Non-rotational (Soft Mount) alignment fixtures
8AA54	Thin mounting brackets, 5/8 inch - 4 1/2 inches (15 - 115 mm) diameter
8AA55	Thin mounting brackets, 3/4 inch - 20 inches (19 - 510 mm) diameter
800056	Magnetic coupling fixtures

Other Accessories

Part No.	Description
8JB050	Portable horizontal jackbolts kit; motor sizes 2 to 300 HP
8JB100	Portable horizontal jackbolts kit; motor sizes 300 HP+
8JB200	Portable horizontal jackbolts kit; motor sizes 2 to 300 HP+
See Price List	Precut stainless steel shims

Recommended Spare Parts*

Part No.	Description
D22745	Chain Clip
8AA10	CSI Tape Measure, 6 ft (2 m)
800001	8210 Direct Connect Cable
821510	8215/8225 Direct Connect Cable
8215C2-PM	8215/8225 Dual Pass Cable

* Other spare parts are available upon request.

Analyzer Travel/Carrying Cases

Part No.	Description
801	Accessory pouch (leather; worn on belt)
D22735	Leather case for UltraSpec 8000 analyzer
D24312	Leather Case for UltraSpec 8117 analyzer
812	Breakaway shoulder strap for UltraSpec 8117 analyzer
D24492	Hard shell case (locking) for UltraSpec analyzer and laser fixtures
D24266	Leather case for UltraSpec 8117 analyzer
D10690	Clear vinyl sheath for UltraSpec 8117 analyzer

Analyzer Accessories

Part No.	Description
705	2400-baud modem (DB25(F) to Tele(F))
705-1	Model 705 AC adapter, input 220VAC @ 50 Hz, output 9VDC @ 200 mA
720A	Analyzer printer interface (DB25(M) to DB25(F))
8003	3-Way Splitter (DB25(F) and DB25(F) to DB25(M))
D24129	UltraSpec 8117 Icon Front Panel Legend Card

Temperature Sensors

Part No.	Description
505	Infrared temperature sensor with 615-C cable (displays in Fahrenheit)
505-C	Infrared temperature sensor with 615-C cable (displays in Celsius)
515	Laser temperature probe

Batteries/Analyzer Chargers

Part No.	Description
A2115-C-120	UltraSpec 8000 analyzer spare battery charger, 120V, 60 or 120 mA
A108-12-3	UltraSpec 8000 analyzer battery pack, 1200 mA hr, 3-pin
660-3	Charge adapters for Model 105-3, 105A-3, 108-3 battery pack to charger connector (3-pin)
660-5	Charge adapters for Model 105-5, 108-5 battery pack to charger connector (5-pin)
8211	Laser head and UltraSpec analyzer battery charger
93140	UltraSpec 8117 analyzer battery charger, 120V
8212	8210 Sensor head and UltraSpec analyzer trickle charger

Note

To fast charge the battery outside the analyzer, a 660-3 or 660-5 charger adapter is required.

Cables and Adapters

Part No.	Description	Input	Output
639	Analyzer to computer communications cable	DB9 (M)	DB25 (M)
634	Computer to modem cable	DB25 (F)	DB25 (M)
635	Analyzer to modem cable	DB25 (M)	DB25 (M)
650	Union connector	BNC (F)	BNC (F)
652	BNC Tee	BNC (F)	2 ea. BNC(M)
654	BNC 50Ω terminator	BNC (F)	–
661	General, 4' cable (RG59) 75Ω	BNC (M)	BNC (M)
662	Hi-temperature, 4' cable (RG142) 50Ω	BNC (M)	BNC (M)
665	Accel., 10' cable (RG174)	Microdot (M)	BNC (M)
8000IQ	Infrared transceiver for analyzer to 8210 communication	DB25 (M)	Infrared
80000RF	Radio Frequency (RF) interface for analyzer communication	DB25 (M)	RF
800001	8210 Direct connection adapter at Analyzer	DB25 (M)	LEMO (M)-2
821510	8215/8225 Direct Connection adapter at analyzer	DB25 (M)	LEMO (M)-2
800002	Direct connection cable interface	LEMO (F)	LEMO (M) (right angle)
800003	Direct connection cable interface at analyzer	LEMO (F)	LEMO (M)
8215C2-PM	8215/8225 Dual Pass Direct Connection cable	LEMO (M)	LEMO (M)

Balancing

Part No.	Description
8000-BK	UltraSpec Balancing Accessory Kit, 4-channel
BK1	Balancing Accessory Kit

Alignment

Part No.	Description
8210	IR Laser Alignment Fixtures with 10 mm by 10 mm PSD's
8215	RF Laser Alignment Fixtures with 10 mm by 10 mm PSD's
8225	RF Laser Alignment Fixtures with 20 mm by 20 mm PSD's

Customer Support

CSI takes great pride in our customers and is committed to providing the highest standard of customer support. Our number one priority is to provide prompt and efficient service to all of our customers. To contact our Customer Support department, please call (865) 671-4274 (4CSI). To reach the Sales Support department, dial (865) 675-2110 and ask our receptionists to direct your call.

To extend the level of support to CSI customers, we have an electronic mail system which is connected through the Internet directly to the Customer Support group. The address is:

custserv@compsys.com

Customer Support also has a Web page on the Internet. You can access it by visiting our *corporate* Web page at:

http://www.CSImeansReliability.com

Once there, choose the Customer Support option and a set of frames will be displayed with general information about CSI Customer Support. There are links to specific information such as TechNotes, MasterService Warranties, and Maintenance Quotes. Also, the following prompt provides a link to the Customer Support Web page.

Visit our Customer Service Site for additional Customer Support information.

Click on this option to access *additional* technical information and assistance for CSI products.

DoctorKnow™

The DoctorKnow system was originally developed to provide a means of transferring high volume, ever-changing technical information to support personnel at CSI. Because it was so successful, further enhancements were made so that it could also be provided to CSI customers. It *now* provides:

- A mechanism to FAX information to the customer (while on-line) and
- Direct access to the Customer Support Web page (through the Internet – see previous section)

In the future, Customer Support plans to include file transfer capabilities. This will allow prompt evaluation of customer data and/or setups. We also plan to provide software updates (for customers with maintenance agreements) by using the Internet.

Reliability Services

CSI provides a broad range of in-plant services including startups, database troubleshooting and diagnostics. Our Reliability Services Department consists of qualified individuals with experience in a variety of technologies and industries. For information, call (865) 675-2400, Ext 2358.

Accuracy
How close a measurement is to the absolute quantity being measured.

Alignment
Positioning two or more machines so that the rotational centerlines of their shafts are co-linear under operating conditions.

Anchor Bolts (or Hold-down Bolts)
Bolts use to anchor or hold the machine to the base or foundation.

Angularity
The angle between two machine shaft centerlines; this angle is the same at any point along either centerline. Normally specified in rise/run.

Axial Float (or End Float)
Movement of one shaft along its centerline due to the freedom of movement permitted by a journal bearing or sleeve bearing. This adjustment should be set before performing vertical and horizontal moves.

Backlash
Normally refers to the torsional play caused by the design or degraded condition of a flexible coupling.

Baseplate
The surface (often made of steel plate or cast iron) to which the feet of a machine are attached. The baseplate is normally mounted on a foundation and grout.

Baud Rate
Unit of speed for data transmission over a serial communications link. The UltraSpec analyzer supports rates from 300 to 76.8K baud.

Bolt Bound

The situation whereby the machine cannot be moved in the desired direction (either horizontally or vertically) because of mounting bolt restrictions, or a limited number of shims.

Brackets (or Fixtures)

Components that mount to machine shafts or couplings to measure the relative position of the centerlines of two machines.

Coefficient of Thermal Expansion

The constant value or factor of expansion of a metal for a given increase in temperature per length of the metal. This is different for each type of material.

Cold Alignment (or Static Alignment, or Primary Alignment)

Condition in which machines are normally aligned. Changes in off-line to on-line running conditions should be allowed for during this procedure so that the machine will "grow" into alignment during operation.

Co-linear

Two or more lines positioned in space with no offset or angularity between them.

Co-planar

Lying or acting in the same plane.

CPM

Cycles per minute. (Same as RPM.)

Current Job

Job in the UltraSpec analyzer that is currently active – the one that can be easily modified.

Dodd Bars

A secondary alignment method.

Dutchman

A tapered filler ring for squaring cocked flanges, or a ring of uniform thickness used to fill pipe gaps.

End Float

See axial float.

Essinger Bars

A secondary alignment method, or method to measure off-line to on-line running condition change.

Face-rim Method (or Rim-face Method)

A method of shaft alignment measurement where the indicators are mounted radially and axially on one machine or the other (not both).

Firmware

A term referring to the software that controls or instructs the function of the UltraSpec analyzer.

Fixtures

See Brackets.

Foundation

The surface, often made of concrete, to which the machine baseplate is mounted, often with grout between the baseplate and foundation to provide even support.

Frame Distortion Index

Method of measuring how much a Soft Foot condition will distort a machine casting (casting distortion affects the alignment).

Frequency

Number of times an event repeats in a specific period of time.

Hertz

The measurement of frequency in cycles per second.

Hold-down Bolts

The bolts anchoring or holding the machine to the baseplate and foundation.

Inclinometer

A device that indicates the rotational position of shafts.

Induced Soft Foot

A type of soft foot that is caused by external forces (coupling, pipe strain, etc.) acting on a machine independent of the foot to baseplate connection.

In-phase

When applied to alignment brackets, the term means the Move and Fixed brackets make the same angle with the horizon at each point of measurement.

Jackscrew (or Jackbolt)

A bolt or screw attached to the base or foundation that is used to move or position the machine (normally horizontally but sometimes vertically) which is being moved.

Jackshaft

A long shaft used as a spacer between two machines.

Job

Usually identified with a number and description; represents data accumulated during an individual alignment session.

Machinery Train

Three or more machines that must be aligned to one another.

Master

When used as a communications term, it is the unit that controls and determines when data will be transferred. In the UltraSpec system, the P/C is the Master and the UltraSpec Analyzer is the Slave.

Micrometer, Outside

Tool used to measure the thickness of shims.

Milliradian

A unit (normally metric) used to describe the angle of one machine shaft centerline to the other. It is the equivalent of mils/inch. It can also be expressed as rise/run (1° = 17.45 milliradians).

Mils

A unit of measure for displacement (thousandths of an inch).

Mils/Inch

A unit (normally English) used to describe the angle of one shaft centerline to the other. It is equivalent to milliradians. It can also be expressed as rise/run (1° = 17.45 mils/inch).

Modem

A device that enables remote communications between the host computer and the analyzer over telephone lines.

Notes

Specific observations that can be stored in each alignment job along with the collected data. These observations can be predefined notes or user-defined notes that have been created via the analyzer's keypad, or a combination of the two methods.

Off-line to On-line Running Condition

Movement of shaft centerlines associated with (or due to) a change in pressures, temperatures and other forces between the static and operating condition.

Offset

Distance between rotational centerlines at any given normal plane, usually measured at the coupling midpoint.

Perpendicular

At right angles (90°) to a given line or plane.

Pipe Strain

Casing and shaft distortion caused by improper pipe flange fitup.

Predictive Maintenance

Technology of periodically monitoring the actual condition of machines to discover faults, to determine probable time of breakdown, and to provide scheduled downtime for repair that avoids excessive cost and lost production.

Primary Alignment

See Cold Alignment.

RBM

Reliability Base Maintenance – the modern maintenance management method that integrates preventive, predictive, and proactive maintenance strategies. This total management method not only improves detection methods but uses root cause analyses to find and correct the actual cause(s) of the problems thereby eliminating unpredictable failures in the future.

Repeatability

The consistency (or variation) of readings and results between consecutive sets of measurements.

Resolution

The smallest change or amount that a measurement system can detect.

Reverse Indicator Method

Method for taking shaft alignment reading with indicators mounted radially at opposite ends of a spanned section (on each machine).

Rim and Face Method

See Face-rim Method.

Rise/Run

For smaller angles, the ratio obtained when the change in offset between two centerlines is divided by the distance along either centerline (between the points of offset measurement). In effect, it is the slope of one line in a plane compared to another line in the same plane. Angularity is normally specified in mils/inch, or milliradians which is rise/run.

Rotor

The part (or assembly of parts) of a machine that spins or revolves as a single unit. For alignment purposes, the shafts of both machines are the rotors.

RS232

A serial, asynchronous communication standard; a type designation for cables that are used to connect communications ports on host computer, analyzer, and telephone modems.

Sag

Deflection due to gravity acting on a cantilevered or otherwise supported object. Mechanical brackets always sag a certain amount. This sag must be corrected for if machine moves are to be calculated correctly.

Secondary Alignment

The act of measuring off-line to on-line machine movement.

Shim

A thin piece of metal material inserted between the base and machine feet to produce precise vertical adjustments of the machine centerline.

Slave

When used as a communications term, it is the unit that is controlled when data is transferred. In the UltraSpec system, the P/C is the Master and the UltraSpec analyzer is the Slave.

Soft Foot

A term used to describe any condition where tightening or loosening the bolt(s) of a single foot distorts the machine frame. Also the name of a method used to measure this condition.

Spacers

A generic term for any coupling that has two flex planes separated by a connecting shaft without bearings or other supports (between the flex points). Sometimes called an insert or spider.

Spool Piece

Any piece of pipe or shafting which can be removed from a line of piping or shafting without disturbing or disassembling any other components. The name spool piece comes from the physical appearance of the piece, often a short cylinder with flanges on the ends, that resembles a spool of string or thread.

Squishy Foot

A type of soft foot characterized by material (could be shims, paint, rust, grease, oil, dirt, etc.) acting like a spring between the underside of the machine foot and the baseplate contact area.

Static Alignment

See Cold Alignment.

Stored Job

A job that has been moved from the current job location and stored in memory. All the data related to that particular job will then be available for recall.

TIR

Total Indicator Runout. The total movement in mils that an indicator would read after the shaft is rotated 180° or 360°.

Thermal Growth

Movement of shaft centerlines associated with (or due to) a change in machinery temperature between the static and operating condition.

Thermal Profile

A secondary alignment method used to measure thermal growth.

Torsional Play

The relative rotation between two coupled shafts that will cause the fixtures to move out of phase with each other (also called backlash).

Tolerance

The maximum permissible deviation from a specified alignment position, defining the limits of offset at the coupling center and angularity.

UltraMgr

CSI's database management software package used to store technology specific information such as alignment or balancing job details.

Unassigned Job

A job that has not been assigned to stations and machines in the UltraMgr database.

Wedge Shim

Use of several shims to fill the wedge shaped gap of a bent foot. Each shim is inserted to a different depth so that a stair-step shaped support is built to better support the entire foot.