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Find the *GE / Bently Nevada TK3-2E* at our website: *Click HERE*

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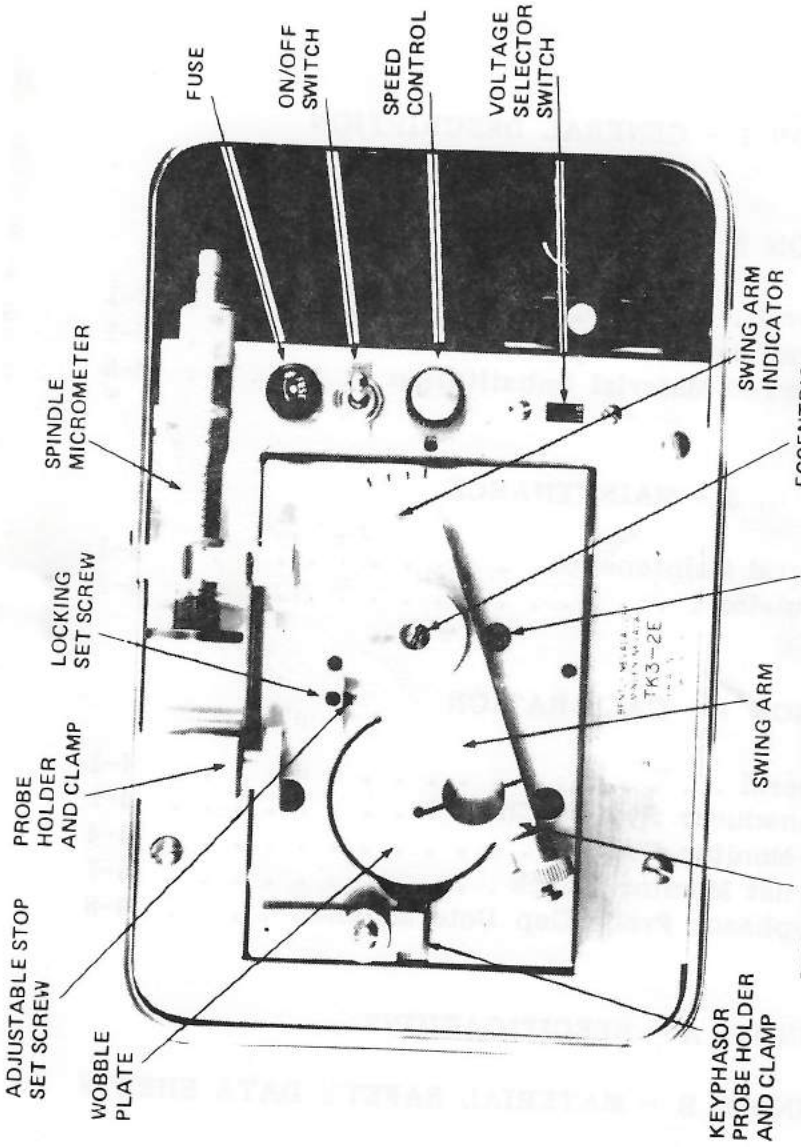


Figure 1-1. TK3-2E Top View

SECTION 1
GENERAL DESCRIPTION

The Bently Nevada Corporation TK-3 Calibration Instrument (Figure 1-1) provides a reference mechanical motion for performing field functional tests of machinery protection systems. The two models of the instrument have identical functions, but different power sources. The TK3-2E is electrically powered; the TK3-2G is power by pressurized air. Because the TK3-2G has no electrical circuitry, it is safe to use in explosive or flammable environments. Each model is available in Metric or English measurement versions.

The instrument includes two basic test devices: a wobulator (which is used in conjunction with an oscilloscope) and a spindle mocrometer. Both have a 4140 Series steel target which can be removed and replaced with a material identical to that in the observed shaft.

NOTE

Bently Nevada Corporation probes and Proximitors operate on the eddy current principle, which requires the target material used by the instrument to be the same as the observed surface of the shaft. This assures accurate calibration and functional testing.

Metals such as 1000 through 4000 Series steel will each present a response curve similar to the one for the 4140 Series steel. However, copper, aluminum, brass, titanium, and other types of metals used in the observed surface require the use of a target of the same material. Bently Nevada Corporation stocks many types of metal targets. Check with your Sales or Service representative for special target requirements.

The spindle micrometer is used to check the voltage versus distance characteristics of the probe and Proximitors. It is also used to calibrate thrust position.

The wobulator generates vibration and Keyphasor reference signals. The peak-to-peak vibration level is controlled by a manually operated swing arm which positions the probe at the desired vibration level. The rotative speed of the wobulator is controlled by adjusting the SPEED control.

If a probe has been permanently installed in a machine or is otherwise inaccessible, a probe with the same part number can be substituted for test purposes.

A complete monitoring system can be checked by applying a mechanical input to the system probe and observing the meter indication, or by measuring the monitor output.

SECTION 2
OPERATION

GENERAL

Both the TK3-2E and the TK3-2G are self contained and require only the appropriate power source connections for operation. To prevent circuit damage in the TK3-2E, make sure that the 115/230 Vac select switch is properly positioned before connecting the unit to a power source. The TK3-2G must be kept upright to prevent oil spillage.

NOTE

The TK3-2E is supplied with a 120 Vac power cord. If a 240 Vac line voltage is used to power the instrument, an alternate cord must be used. To insure safe operation, the power cord shall be a certified type with a 6-15A configuration attachment plug.

Both versions of the test kit contain 10 probe adapters stored in the case cover. The adapters enable probes with different diameters to be properly positioned in the wobulator or spindle micrometer mounting clamps. The adapters are designed to fit the spindle micrometer probe mounting clamp and can be inserted in either direction, thereby allowing maximum flexibility when mounting long or odd shaped probes.

OPERATIONAL DESCRIPTION

The wobulator generates a mechanical vibration reference for use as the input to the proximity probe. The vibration level is controlled by manually positioning the swing arm towards the center of the wobble plate for a small vibration amplitude, or towards the plate edge for a larger vibration amplitude. Since the surface of the wobble plate is at an angle other than 90° with respect to the centerline of the proximity probe and the motor shaft it is mounted to, a change in gap is produced for the probe to observe as the motor rotates the shaft and wobble plate.

When placing a probe and the appropriate adapter in the spindle micrometer probe mounting clamp, locate the adapter slot at the top of the mounting clamp before tightening.

When placing the probe and adapter in the wobulator swing arm clamp, align the adapter slots with the slots on each side of the adapter receptacle. Ensure the probe tip extends beyond the edge of the adapter.

On the TK3-2E, turn the SPEED control fully counterclockwise before turning the ON/OFF switch to ON.

On the TK3-2G, turn the SPEED control fully clockwise before attaching the air hose to the intake fitting. After the air hose is attached, turn the SPEED control to obtain the desired operating speed. Adjust the oil feed control until the oil drips into the observation window just below the adjusting knob at the rate of one or two drops per minute. To adjust the oil drip rate, turn the adjusting knob counterclockwise to

increase, and clockwise to decrease the drip rate. Push the lock ring on the adjusting knob downward to lock the drip rate setting. To release, pull the lock ring upward. Sometimes the lock ring and adjustment knob may be stiff, requiring extra force to turn the knob. The oil feed control will only need occasional setting, since the oil feed is automatic whenever the wobble plate is operating. It is not necessary to turn off the oil when the wobble plate is stopped.

Oil is added to the reservoir by first unscrewing the oil fill plug located next to the oil feed adjustment knob on top of the lubricator, then carefully filling the reservoir. Use 10W oil. See Figure 2-1.

The TK3-2E motor bearings have been lubricated for the life of the motor, so no oiling is required.

For both models, setting the SPEED control at midrange each time the unit is operated will prolong the life of the unit and still provide a vibration reference fast enough to be observed by vibration monitors. The vibration output is constant across the entire speed range. As a result, the wobulator speed has no effect on the amplitude of the vibration signal.

The swing arm of the wobulator is mounted on an eccentric bearing to permit radial displacement when adjusting for minimum motion level. The procedure for making this adjustment is described in Section 3, paragraph Wobulator, step c, items 5 through 7.

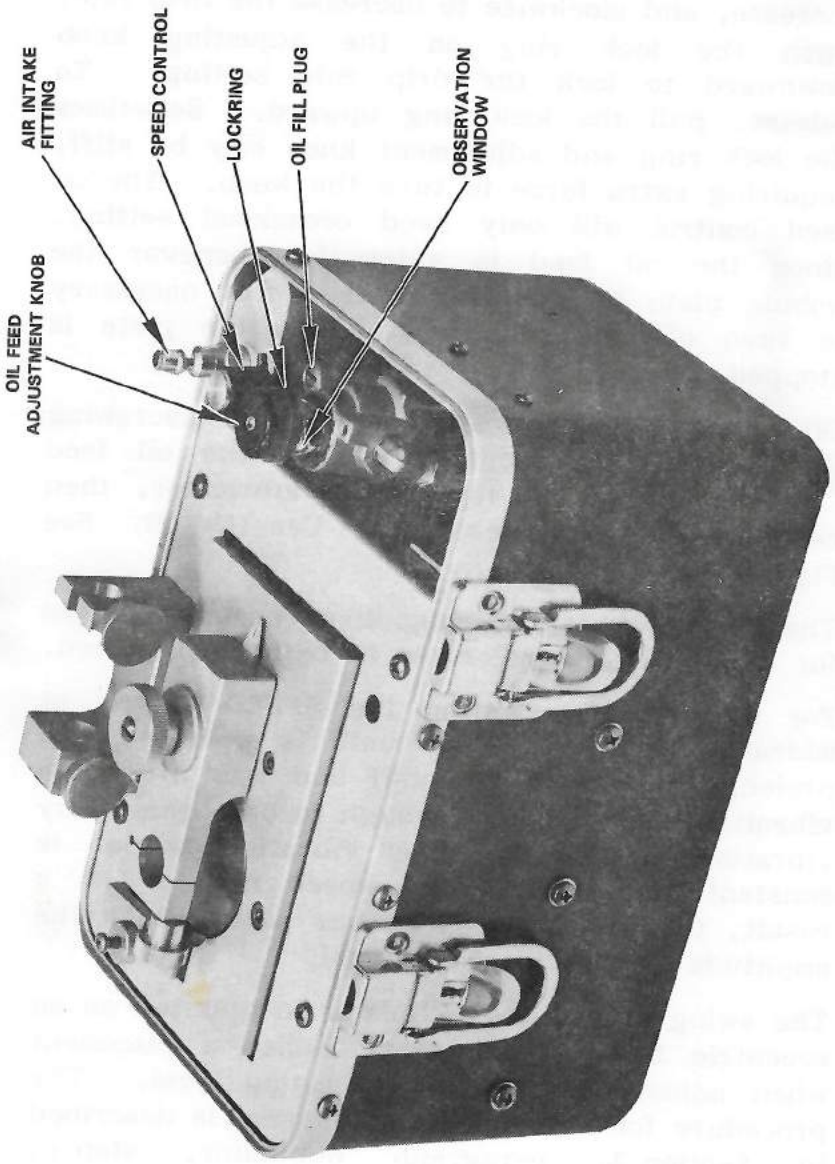


Figure 2-1. Top View TK3-2G

OBSERVED MATERIAL SUBSTITUTION

If a material other than 4140 steel is to be observed by the probe, then the wobulator plate must be changed and the spindle micrometer target must be altered to assure proper testing and calibration (see Section 1).

To alter the spindle micrometer target material, fabricate a substitute target disc from the same material to be observed (e.g., brass, copper, aluminum). The substitute target disc should be 1.20 inches (30.48 mm) in diameter and at least 1/8-inch (3.17 mm) thick. Glue the substitute target disc to the face of the 4140 steel target.

To install a substitute wobble plate, perform the following procedure. The substitute wobble plate must be the same size as the standard wobble plate and be properly balanced. See your BNC sales representative to order a substitute wobble plate made from a special material.

a. Remove the snap-in button from the 1/2-inch (12.7 mm) opening at the left side of the instrument case. The wobble plate is secured to the motor shaft by two set screws with a 3/32-inch hexagonal (Allen) head.

b. Rotate the wobble plate until the Keyphasor hole in the side of the wobble plate is aligned with the opening in the side of the case. The first setscrew should now be opposite the opening in the case.

c. Using a 3/32-inch Allen wrench, loosen the setscrew. (To view the setscrew, it may be necessary to position the instrument case so that surrounding light is allowed to radiate through the opening. A flashlight can also be used.)

d. Rotate the wobble plate 1/4 turn clockwise and loosen the second setscrew.

e. With the setscrew loosened, remove the Allen wrench and carefully insert a screwdriver below the hub of the wobble plate in order to lift the wobble plate off.

f. Rotate the wobble plate in small increments, while carefully exerting downward pressure on the screwdriver handle to lift the wobble plate off.

g. The substitute wobble plate should be placed over the shaft with the Keyphasor hole aligned with the flat on the shaft and the opening in the case. The high side of the wobble plate must be 0.010 to 0.020 inch (0.25 to 0.50 mm) below the top surface of the mounting base to prevent contact with the swing arm.

h. With the substitute wobble plate properly positioned, tighten the first setscrew. Then rotate the wobble plate 1/4 turn clockwise and tighten the other setscrew. Replace the metal cover over the setscrew opening.

SECTION 3
MAINTENANCE

GENERAL MAINTENANCE

The TK3-2E and TK3-2G are housed in plastic carrying cases and made of heavy gauge parts and material to ensure durability of each unit. Periodic cleaning and oiling is necessary for continued operation and reliability. To minimize corrosion, clean all exposed metal parts with WD-40 or a lightweight oil. The wobulator plate should be oiled because corrosion on its top can present inaccurate vibration indications to the observing probe, resulting in false inputs to an associated monitoring system.

The dial indicator Teflon tip must be kept free of grit or other particles to prevent scoring or other damage to the wobble plate. The dial indicator Teflon tip is also susceptible to wear. Flat spots, scoring, or grinding of the tip can cause errors in dial indicator readings. If tip damage is suspected, replace the Teflon tip (BNC P/N 14733-01).

WOBULATOR

Perform the following procedure to establish the wobulator minimum motion level. The steps must be performed in the order given. This procedure will reveal bearing problems.

CAUTION

Before removing a probe from the machinery, be sure to disconnect the probe lead from the extension cable. Then reconnect the probe lead to the extension cable after the probe has been inserted into the swing arm. This will prevent probe lead and cable damage caused by twisting during removal.

a. See Table 3-1 for test equipment requirements. Connect the probe and test equipment to the Proximitor as shown in Figure 3-1. Ensure that the proper extension cable is used.

b. Carefully position the probe in the wobulator swing arm mounting. Do not tighten the mounting clamp more than necessary to hold the probe. Adjust the probe gap to equal the probe gap in the monitored machine (refer to the appropriate probe calibration graph to determine the gap). (See Section 4, paragraph Transducer System Check.) To insert the probe in the swing arm, use the appropriate adapter (stored in the top of the case). Loosen the clamp at the end of the swing arm.

Table 3-1. Recommended Maintenance Equipment

ITEM	MINIMUM SPECIFICATIONS	EQUIPMENT
Digital Multimeter 4-1/2 digits	1 megohm input impedance ac volts to 100 Volts ac dc volts to 100 Volts dc dc current to 200 milliamps dc Resistance to 1 megohm	HP 3465A/B (DMM)
Oscilloscope	10 Volts pk-to-pk dc to 1MHz bandwidth	Tektronix Model 5110
Power Supply	-18 or -24 Vdc output, depending on Proximitor used, capable of 30 mA minimum output current	BNC
Probes, Extension Cables	Appropriate units to be used with Proximitor	BNC

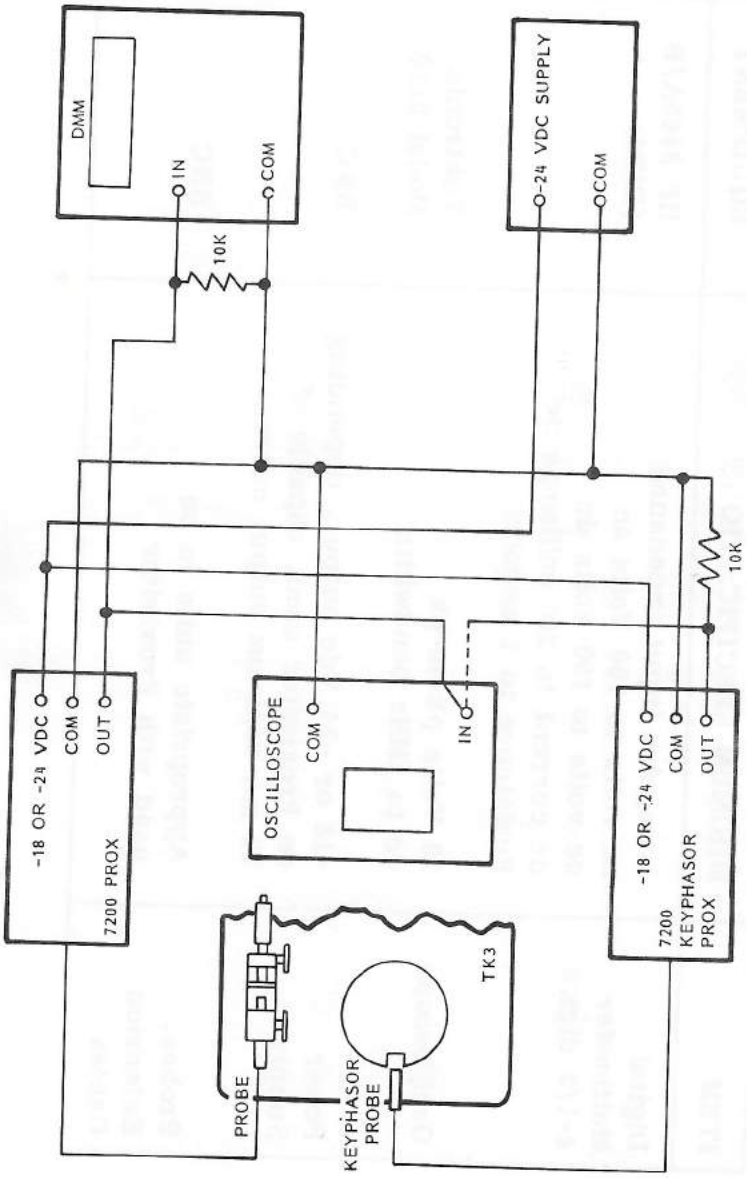


Figure 3-1. Equipment Set-Up

Align the adapter slit line of the clamp opening and insert the adapter. Insert the probe and tighten the clamp nut. The probe gap can be adjusted using a feeler gauge or by observing the Proximitor dc output on a digital multimeter and referring to the appropriate calibration graph.

c. Perform the following steps to position the swing arm to the point where peak-to-peak vibration is minimal as indicated on the oscilloscope display.

1. Adjust the SPEED control to midrange and set power switch to ON.

2. Adjust the knurled nut on top of the swing arm so that the swing arm moves with low resistance.

3. Using a 3/32-inch Allen wrench, loosen the setscrew on top of the post to allow movement of the adjustable stop setscrew (see Figure 3-2).

4. With the same Allen wrench used in step 3, adjust the setscrew on the back side of the post until the swing arm rests against it (see Figure 3-3). Keep a slight back pressure on the swing arm with one hand while adjusting the setscrew so as to move the swing arm away from the post. Observe the oscilloscope during this adjustment and adjust the setscrew until the swing arm is positioned at the point of minimum motion. Do not tighten the setscrew on the top of the post at this time, because further adjustment is necessary.

POSITIONING SWING ARM FOR MINIMAL VIBRATION LEVEL

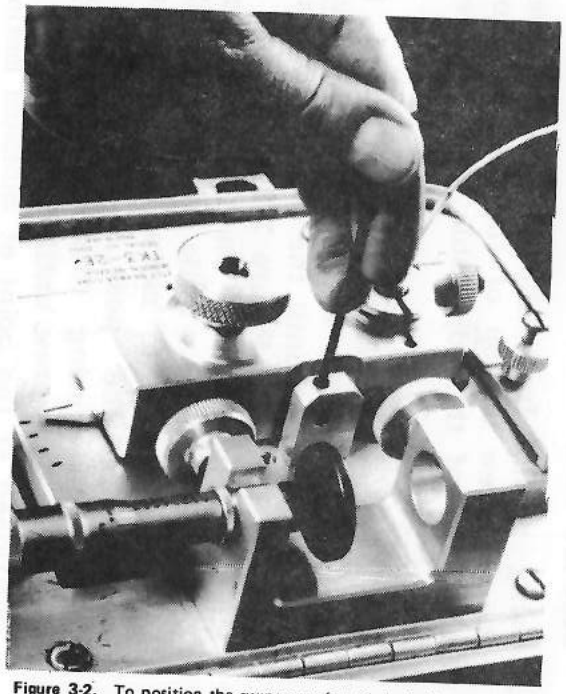


Figure 3-2. To position the swing arm for minimal vibration level (angular displacement), first loosen the locking screw using a 3/32-inch hexagonal wrench. The wobble plate must be rotating and test equipment must be connected as shown in Figure 3-1.

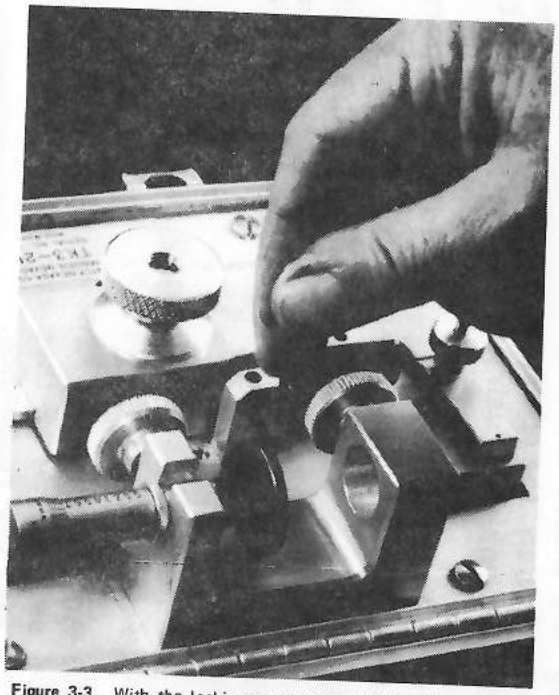


Figure 3-3. With the locking screw loosened, the adjustable stop screw can be set. The knurled nut atop the swing arm must be adjusted to allow movement, but with some resistance.

5. Using a 5/32-inch Allen wrench, loosen the eccentric clamp screw on the mounting surface near the pivot of the swing arm (see Figure 3-4). This will permit radial displacement of the swing arm.

6. Using a screwdriver, rotate the straight-slot screw which is the eccentric in the center of the knurled nut on the top of the swing arm (see Figure 3-5). With only slight pressure on the knurled nut, rotate the screwdriver in both directions while observing the oscilloscope. Stop at the point of minimum peak-to-peak vibration and tighten the eccentric clamp screw with the Allen wrench.

7. Loosen the knurled nut and recheck the stop position of the swing arm that was determined in step 4.

d. Gradually increase the wobulator SPEED control to its maximum setting. The deflection on the oscilloscope display should not vary with a change in wobble plate rpm. A deflection on the display of more than 0.2 mil (0.005 mm) means the unit has faulty bearings and should be returned to Bently Nevada Corporation.

POSITIONING SWING ARM FOR MINIMAL VIBRATION LEVEL

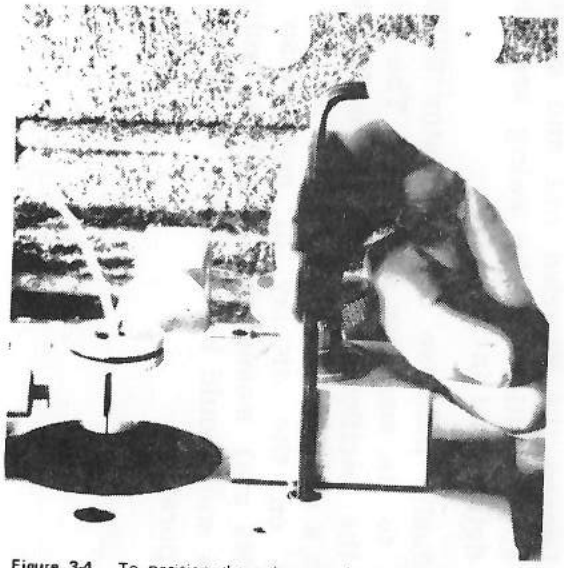


Figure 3-4. To position the swing arm for radial displacement, first loosen the eccentric clamp screw using a 5/32-inch hexagonal wrench. Maintain the slight pressure on the knurled nut.

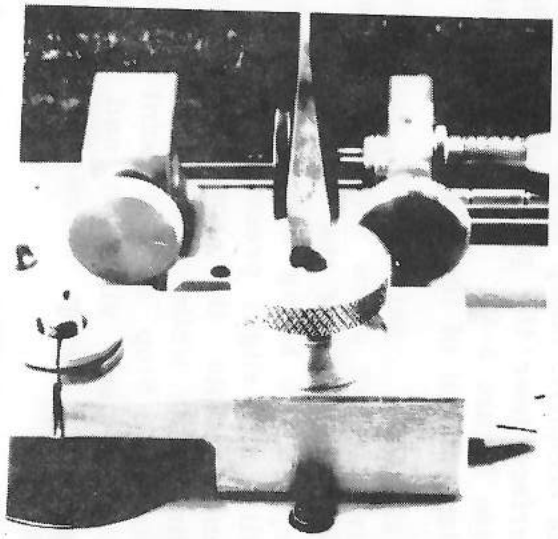


Figure 3-5. Eccentric adjustment is made with the screwdriver by rotating the eccentric shaft in the center of the knurled nut.

SECTION 4
CALIBRATION

GENERAL

The procedures in this section are included to help the user check thrust and radial vibration channel operation. In addition, this section contains a procedure for determining the Keyphasor probe gap and checking the transducer system operation

TRANSDUCER SYSTEM CHECK

The Proximitor must be connected to the probe and extension cable to be used with it. The target material used during the test must be the same or of similar electrical properties as the observed material in the monitored machinery. The recommended maintenance equipment for performing the procedures in this section is given in Table 3-1. The test equipment setup is shown in Figure 3-1.

Successful completion of the following procedure will test the transducer system operation. The steps should be performed in the order given.

a. With the spindle micrometer set to zero, position the probe into the spindle micrometer so that the probe tip lightly contacts the observed sample. Secure the probe in position. Adjust the spindle micrometer so that the sample moves away from the probe tip, then return it to zero to ensure the probe is positioned properly.

b. Connect the probe to the Proximitor using the appropriate extension cable.

c. With input power disconnected, connect the power supply minus (-) output to the Proximitor -18 Vdc or -24 Vdc input, whichever applies. Connect the power supply common terminal to the Proximitor COM connector.

d. Connect the DMM between the Proximitor OUTPUT and COM connectors. Connect a 10 000-ohm resistor across the DMM input terminals.

e. Energize the power supply, and adjust the spindle micrometer for the probe gap appropriate for the probe in use. (If in doubt, refer to the technical manual for the equipment using that probe.)

f. Adjust the spindle micrometer 10 more mils (0.25 mm) away from the probe face. The DMM should indicate approximately 2 volts more for a 200 mV per mil (7.87 V/mm) scale factor, or approximately 1 volt more for a 100 mV per mil (3.94 V/mm) scale factor.

g. The probe voltage vs gap graph can now be drawn. Use graph paper graduated in 1-inch or 1-cm increments. Divide the vertical scale into increments of 2 volts per division. Divide the horizontal scale into increments of 10 mils (0.25 mm) per division. Begin from the graph zero point with the probe gap set at zero. Slowly adjust the spindle micrometer to increase the probe gap distance, and plot the voltage change over a range of increasing gap settings.

NOTE

For the first 10 or 20 mils (0.25 mm or 0.50 mm) the curve cannot be used due to nonlinearity. A sharp change in the slope of the curve will occur at a probe-to-target gap of about 10 to 20 mils (0.25 mm to 0.50 mm). This change will depend upon the type of probe and Proximitor used and the type of material being observed. The response curve should be linear at 20 mils (0.50 mm) and remain so through a range of 50 to 100 mils (1.27 mm to 2.54 mm) or more. Continue plotting the voltage vs gap graph until the linear response starts to become nonlinear. The completed graph should be kept for future reference. Consult the appropriate transducer manual for further transducer performance and Proximitor recalibration information on the particular transducer system in use.

h. If all the preceding steps have been completed successfully, the transducer system operation has been verified using a particular combination of probe, extension cable, Proximitor, and observed material. However, at any time that a different type of target material is observed, or a major change occurs to the probe, Proximitor, or cable, the transducer system operation should be rechecked.

RV MONITOR CHECK

There are three methods of RV monitor testing. These methods are presented in order of preference.

1. The calibration procedure found in the applicable RV monitor manual. This method uses a signal generator to provide a precision simulated vibration waveform and an oscilloscope or DMM to determine the waveform amplitude. The accuracy of this method is approximately 1 to 2%.

2. Using the TK3 wobble plate, a transducer system to provide a vibration waveform for checking monitor calibration, and an oscilloscope to determine the waveform amplitude. An oscilloscope is preferred over a DMM for measuring the peak-to-peak amplitude, to eliminate errors due to possible waveform distortion. The accuracy of this method is approximately 3 to 4%.

3. Using the TK3 wobble plate, a transducer system to provide the vibration waveform, and a dial indicator, instead of an oscilloscope, to determine the waveform amplitude when an oscilloscope is not available. The accuracy of this method is approximately 5 to 10%.

TK3 RV Monitor Calibration Check

If a signal generator is not available, an alternative means of checking the calibration of an RV monitor is by using an oscilloscope in conjunction with the TK3 as outlined in the following procedure.

a. Insert the probe into the swing arm clamp using the appropriate size adapter for the probe case. Adjust the probe gap mechanically with a feeler gauge, or electrically by observing the dc voltage on a DMM, or by using the gap switch on the monitor to be checked. The gap used for this test must equal the normal probe gap as installed in the monitored machine. (To determine the gap, refer to the appropriate transducer voltage vs gap graph or the Application Note for gapping RV proximity transducers.) When removing the probe from the equipment, always disconnect the probe lead from the extension cable first. Tighten the thumb screw of the swing arm clamp after the proper probe gap is set.

b. Connect the probe and its extension cable to the Proximitor using an appropriate length of extension cable. Connect the Proximitor to the monitor. Connection procedures are provided in the appropriate Proximitor or monitor manuals. Refer to either or both of these manuals if the connections have not already been made.

c. Energize the monitoring system.

d. The monitor OK circuit lamp should now be illuminated indicating that the probe gap is within the proper operating range, the proper voltage is being applied to the system, and all connections are secure. If the monitor OK circuit lamp does not illuminate, check the appropriate monitor manual for the trouble-shooting procedure.

e. Set the ON/OFF switch to OFF, the power input controls to the proper voltage (115 or 230) and connect the power source. Set the wobulator speed to the lowest position, switch power on, and bring speed to midrange, or a speed within the passband of the monitor.

f. Adjust the position of the probe over the wobble plate to obtain a peak-to-peak voltage, measured by the oscilloscope, which is equal to the full scale reading of the monitor. Divide the peak-to-peak voltage by 0.2 V/mil (7.87 V/mm) for 7200 and most 3000 Series transducers, or by 0.1 V/mil (3.94 V/mm) for 7000 Series transducers to obtain the equivalent meter reading in mils. (If an oscilloscope is not available, the dial indicator supplied with the TK3 may be used to obtain an approximate indication of the equivalent peak-to-peak voltage which the transducer system outputs to the monitor.)

CAUTION

To prevent damage to the dial indicator, never energize the wobble plate drive motor while the dial indicator is mounted in the swing arm.

g. The monitor meter should indicate a peak-to-peak vibration in mils approximately equal to the equivalent meter reading as measured by the oscilloscope in the preceeding step.

h. If the monitor meter reading and the oscilloscope equivalent reading are approximately the same, monitor recalibration is not required or recommended since the monitors have been calibrated as accurately as possible before shipping. If the oscilloscope value and monitor meter reading are not within reasonable agreement, refer to the appropriate monitor manual for proper adjustment.

THRUST MONITOR CHECK

The spindle micrometer generates a precise gap reference. Using the same setup for checking the transducer operation (see Transducer System Check in Section 4) the spindle micrometer may be used to simulate the appropriate "zero" gap and the appropriate "normal" and "counter" thrust motions to either side of the zero gap. Refer to the appropriate thrust monitor manual if any adjustments are required.

KEYPHASOR PROBE GAP DETERMINATION

The following procedure should be used to determine the optimum gap between a Keyphasor probe and the observed surface.

a. Connect the test equipment as shown in Figure 3-1. However, connect the Keyphasor Prox OUT to the oscilloscope IN (instead of connecting the vibration Prox OUT).

b. Insert the probe to be used into the Keyphasor mounting.

c. Energize the wobble plate and adjust to any desired speed, preferably midrange (refer to Section 2, paragraph Wobulator).

d. With the oscilloscope operating and power applied to the Proximitor, manually adjust the probe toward and away from the wobble plate edge to a point at which the optimum voltage excursion (spike) is displayed.

e. Carefully secure the probe in place by tightening the clamp. Make sure that the displayed voltage excursion remains unchanged. If it has changed, readjust the probe as necessary.

f. Turn off the wobble plate.

g. Using a feeler gauge, measure the gap between the probe tip and the wobble plate edge. For optimum performance, the measured gap should equal the one between the monitored rotor shaft and the installed probe tip.

APPENDIX
SPECIFICATIONS

POWER

TK3-2E	95 to 125 Vac, 50 to 60 Hz, 1 amp max. 190 to 250 Vac, 50 to 60 Hz, 1 amp max.
TK3-2G	40 to 90 psi @ 15 Std cfm max ($2.76 \cdot 10^5$ to $6.21 \cdot 10^5$ N/M^2 @ 26 std cubic metres per hour)

HOUSING

High-impact plastic portable carrying case.

DIMENSIONS (Overall)

Height	8-1/2 inches (216 mm)
Width	7-1/4 inches (184 mm)
Length	11-1/4 inches (286 mm)

CONTROLS

Wobulator Speed
Vibration Amplitude
ON/OFF (TK3-2E)
Oil Drip Rate Adjustment (TK3-2G)

PROBE ADAPTERS

Body Diameter	
inch	millimetres
0.205	5.2
0.250	6.4
0.312	7.9
0.323	8.2
0.375	9.5
0.437	11.1
0.500	12.7
0.562	14.3
0.625	15.9
0.675	17.1
(Probe Without Adapter)	
0.750	19.0

TARGET MATERIAL

4140 steel

WOBULATOR - Maximum Speed

TK3-2E — 10,000 rpm ± 2,500 rpm over specified line voltage range.

TK3-2G — 5,000 rpm ± 1,000 rpm over specified air pressure range.

Vibration Amplitude Range

2 mils to 10 mils (50 mm to 254 mm) peak-to-peak

APPENDIX B
MATERIAL SAFETY DATA SHEETS

206-036-40

Keystone Oil, Blue A

KEYSTONE--INGHAM CORP.
P.O. Box 1296
La Mirada, CA 90637
(213) 802-3937

Material Safety Data Sheet

PRODUCT IDENTIFICATION

Chemical Name: 9,10-Anthracenedione, 1,4-bis[(1-methylethyl)amino]-
Common Name: C.I. Solvent Blue 36 (61551)
Product Name:
CAS Number: 14233-37-5
Chemical Formula: $C_{20}H_{22}N_2O_2$
Product Use: Colorant
Emergency Phone: CHEMTREC (800) 424 9300
Other Phone: OFFICE (213) 802 3937

HAZARDOUS INGREDIENTS

Chemical Name	Common Name	CAS No.	%[1]	OSHA PEL	ACGIH TLV-TWA
As above	C.I. Solvent Blue 36	14233-37-5	100	N.E.[2,3]	N.E.[2,3]

[1] Typical amount - not a specification.

[2] Not established.

[3] For Airborne Particulates the OSHA P.E.L. (for inert or nuisance dust) is 15 mg/m^3 total dust, 5 mg/m^3 respirable (29 CFR 1910.1000, Table Z-3). For ACGIH, the T.L.V. is 10 and 5 mg/m^3 respectively (ACGIH T.L.V. 1984-85).

PHYSICAL DATA

Boiling Point: N.A.
Vapor Pressure: N.A.
Vapor Density (Air = 1): N.A.
Solubility in Water: Insoluble
Specific Gravity (Water = 1): N.A.
% Non-volatile: 99
Evaporation Rate (Ether = 1): N.A.
pH: N.A.
Appearance and Odor: Dark blue power with practically no odor.

FIRE AND EXPLOSION DATA

Flash Point: N.A.
Method Used: N.A.
Flammable Limits Lel: N.A. Uel: N.A.
Extinguishing Media: Water, fog, CO_2, dry chemical
Special Fire Fighting Procedures: Wear NIOSH-MSHA approved self-contained breathing apparatus and appropriate clothing.
Unusual Fire and Explosion Hazards: None
Hazardous Decomposition Products: Oxides of carbon and nitrogen. Acrid smoke and fumes.

HEALTH HAZARD DATA

Oral Toxicity:	Oral - Rats - LD_{50}: 5.0 g/Kg.
Dermal Toxicity:	Skin - Rabbits - LD50: 2.0 g/Kg.
Eye:	Eye - Rabbits: Inconsequential irritation.
Inhalation:	Not established. We recommend maintaining airborne particulate levels as low as possible. This material is not considered a nuisance dust. OSHA Nuisance Dust standard(s) may apply however; see Footnote 3.
Chronic Toxicity:	Not established.
Mutagenesis:	Morton Blue 1003 was positive in Ames Salmonella Plate Test.
Effects of Overexposure:	
Ingestion	May experience nausea, vomiting, and abdominal pain. May cause gastrointestinal distress. May cause diarrhea.
Skin Contact:	Remove contaminated clothing, shower with soap and water. Excess dye may be removed with waterless hand cleaner or cold cream. If irritation is present after washing, GET MEDICAL ATTENTION.
Inhalation:	If dizzy, drowsy, or unconscious, remove to fresh air. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.
Ingestion:	If person is fully conscious, induce vomiting. Give syrup of ipecac if available. Call nearest regional Poinson Control Center. GET MEDICAL ATTENTION.
Note to Physician:	No known antidote. Supportive therapy is recommended. Monitor for methemoglolin formation. May be metabolized to yield free amine.

REACTIVITY DATA

Stability:	[X] Stable [ ] Unstable
Conditions to Avoid:	Heat, open flames.
Incompatible Substances:	Oxidizing agents.
Can Hazardous Polymerization Occur:	No
Hazardous Decomposition Products and Conditions:	Thermal decomposition may liberate toxic oxides of nitrogen and carbon.

SPILL AND LEAK PROCEDURES

Response to Small Spills:	Recover material by sweeping or vacuum and place in containers for further handling.
Response to Large Spills:	Recover material by sweeping or vacuum and place in containers for further handling.
Hazards to be Avoided:	Avoid generation of dust. Avoid exposure to dusting and wear proper protective equipment specified in SPECIAL PROTECTION INFORMATION. Other hazards, see Fire and Explosion Hazard Data and Health Hazard Data.
Reportable Quantity:	None
Waste Classification:	Non-hazardous waste.
Disposal Methods:	Recycle internally or landfill in authorized facility according to local, state, and federal regulations.

SPECIAL PROTECTION INFORMATION

Respiratory Protection:

Not typically required. If conditions exist where particulates exceeds the P.E.L.-T.L.V. for the total dust and/or respirable particulate, a NIOSH-MSHA approved respirator should be utilized. The specific type of respirator necessary will vary depending upon contaminant levels. Professional consultation is recommended to aid in this determination. Comply with O.S.H.A. 1910.134 (29 CFR).

For Hands, Body:

Impervious gloves recommended for hand protection. Work clothing for general body protection and other protective clothing as necessary to prevent repeated or prolonged skin contact.

For Eyes:

Safety glasses, face shields (eight inch minimum) or splash-proof chemical goggles in addition to safety glasses during pouring and dispensing or where other eye hazards exist.

Ventilation:

To prevent routine inhalation, efficient exhaust ventilation should always be provided to draw particulates away from workers. Ventilation should be adequate to maintain the ambient workplace atmosphere below the limits listed in Hazardous Ingredients.

SPECIAL PRECAUTIONS

Recommended Storage Practice and Conditions:

Store in a cool, dry place.

Other Precautions:

Use under well-ventilated conditions.

For personal hygiene protection, we recommend that employees wash thoroughly after handling product. Always wash up before eating, smoking, or using toilet facilities.

When pouring or dispensing to/from drums or other containers, insure that all containers are properly grounded to minimize the effects of static charge buildup.

LABELING INFORMATION

Dot Shipping Name:	Not Regulated by DOT
DOT Label:	None
UN No.	None
NA No.	None

Other Contents of Product Label:

CONTAINS: 9,10-Anthracenedione, 1,4-bis[(1-methylethyl)amino]-CAS 14233-37-5

Caution: May cause eye or skin irritation. May be harmful if swallowed. Do not get in eyes, on skin, or on clothing. Do not breathe dust and minimize dusting during use. If dusting is unavoidable, use a NIOSH - USBM approved respirator. Wash thoroughly with soap and water after use. Do not take internally. Keep container closed. Use with adequate ventilation. When heated to decomposition, product emits toxic fumes. Wash thoroughly with soap and water after use.

First Aid: If eye contact occurs, flush with water for at least 15 minutes. Call a physician.

If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Call a physician.

For Fire: Use water spray or comver with foam, dry chemical, or carbon dioxide.

For Spills: Sweep up. Observe precautions for dusting shown above.

Warning: This container hazardous when empty! Do not use heat, sparks, open flames, torches, cigarettes on or near empty container since empty containers retain product residues (vapor, liquid or solids). All labelled hazardous precautions must be observed. Do not reuse Empty Container for food, clothing, or products for human or animal consumption or skin contact without professional cleaning.

USERS RESPONSIBILITY

A bulletin such as this cannot be expected to cover all possible individual situations. As the user has the responsibility to provide a safe workplace, all aspects of an individual operation should be examined to determine if, or where, precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to your customers or employees, as the case may be. Morton Thiokol, Inc. must rely on the user to utilize the information we have supplied to develop work practice guidelines and employee instructional programs for the individual operation and regulations.

Disclaimer of Liability

The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. All chemicals may present unknown health hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards which exist. Final determination of suitability of the chemical is the sole responsibility of the user. Users of any chemical should satisfy themselves that the conditions and methods of use assure that the chemical is used safely. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION CONTAINED HEREIN OR THE CHEMICAL TO WHICH THE INFORMATION REFERS. It is the responsibility of the user to comply with all applicable federal, state, and local laws and regulations.

Nothing contained herein is to be construed as a recommendation for use in violation of any patents or of applicable laws or regulations.

October 1985 FORM #C-159

KEYSTONE-INGHAM CORP.
P.O. Box 1296
La Mirada, CA 90637

Material Information Bulletin

(Approved – "Essentially Similar" to Form OSHA 20, Material Safety Data Sheet)

Chevron

CHEVRON GST Oil 32

CPS 234229

TYPICAL COMPOSITION

Hydrocarbon base oils	99%
Additives including alkyl dimercapto thiadiazole	1%

EXPOSURE STANDARD

No OSHA exposure standard or Threshold Limit Value (TLV) has been established for this material. The suggested TLV is 5 mg/m^3 (milligrams of material per cubic meter of air) for a daily 8-hour exposure. This is the OSHA exposure standard and the TLV (1983) for mineral oil mists.

PHYSIOLOGICAL & HEALTH EFFECTS	EMERGENCY & FIRST AID PROCEDURES
Eyes	
Expected to cause no more than minor eye irritation.	Wash eyes with fresh water for at least 15 minutes. If irritation continues, see a doctor.
Skin	
Expected to cause no more than minor skin irritation, but prolonged or frequently repeated skin contact may be harmful. See ADDITIONAL HEALTH DATA.	Wash skin thoroughly with soap and water. Launder contaminated clothing.
Inhalation	
Not expected to be acutely toxic by inhalation but breathing mineral oil mists at levels above the exposure standard can cause respiratory irritation or discomfort.	If respiratory discomfort or irritation occur, move the person to fresh air. See a doctor if discomfort or irritation continues.
Ingestion	
Not expected to be acutely toxic by ingestion.	If a large volume of this material is swallowed, give a large amount of water to drink, make person vomit, and call a doctor.

Chevron Environmental Health Center Inc.
P.O. Box 4054, Richmond, CA 94804
Emergency Phone Number (415)233-3737

CRR-6745(A)(2500-2-83)

No. 221 - Rev 2/84

ADDITIONAL HEALTH DATA

Experimental evidence indicates that alkyl dimercapto thiadiazole may cause allergic skin reactions. There is no evidence that human exposure to the low levels of the additive in this product will cause such skin reactions. However, we strongly recommend that the precautions outlined in this bulletin be followed to minimize contact with this product.

SPECIAL PROTECTIVE INFORMATION

Eye Protection: No special eye protection is necessary.

Skin Protection: Avoid prolonged or frequently repeated skin contact with this material. Skin contact can be minimized by wearing impervious protective clothing including gloves.

Respiratory Protection: If operating conditions create airborne concentrations which exceed the exposure standard, the use of an approved respirator is recommended.

Ventilation: Use adequate ventilation to keep the airborne concentrations of this material below the exposure standard.

FIRE PROTECTION

Flash Point:	(COC) 190°C (min)
Autoignition Temp:	NDA
Flammability Limits:	NA

Extinguishing Media: CO_2, Dry Chemical, Foam, Water Spray.

Special Fire Fighting Procedures: For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire bulletin.

NDA = No Data Available

ENVIRONMENTAL PROTECTION

Environmental Impact: This material is not expected to present any environmental problems other than those associated with oil spills.

Precautions if Material is Released or Spilled: Clean up spills as soon as possible. Absorb large spills with absorbent clay, diatomaceous earth, or other suitable material.

Waste Disposal Methods: Place contaminated materials in disposable containers and bury in an approved dumping area.

REACTIVITY DATA

Stability (Thermal, Light, etc): Stable.

Incompatibility (Materials to Avoid): May react with strong oxidizing materials.

Hazardous Decomposition Products: Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

Hazardous Polymerization: Will not occur.

PHYSICAL PROPERTIES

Solubility: Soluble in hydrocarbon solvents; insoluble in water.

Appearance (Color, Odor, etc):	Yellow liquid.
Boiling Point:	NA
Melting Point:	NA
Specific Gravity:	0.87 @ 15.6/15.6°C
Vapor Pressure (mm Hg & Temp):	NA
Vapor Density (Air = 1):	NA
Percent Volatile (Volume 96):	NA
Evaporation (= 1):	NA
Pour Point:	-26°C (max)
Viscosity:	28.8–32.0 cSt @ 40°C

NA = Not Applicable

The above information is based on data of which we are aware and is believed to be correct as of the date hereof. Since the information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon the condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

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