Bently Nevada 19049-04

11mm 7200 Series Proximitor

$425.00

In Stock

Qty Available: 2

Used and in Excellent Condition

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Transducers
(Manual No. 8029288)

11mm PROXIMITY TRANSDUCER SYSTEM
7200 SERIES

BENTLY NEVADA

SECTION 1
SYSTEM OVERVIEW

1.1 INTRODUCTION

The 7200 Series 11 Millimeter Proximity Transducer System is a non-contacting, shaft vibration and relative position measurement system. The system includes a probe with an integral cable, extension cable, and Proximitor. Figure 1-1 shows a typical system.

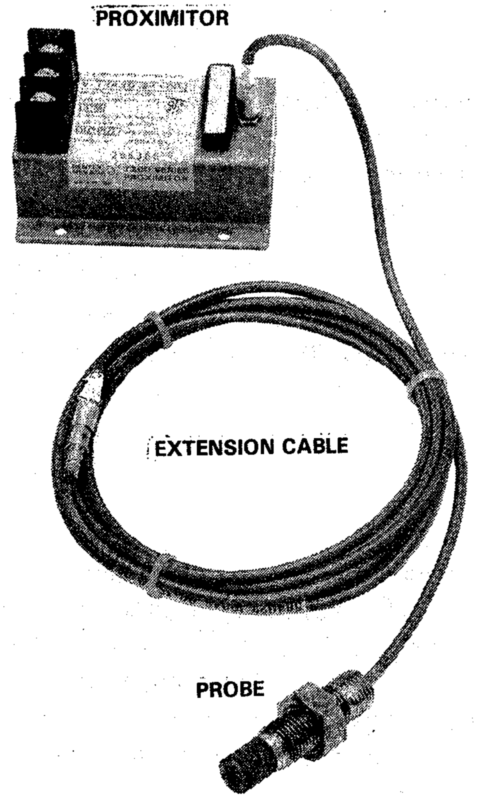

Figure 1-1. 11 mm Proximity Transducer System

The transducer system measures the gap between the probe tip and an observed metal surface and converts this distance to a proportional negative dc voltage. The system measures both static (fixed) and dynamic (changing) distances. The output signal is fed to a monitor to determine such things as radial vibration and axial thrust position.

Probes are available in different configurations to accommodate a variety of applications and to aid in installation. The probe tip is approximately 11 millimeters (0.43 inches) in diameter. The system offers a linear measuring range of 160 mils (4.1 mm) beginning at 40 mils (1.0 millimeter) from the probe face. Also, the system scale factor is 100 mV/mil (3.9 V/mm).

Several Proximitor types are available, each calibrated to a specific probe type, cable electrical length, and temperature range. Probe integral cables and extension cables between the probe and the Proximitor are designed to achieve a system length of 5.0 or 9.0 meters (16.4 or 29.5 feet). All cables are trimmed to an electrical length which can be longer or shorter than the stated physical length. Cables are available with or without armor.

The probe integral cable and extension cables come with the serial number and part number printed on a label. The label is protected by a piece of clear Teflon tubing. During installation, user identification can be placed under another piece of shrinkable Teflon tubing. The tubing is shrunk when heat is applied.

The probe signal and the input power are transmitted between the proximitor and a standard Bently Nevada monitor through a 3-wire shielded signal cable (provided by the user in most cases). The proximitor can be up to 1000 feet (304 meters) from a monitor without degradation of performance.

Probes are compatible with most petrochemical environments. Strong acids with a pH of less than 4, strong bases with a pH greater than 10, and some organic solvents may damage the probes. Contact the nearest Bently Nevada Corporation office for details about probes that operate in harsh environments.

Standard versions of the components of this system are shown in Appendix A. Specifications are listed in Appendix B, and Appendix C shows scale factors and sensitivity curves.

1.2 PROXIMITY MEASUREMENTS

The probe radiates radio frequency energy from the probe tip coil. As a conductive material (such as a machine shaft) approaches the probe tip, eddy currents are induced in that material. The closer the conductive material comes to the probe tip, the greater the magnitude of the eddy currents. As the eddy currents increase, the power energy radiated from the probe tip is absorbed and the corresponding loss in power is detected at the Proximitor. If the probe-to-shaft gap remains constant, the Proximitor output signal remains constant; if the gap changes, the output signal changes accordingly.

The 11 Millimeter Proximity Transducer System is primarily intended for measuring the axial thrust motion of large machine rotors. Its relatively large linear measuring range may be required for thrust position measurements on large machines. Probes mounted to measure thrust position should be located within 12 inches of the thrust collar. Thrust position probes mounted at the machine end opposite the thrust collar do not provide adequate protection since they also measure differential expansion. Typically, two probes are used so that if one is damaged or fails, thrust position can continue being monitored. See Figure 1-2.

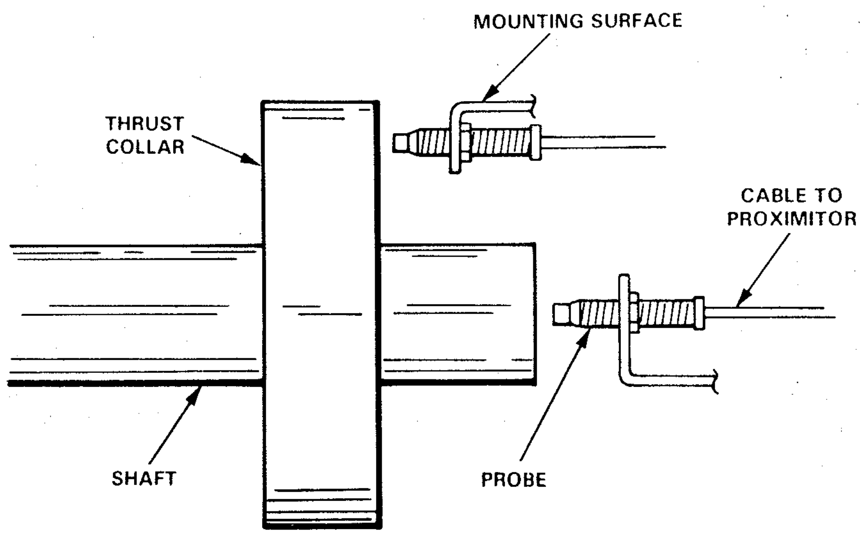

Figure 1-2. Typical Thrust Position Probe Mounting

This transducer system can also be mounted to measure radial vibration. Typically, two probes are mounted 90 degrees apart along the radial axis of a shaft. This enables vibration to be analyzed at all angles along the radial plane. Radial vibration probes should be mounted within 6 inches of the bearing under surveillance. See Figure 1-3.

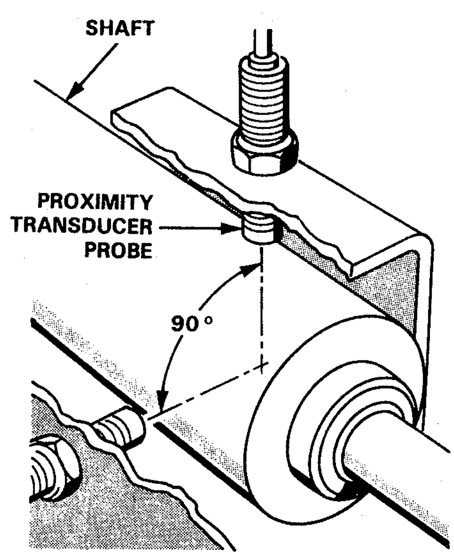

Figure 1-3. Typical Radial Vibration Probe Mounting

SECTION 2
INSTALLATION

2.1 RECEIVING INSPECTION AND STORAGE

All equipment should be removed from shipping containers and visually inspected to ensure there is no shipping damage. If shipping damage is apparent, file a claim with the carrier and submit a copy to Bently Nevada Corporation. Include part and serial numbers on all correspondence. If no damage is apparent and the equipment is not going to be used immediately, Bently Nevada Corporation recommends returning the equipment to the shipping container and resealing. The equipment should be stored in an environment free from potentially damaging conditions such as high temperature, excessive humidity, or a corrosive atmosphere. See Appendix B for environmental specifications.

The equipment is durable; however, reasonable handling care should be exercised during installation. When cable connectors are part of the equipment, they must be properly protected from physical abuse or contamination by oil, water, or other substances by wrapping them with with Teflon tape or other connection protective device.

2.2 INSTALLATION CONSIDERATIONS

Bently Nevada probes and Proximitors are calibrated to AISI E4140 series steel. Most AISI 1000 and AISI 4000 Series steel will present a response curve similar to the AISI E4140 Series steel. However, copper, aluminum, brass, tungsten, or other types of metals will present a different response curve (see Appendix C). If the metal to be observed has significantly different magnetic and electrical properties than AISI E4140 steel, follow the recalibration procedure in Section 3. If it is necessary for the probe to observe a plated area, contact the nearest Bently Nevada Corporation office for assistance.

Proper installation requires the observed surface to be free of irregularities such as hammer marks, scratches, holes, or keyways. Any type of plating (including chrome) normally results in a nonuniform plating thickness. Residual magnetism, surface irregularities, and other conditions in the observed surface can cause electrical or mechanical runout which will introduce error in the Proximitor output.

The various techniques for eliminating electrical and mechanical runout are described in several papers available from Bently Nevada Corporation, including:

- Dealing with "Glitch". Where does Electronic Vectorial Runout Compensation Fit In? (Application Note 004)
- "Glitch": Definition of and Methods for Correction, including Shaft Burnishing to Remove Electrical Runout. (Application Note 011)

The magnetic fields of probe tips mounted too close together will cross-couple, causing a small-amplitude ac signal to be superimposed on the Proximitor outputs. To prevent cross-coupling, probe tips should be mounted with at least 1.5 inches (38.1 mm) clearance between tips. See Figure 2-1.

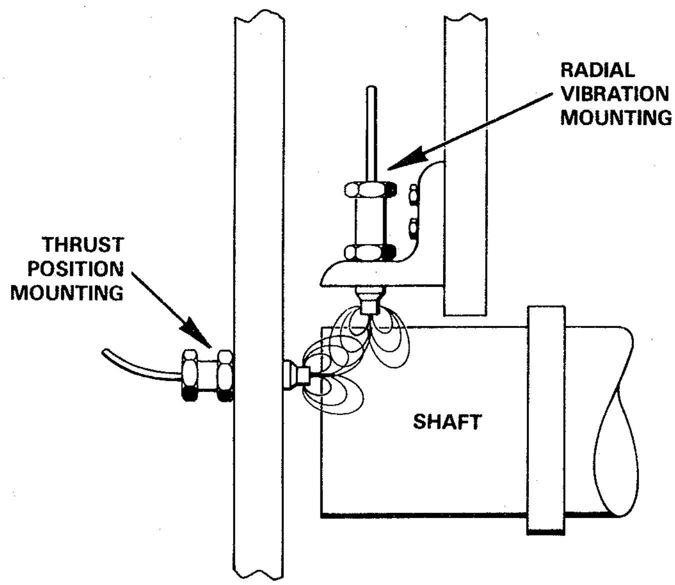

Figure 2-1. Cross-Coupling

Because the electromagnetic field also extends outward from the side of the probe tip, it is necessary to remove all conductive material from around the tip as shown in Figure 2-2. If this is not done, false information will be generated. Sideview can be avoided by proper gapping of the probe or by removing conductive material by counterboring.

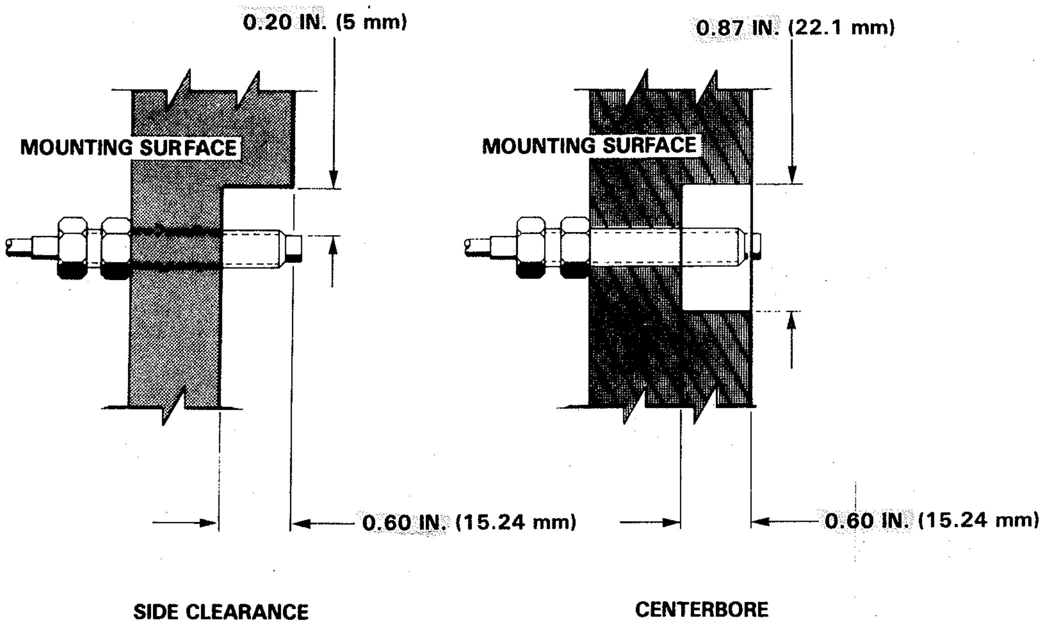

Figure 2-2. Proper Probe Tip Side Clearance

Brackets or other structural members used to mount probes must be rigid. When using a mounting bracket, it should be field checked for resonant frequency. The resonant frequency should be at least ten times machine running speed. Brackets must support the probe in a position perpendicular to the observed surface. The probe axis can vary 15 degrees from perpendicular without affecting the performance of the transducer system.

Probes may be mounted through existing machine hardware such as the bearing cover of a machine case. Many times it is advantageous to use an external mounting adapter, allowing the probes to be removed and replaced, or re-gapped without taking the machine apart. For more information on mounting brackets and adapters, contact your nearest Bently Nevada office for information on transducer accessories.

2.3 PROBE INSTALLATION

Perform the following procedure to assure proper probe installation. The observed surface must remain motionless while gapping the probe. The probe can be gapped mechanically or electrically. Use either steps a and b or steps a and c.

a. Before installing the probe into its mounting hole, ensure the tapped hole is free of foreign material. If necessary, use an appropriate tap to clean the threads. Before the probe is threaded, disconnect the probe integral cable or make sure it is free to turn to prevent a twisting lead between it and the probe.

b. The probe can be gapped mechanically. Thread it into the mounting and use a nonmetallic feeler gauge to set the gap. A nonmetallic feeler gauge must be used to prevent scratching of the probe tip or the observed surface.

c. The probe can also be gapped electrically by connecting the probe integral cable to the extension cable and Proximitor. Apply the proper input voltage (-18 Vdc or -24 Vdc) to the Proximitor. Connect a digital multimeter to the Proximitor output. Thread the probe into the mounting, and observe the transducer output voltage. As the probe is threaded, the transducer output voltage will remain low or give a false reading because it is sensing the surrounding mounting material. See Figure 2-3. As the probe tip extends through the mounting, the transducer output voltage will increase to its maximum output and then decrease as it approaches the observed surface. By cross-referencing this voltage with the probe calibration curve in Appendix C, the proper gap can be set.

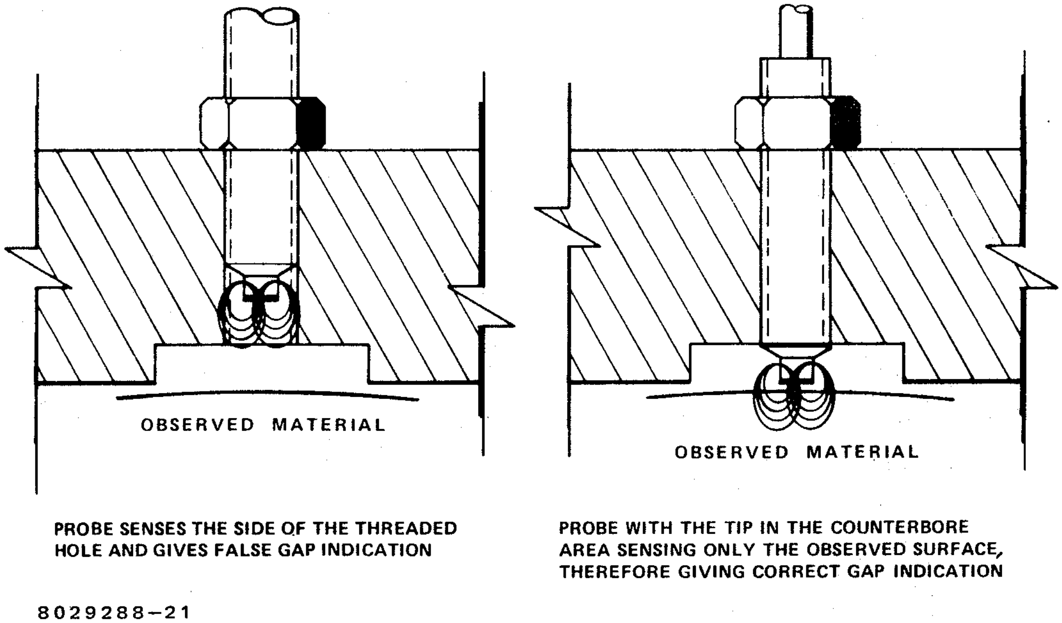

Figure 2-3. Gap Indications During Mounting

d. When the probe is properly gapped, secure by tightening the jam nut (locknut). Care should be taken so the jam nut is not secured so tightly the threads are stripped.

CAUTION

Remember to disconnect the probe integral cable from the extension cable when threading the probe to prevent twisting. Reconnect it to take readings.

Axial position probes should be gapped when the machine is not running so that the rotor can be placed at a known position with respect to the clearances in the thrust bearing.

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After the probe is secured in position, the probe integral cable must be securely fastened to prevent fatigue failure caused by oil flow, moving air, or singular stress conditions. A clip or cable holding device will work as long as it does not exert enough force on the cable to cause the Teflon insulation to cold flow. Cold flow is change in dimension or distortion caused by the sustained application of force.

It is imperative that the probe integral cable be long enough to connect with the extension cable outside the machine case. With the connection outside, a damaged extension cable or a dirty connection can be repaired or replaced without taking the machine apart. The connectors are not watertight, therefore they should be protected with Teflon tape, connector protector cover, shrinkable tubing, room temperature vulcanizing compound that does not have an acetic base, or other connector protecting/sealing device.

CAUTION

Do not use adhesive electrical tape; oil mist will dissolve the adhesive causing connector contamination.

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Sometimes it will be necessary to seal around the probe integral cable. Sealing creates a special problem, because the cable is insulated with Teflon which will cold flow and cannot be subjected to high pressure exerted by some gland seals. If the pressure differential across the seal area is one atmosphere or less, a simple seal (such as duct seal putty) can be used. If the differential pressure is greater than one atmosphere, a special probe must be used. Contact your nearest Bently Nevada office for more information.

2.4 EXTENSION CABLE INSTALLATION

The handling precautions, temperature limitations, chemical compatibility, and sealing techniques for the probe integral cable also apply to the extension cable.

Before the extension cable is installed, make sure its electrical length plus the electrical length of the probe integral cable equal the electrical length required by the Proximitor.

Before routing the cable, insert the identification labels (provided by the user) under the clear Teflon sleeves at each end of the cable. Secure the labels by applying heat to shrink the tubing. The heat source should not exceed 300 degrees F (149 degrees C). If the cable is armor clad, install the label on the armor.

The extension cable should be routed inside conduit, one end of which should be connected to a junction box containing the probe integral cable and extension cable connection. The other end should be connected to an enclosure which contains the Proximitor. Where the cable is installed in a conduit, care must be taken not to rub or cut the cable on sharp or rough surfaces. Protect the connectors from contamination by covering or taping each prior to pushing through the conduit.

If it is undesirable or not possible to route the cable inside conduit, armored extension cable should be used. Use clips or similar devices to secure the armored cable to supporting surfaces. Route the cable through protected areas to reduce the chance of physical abuse. The armor should be terminated at one end in a junction box and at the other end in the Proximitor enclosure.

If the connectors on the extension cable ever need to be replaced, check with Bently Nevada Corporation for installation procedures, connector part numbers, and the required tools.

2.5 PROXIMITOR INSTALLATION

The Proximitor should be mounted in an enclosure that provides protection from mechanical damage and contamination. Weatherproof or cast-aluminum housings provide optimum protection from mechanical damage and undesirable climatic conditions. In corrosive or solvent environments, the enclosure should be purged with clean, dry compressed air or inert gas to protect the Proximitor. The protective enclosure should be free of material such as loose metal parts that could short-circuit Proximitor terminals. Excess cable and uninsulated armor must be secured away from Proximitor terminals. The excess cable, for example, can be secured with clamps to the enclosure lid.

Bently Nevada Corporation recommends placing as many Proximitors as possible in the same protective enclosure, provided that all can be installed without altering the electrical length of the probe-to-Proximitor cabling. Enclosing multiple Proximitors decreases the installation cost and simplifies the routing of cables from the Proximitors to the monitors. Check with the nearest Bently Nevada Corporation office for information on available Proximitor housings.

Before installing power and signal connections, make sure the Proximitor supply voltage is within a range of -17.5 Vdc to -26 Vdc, referenced to supply common. The exact voltage will depend on the requirements of the monitor being used with the system. When used with a -24 Vdc power source, the 11 Millimeter Proximity Transducer System offers a linear range of approximately 160 mils (4.1 millimeters). As the power source decreases (-18 Vdc for instance) there is a decrease in the linear range. See Appendix C.

Field wiring from the Proximitor to the monitor is generally provided by the user unless a specific request is made to have Bently Nevada Corporation do the fabrication. Shielded three-wire cable should be used.

Proper isolation and shield grounding ensure that a minimum amount of noise will be induced in the signal conductor. Bently Nevada Corporation recommends electrically isolating all Proximitors. The Proximitor protective housings manufactured by Bently Nevada Corporation are equipped with an isolation board. For retrofit and conversion situations, Bently Nevada Corporation offers a Proximitor Isolation Kit (BNC P/N 19094-01).

The probe is internally isolated to provide shield isolation at the probe end. The probe integral cable and extension cable shields, which are physically connected to the Proximitor case, are isolated with Teflon insulation. The exposed connector joining the probe integral cable and the extension cable must be insulated with nonconductive, oil-resistant, water-resistant tape, Teflon shrink tubing, or Bently Nevada connector protector cover.

Figure 2-4 shows the field wiring and shield grounding connections made to 7000, 7200, and 9000 Series monitors while Figure 2-5 shows that information for the 11000 Series Smart Monitor System.

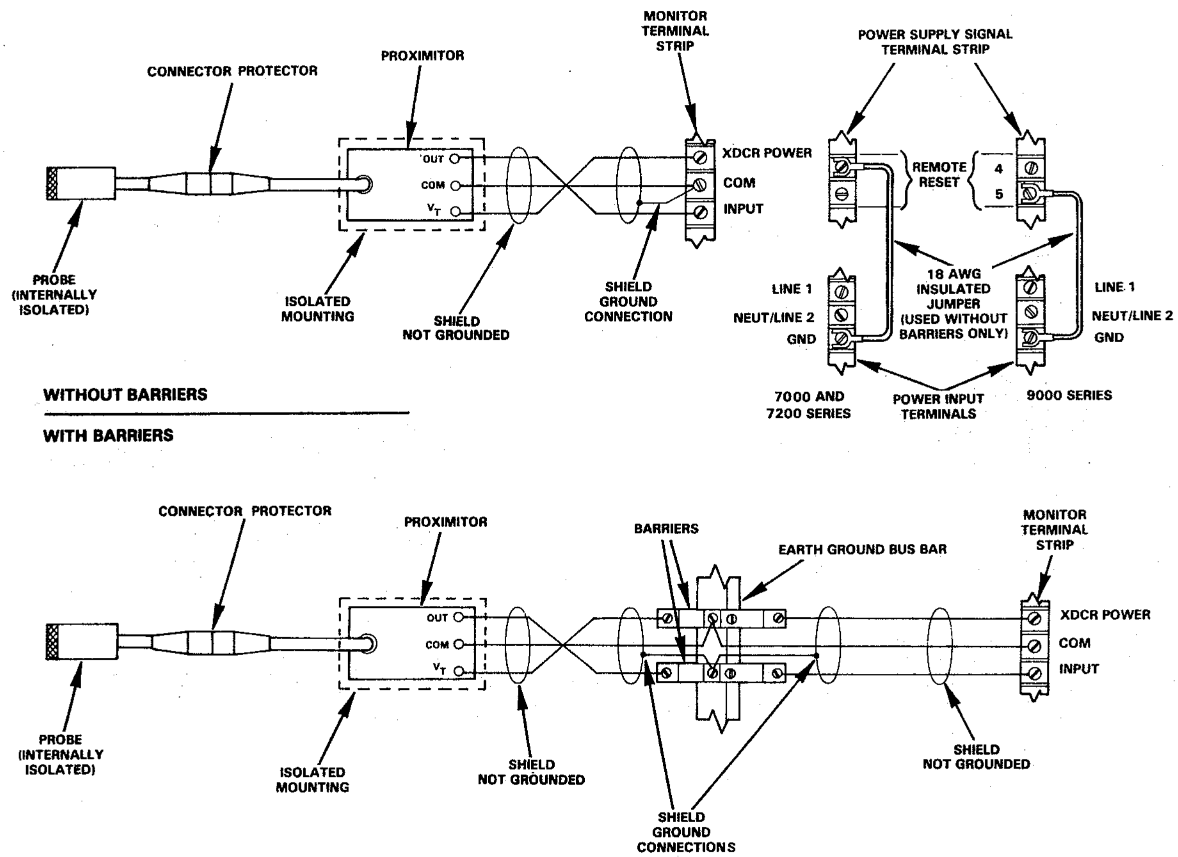


Figure 2-4. Field Wiring and Shield Grounding for 7000, 7200, and 9000 Series Monitors

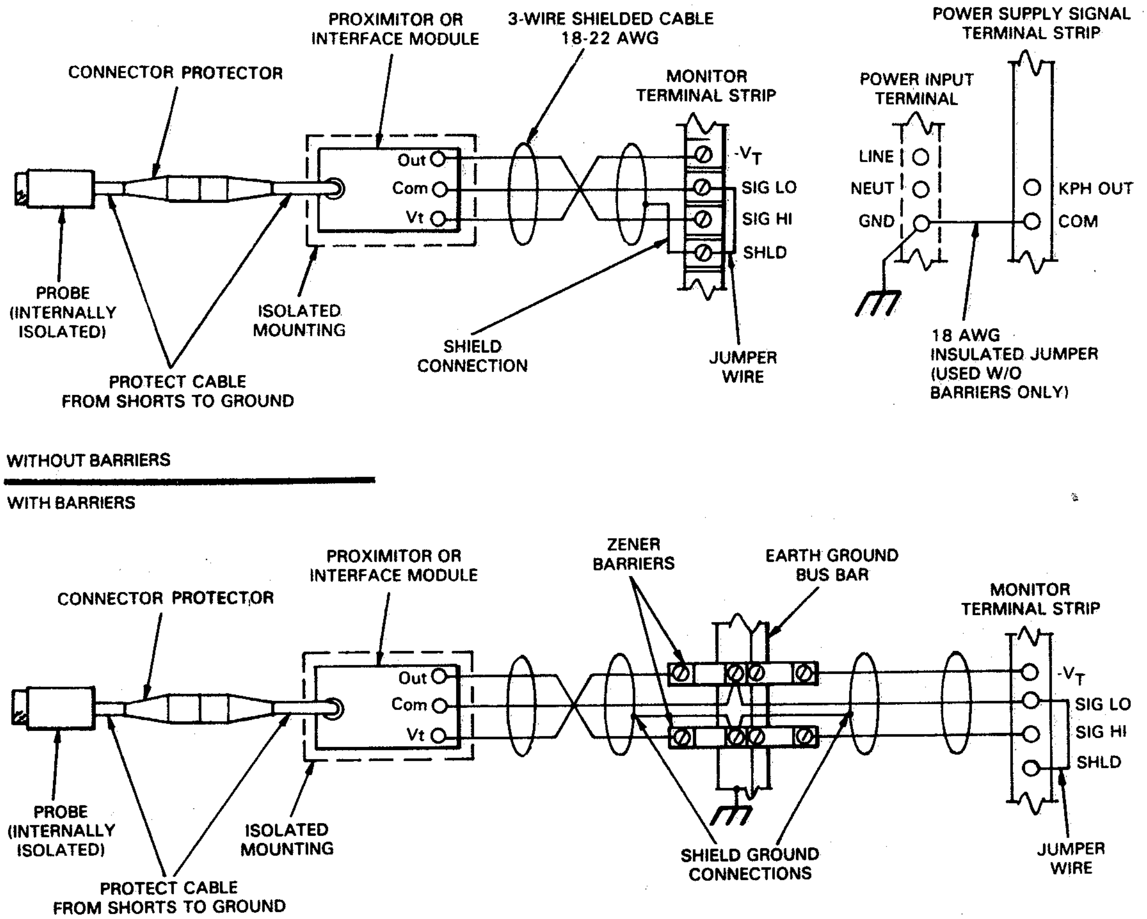


Figure 2-5. Field Wiring and Shield Grounding for 11000 Series SMART MONITOR System

The shield of each field wiring cable should be earth grounded at only one end; the other end should not be grounded. All shields of field wiring connected to the monitors in the same rack should connect to the same earth ground to avoid ground loops. If safety barriers are not used in the field wiring, each monitor-end shield connects to the COM terminal of the respective rack signal module. The signal module COM terminals are connected to ground by a user-installed jumper wire connecting a specific remote reset terminal (common) to the earth ground. If safety barriers are used, shields are connected to the earth ground bus, and the jumper wire between the remote reset terminal and earth ground must not be installed.

SECTION 3
MAINTENANCE

This section contains calibration and troubleshooting procedures. The recommended maintenance equipment is given in Table 3-1. If the recommended equipment is not available, equivalent instruments can be used. Any maintenance performed by the user, other than that which is specified herein, may void the warranty.

Table 3-1. Recommended Maintenance Equipment

MAINTENANCE EQUIPMENT	RECOMMENDED EQUIPMENT
Digital Multimeter	Hewlett-Packard Model 3465 A/B
Test and Calibration Kit	Bently Nevada Corporation Model TK3-2E or TK3-2G
Variable Resistor	0 to 10k ohms
Soldering Iron	Weller Model SP23
Power Supply	Hewlett-Packard Model 6215A

3.1 CALIBRATION CHECK

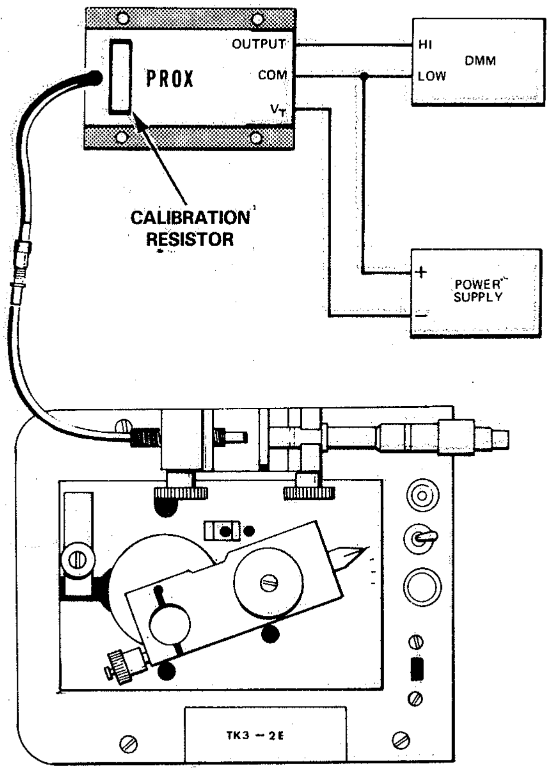
Successful completion of the following procedure will assure proper transducer calibration.

a. Connect test equipment as shown in Figure 3-1.

b. Adjust the spindle micrometer on the TK3 test and calibration kit until it indicates 40 mils (1.01 mm).

c. Insert the probe into the TK3 probe holder. Adjust the probe in the holder until the digital multimeter indicates -3.60 ±0.01 Vdc and tighten the probe in the fixture. Do not contact the probe tip.

40 mils = 1.01 mm
X mils = 25.4 mm
1005.9 mils = 25.4 mm
1005.9 mils = 1"
1 mil = .001"



8029288-23

Figure 3-1. Test Equipment Setup

d. Adjust the micrometer to a 15 mil (0.38 millimeter) indication, then back to a 20 mil (0.51 millimeter) indication and record the output voltage. Going to the 15 mil (0.38 millimeter) indication first will eliminate any play in the micrometer before taking the 20 mil reading.

e. Increase the gap in 10-mil increments by adjusting the micrometer. Record the voltage indication at each increment.

f. Either plot each voltage indication obtained in step e or compare each to the desired calibration curve in Appendix C.

g. If the transducer is out of tolerance (refer to the specifications), perform the recalibration procedure in paragraph 3.2.

3.2 RECALIBRATION

Perform the following procedure to recalibrate the transducer.

a. Remove the protective assembly from the calibration resistor on the Proximitor. Unsolder and remove the calibration resistor (see Figure 3-1).

b. Attach the variable resistor between the calibration resistor terminals.

NOTE

Increasing the resistance between the calibration terminals will decrease the Proximitor output voltage and slope of the calibration curve; decreasing the resistance will cause the Proximitor output voltage and slope of the calibration curve to increase.

c. Perform the procedure in paragraph 3.1 and adjust the variable resistor as appropriate until the desired calibration curve is obtained.

d. When the desired average scale factor is obtained, remove the variable resistor from the calibration terminals and use the digital multimeter to measure its resistance. Select a 1% tolerance resistor (or two in parallel) equal to the measured resistance of the variable resistor.

CAUTION

To prevent damage to components, do not leave the soldering iron in contact with the Proximitor terminals too long.

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e. Solder the resistor(s) between the calibration terminals.

f. Remove the room-temperature vulcanizing compound from the epoxy fiberglass shroud.

g. Install the shroud over the calibration resistor(s) and encapsulate with room-temperature vulcanizing compound that does not have an acid base.

3.3 TROUBLESHOOTING

The following troubleshooting procedure is provided to help the user interpret fault indications and isolate faults in an installed transducer system. Before beginning this procedure, ensure the system has been installed correctly and all connectors have been secured properly in the correct locations.

When a malfunction occurs, locate the fault indication in the left-hand column of Table 3-2. The center column lists the probable causes for each fault indication, and the right-hand column lists the procedure to isolate and correct the fault. Use a digital multimeter to perform voltage and resistance measurements.

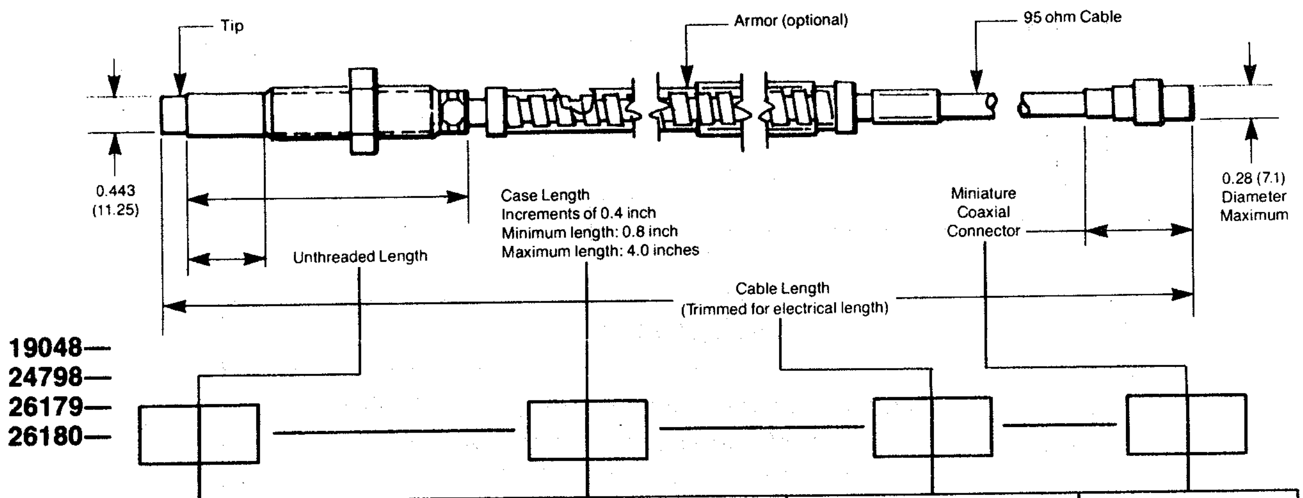
Table 3-2. Fault Isolation and Correction

FAULT INDICATION	PROBABLE CAUSE	ISOLATION AND CORRECTION
Voltage between Prox. COM and V_T terminals not within range of -17.5 to -26 Vdc.	1. Faulty power source. 2. Faulty wiring between power source and Proximitor	Disconnect output wiring from power source. Measure power source output voltage. If not within range of -17.5 to -24 Vdc, replace power source. If power source output voltage is within range of 17.5 to -26 Vdc, fault exists in wiring between power source and Proximitor or in the Proximitor. Reconnect wiring at power supply and disconnect at Proximitor. If voltage at wire terminals which connect to Proximitor is not correct, replace faulty wiring. If voltage is correct, replace Proximitor.
Voltage between Prox. OUTPUT and COM terminals remains at 0 volts.	1. Short circuit in field wiring or instrument connected to Proximitor output terminal 2. Faulty Proximitor.	Disconnect wiring from Proximitor OUTPUT terminal. Remeasure voltage between Proximitor OUTPUT and COM terminals. If some voltage other than 0 is measured, replace field wiring or instrument that was connected to Proximitor OUTPUT terminal. If 0 volts, replace Proximitor.
Voltage between Prox. OUTPUT and COM terminals remains at more than 0 and less than 1 volt.	1. Short circuit in probe or extention cable. 2. Short circuit in probe integral cable or extension cable connector. NOTE: A gap of less than 10 mils between the probe tip and observed surface could cause an indication like a short circuit.	Disconnect extension cable from Proximitor. Remeasure voltage between Proximitor OUTPUT and COM terminals. If unchanged, replace Proximitor. If within a few volts of the voltage between Proximitor COM and V_T terminals, a short circuit exists in probe or extension cable. Clean probe integral cable and extension cable connectors with solvent such as Freon. Reconnect probe lead and extension cable to Proximitor. Remeasure voltage between Proximitor output and COM terminals. If 0 volts, replace the extension cable. If still 0 volts, replace the probe.
Voltage between Prox. OUTPUT and COM terminals remains within a few volts but is not identical to the voltage between COM and V_T terminals	1. Faulty Proximitor. 2. Open circuit in probe or extension cable. NOTE: A gap between the probe tip and observed surface that is too large for the transducer to measure could cause an indication similar to an open probe of extension cable circuit.	Disconnect extension cable from the Proximitor. Using a small piece of wire, short the center pin to the outer shell of the coaxial connector on the Proximitor and remeasure the output voltage. If the voltage is not 0.6 to 0.8 volts, replace the Proximitor. If the voltage is between 0.6 to 0.8 volts, an open circuit exists in either the extension cable or the probe. Using the DMM set to the resistance function, measure the outer conductor and the inner conductor of the extension cable connected to the probe. Normal resistance should be between 5 to 20 ohms. If an open or shorted condition exists, disconnect the extension cable and measure the resistance of the probe integral cable and extension cable individually. Normal resistance of the probe measured center to outer is 3 to 9 ohms. The center to center measurement on the extension cable should be 2 to 10 ohms; the outer to outer measurement should be 0 to 1 ohm. Replace faulty probe or extension cable.
Voltage between Prox. OUTPUT and COM terminals remains identical to voltage between COM & V_T terminals.	1. Short circuit in wiring between Proximitor OUTPUT and V_T terminals. 2. Faulty Proximitor.	Remove wiring from Proximitor OUTPUT terminal. Remeasure voltage between Proximitor OUTPUT and COM terminals. If voltage is less than supply, a short circuit exists in wiring between Proximitor OUTPUT and V_T terminals. If voltage is unchanged, replace Proximitor.

APPENDIX A

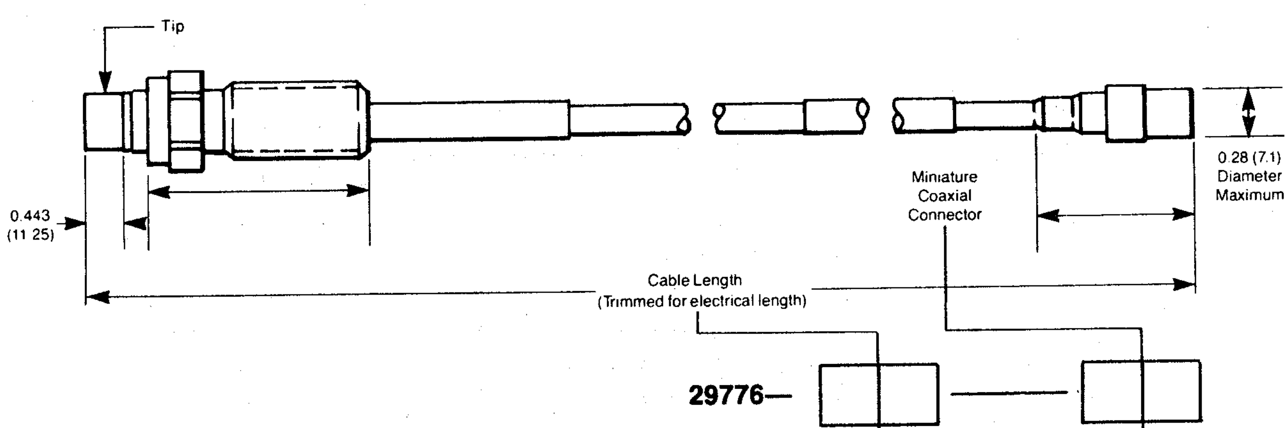
DRAWINGS AND ORDERING INFORMATION

11mm proximity probe, standard mount



UNTHREADED LENGTH	CASE LENGTH	CABLE LENGTH	CONNECTOR TYPE
Increments of 0.5 inch (12.7 mm) Maximum length = 8.5 inches (215 mm) Minimum length = 0.0 inch (This length must be at lease 1 inch less than the case length).	Increments of 0.5 inch (12.7 mm) Maximum length = 9.5 inches (241 mm) Minimum length = 1.0 inch (25.4 mm)	0 5 = 0.5 ±0.15 meter 1 0 = 1.0 ±0.15 meter 5 0 = 5.0 ±0.5 meters 9 0 = 9.0 ±0.9 meters (Probes ordered with 5 meter or 9 meter cables do no use extension cables)	00 = No connector 02 = With connector

11mm proximity probe, reverse mount, without armor



CABLE LENGTH	CONNECTOR TYPE
0 5 = 0.5 ±0.15 meter 1 0 = 1.0 ±0.15 meter 5 0 = 5.0 ±0.5 meters 9 0 = 9.0 ±0.9 meters (Probes ordered with 5 meter or 9 meter cables do no use extension cables)	00 = No connector 02 = With connector

11mm probes

CATALOG NUMBER	CONFIGURATION	ARMOR	CASE THREAD
19048	Standard	No	½ x 20
24798	Standard	Yes	½ x 20
26179	Standard	No	M14 x 1.5
26180	Standard	Yes	M14 x 1.5
29776	Reverse	No	3/8 x 24

Proximitor
19049 — [ ][ ]

DESCRIPTION
01 = For combined system length of 5 Meters (electrical) standard temperature at 32° to 149° F (0° to 65° C) 02 = For combined system length of 9 Meters (electrical) standard temperature at 32° to 149° F (0° to 65° C) 03 = Extended temperature version of 19049-01; -40° to 212° F (-40° to 100° C) 04 = Extended temperature version of 19049-02; -40° to 212° F (-40° to 100° C)

Extension cable
24710 — [ ][ ][ ] — [ ][ ]

EXTENSION CABLE LENGTH	ARMOR
040 = 4.0 meters (157 inches) 045 = 4.5 meters (177 inches) 080 = 8.0 meters (315 inches) 085 = 8.5 meters (335 inches)	00 = No armor 01 = Armor

APPENDIX B

SPECIFICATIONS FOR THE

11 MM PROXIMITY TRANSDUCER SYSTEM

SPECIFICATIONS FOR THE 11 MM PROXIMITY TRANSDUCER SYSTEM

SYSTEM PERFORMANCE

The following specifications apply at 72° F (22° C) with -24.0 ±0.1 Vdc supply, 10k ohm load, and AISI E4140 steel target; and when test equipment is used with accuracy as specified by BNC Specification 150980.

A. Calibrated Range	160 mils (4.06 mm) beginning at -3.6 Vdc -- approximately 40 to 200 mils (1.02 to 5.08 mm)
B. Average Scale Factor Over Calibrated Range	
Typical (90%)	100 ±3.0 mV/mil (3.94 ±0.12 V/mm)
Worst Case (99.7%)	100 ±7.0 mV/mil (3.94 ±0.28 V/mm)
Bench Calibration	Can be adjusted with the Proximitor calibration resistor for exactly 100 mV/mil (3.94 V/mm)
C. Incremental Scale Factor (Derivative) Over Calibrated Range in 20 mil (0.51 mm) Increments	See Appendix C, Figure C-1
Typical (90%)	100 ±10 mV/mil (3.94 ±0.39 V/mm)
Worst Case (99.7%)	100 ±16 mV/mil (3.94 ±0.63 V/mm)
Bench Calibration, average scale factor adjusted for 100 mV/mil (3.94 V/mm)	100 ±10 mV/mil (3.94 ±0.39 V/mm) in 20 mil (0.78 mm) increments over 160 mil (4.06 mm) range starting at -3.6 Vdc

D.	Deviation from best straight line over a range beginning 20 mils (0.51 mm) below the calibrated range and ending at the end of the calibrated range -- approximately 20 to 200 mils (0.51 to 5.08 mm). Error is referenced to the straight line which is centered to yield minimum error and which has a 100 mV/mil (3.94 V/mm) slope.	See Appendix C, Figure C-2
	Typical (90%)	Less than ±4.5 mils (0.11 mm)
	Worst Case (99.7%)	Less than ±6.5 mils (0.17 mm)
E.	Gap at -3.6 Vdc	40 ±17 mils (1.0 ±0.43 mm)
F.	Temperature Sensitivity	
	Probe Tip Only	See Appendix C, Figure C-3, C-4, C-5, and C-6
	Probe and 1 foot (0.304 meters) of cable	See Appendix C, Figure C-7
	Probe and 1 meter of cable	See Appendix C, Figure C-8
	Proximitor Only	See Appendix C, Figure C-9 and C-10
	Extension Cable Only	See Appendix C, Figure C-11 and C-12
	Probe and 1 Meter of Cable at 150° F (65° C), Proximitor and Remaining Cable at Temperature	See Appendix C, Figure C-13
G.	Calibration Curves to Materials other than E4140 Steel	See Appendix C, Figure C-14 and C-15
H.	Side Sensitivity, One Side Only (Figure 2-2)	See Appendix C, Figure C-16

11 MM PROXIMITORS

The following specifications apply at 72°F (22°C) with AISI E4140 steel target and when test equipment is used with accuracy as specified by BNC Specification 150980.

A.	Calibration Range	160 mils (4.06 mm) beginning at -3.60 Vdc -- approximately 40 to 200 mils (1.02 to 5.08 mm)
B.	Interchangeability Error	
	1. Average Scale Factor Change	
	Typical (90%)	Less than 4.8 mV/mil (157 mV/mm)
	Worst Case (99.7%)	Less than 6.4 mV/mil (252 mV/mm)
	2. Voltage Change (Maximum)	
	At midrange, 120 mils (3.0 mm)	1.4 Vdc
	Near beginning of range, 40 mils (1.0 mm)	0.9 Vdc
C.	Supply Sensitivity	See Appendix C, Figure C-14
D.	Supply Voltage Range	-18 Vdc to -24 Vdc
E.	Current Draw	13 mA max with 10k ohm load 24 mA max with output shorted
F.	Output Resistance	50 ohms
G.	Short Circuit Duration	Continuous
H.	Output Load	Calibrated into a 10k ohm resistive load
I.	Frequency Response	
	+0%, -5%	0 to 600,000 rpm
	Capacitive Load	See Appendix C, Figure C-15

J.	Output Noise	Less than 10 millivolts peak-to-peak when terminated into a 0.01 microfarad capacitor load or a standard Bently Nevada monitor plus any high frequency noise which may be present on the supply
K.	Indication of Fault Conditions	If the probe or extension cable opens or shorts, the output goes to within 2 volts of supply or within 1 volt of common
L.	Effects of Incorrect Field Wiring	When used with a 7000, 7200 or 9000, or 11000 (SMART MONITOR) monitors, the Proximitor can be wired wrong in any manner with no resulting damage
M.	Materials	
	Coaxial Connector	Gold-plated stainless steel
	Barrier Strip	Nylon
	Case	Aluminum; Finish - gold chromate conversion process
	Calibration Terminals	Gold-plated brass
	Calibration Resistor Sealant	Dow Corning 3110 RTV
	Calibration Terminal Grommet	Teflon
	Label	Mylar (acetate laminate finish)

N. Environmental Restrictions

Storage Temperature	-60° F to 212° F (0° C to 65° C)
Operating Temperature Range	
Models 19049-01, and -02	32° F to 150° F (0° C to 65° C)
Models 19049-03, and -04	-60° F to 212° F (-51° C to 100° C)
Relative Humidity from 35° F to 212° F (1° C to 100° C)	95% noncondensing

11 MM EXTENSION CABLES

The 7200 Series 11 mm extension cables are available with or without armor and in lengths of 4 meters, 4.5 meters, 8 meters, and 8.5 meters. The following specifications apply at 72°F (22°C) with AISI E4140 steel target and when test equipment is used with accuracy as specified by BNC Specification 150980.

A. Calibration Range — 160 mils (4.06 mm) beginning at -3.60 Vdc -- approximately 40 to 200 mils (1.02 to 5.08 mm)

B. Interchangeability Error with 11 mm System

1. Average Scale Factor Change

   Typical (90%) — Less than 1.3 mV/mil (51 mV/mm)

   Maximum (99.7%) — Less than 2.4 mV/mil (94 mV/mm)

2. Voltage Change at Same Gap (Maximum)

   At midrange, 120 mils (3.1 mm) — 0.5 Vdc

   Near beginning of range, 20 mils (0.5 mm) — 0.2 Vdc

C. DC Resistance, Nominal

   Center Conductor — 0.325 ohms/ft. (0.10 ohms/meter)

   Shield — 0.017 ohms/ft (0.06 ohms/meter)

D. Capacitance — 15.4 pF/ft (50.5 pF/meter)

E.	Characteristic Impedance	95 ohms
F.	Materials	
	Jacket and Core	Teflon
	Armor (if applicable)	Stainless steel
	Armor Covering (if applicable)	Teflon
	Shrink Tubing	Teflon
	Connector	Silver-plated brass with Teflon dielectric insert
G.	Tensile Strength (connector to connector)	30 lbs (13.6 kg)
H.	Temperature	
	Storage	-60° F to +350° F (-51° C to +177° C)
	Operating	-60° F to +350° F (-51° C to +177° C)

11 MM PROBES

The 7200 11 mm probe is available in many case styles, with or without armored probe integral cable, and with or without a connector. The following specifications apply at 72°F (22°C) with AISA E4140 steel target and when test equipment is used with accuracy as specified by BNC Specification 150980.

A.	Calibration Range	160 mils (4.06 mm) beginning at -3.60 Vdc -- approximately 40 to 200 mils (1.02 to 5.08 mm)
B.	Interchangeability Error	
	1. Average Scale Factor Change (over calibration range)	
	Typical (90%)	Less than 4 mV/mil (157 mV/mm)
	Maximum (99.7%)	Less than 8 mV/mil (315 mV/mm)
	2. Voltage Change at Same Physical Gap (Maximum)	
	At midrange gap, 120 mils (3.1 mm)	2.2 Vdc
	Near beginning of range, 40 mils (1.0 mm)	1.8 Vdc
C.	DC Resistance (Typical)	
	Probe Coil	8.7 ohms
	Lead Center Conductor	0.325 ohms/ft (1.07 ohms/meter)
	Lead Shield	0.017 ohms/ft (0.06 ohms/meter)
D.	Insulation Resistance	Capable of withstanding a minimum of 500 Vac rms at 60 Hz between probe case and electrical circuit with less than 1 mA current flow.
E.	Inductance	0.165 mH

F. Materials

Lead Jacket and Core	Teflon
Tip	G11 Fiberglass and Epoxy Resin with Anhydride Curing
Case	300 Series Stainless Steel
Armor (if Applicable)	Stainless Steel
Shrink Tubing	Teflon
Connector	Silver-plated brass with Teflon dielectric insert

G. Case Torque (Maximum Rated)

½-20 Case	400 inch pounds (45.2 newton meters)
M14 x 1.5 Case	560 inch pounds (63.3 newton meters)

H. Torque (Maximum Rated)

Tip to Case	1 inch pound (0.11 newton meters)
Tip to Lead	1 inch pound (0.11 newton meters)

I. Tensile Strength (Maximum Rated)

Tip to Case	5 lbs (2.27 kg)
Case Connector	30 lbs (13.64 kg)

J. Temperature

Storage	-30° to 350° F (-34° to 177° C)
Operating	-30° to 350° F (-34° to 177° C)

K. Relative Humidity from 35° to 212° F (1° to 100° C) — 95% noncondensing

APPENDIX C

SCALE FACTORS AND SENSITIVITY CURVES

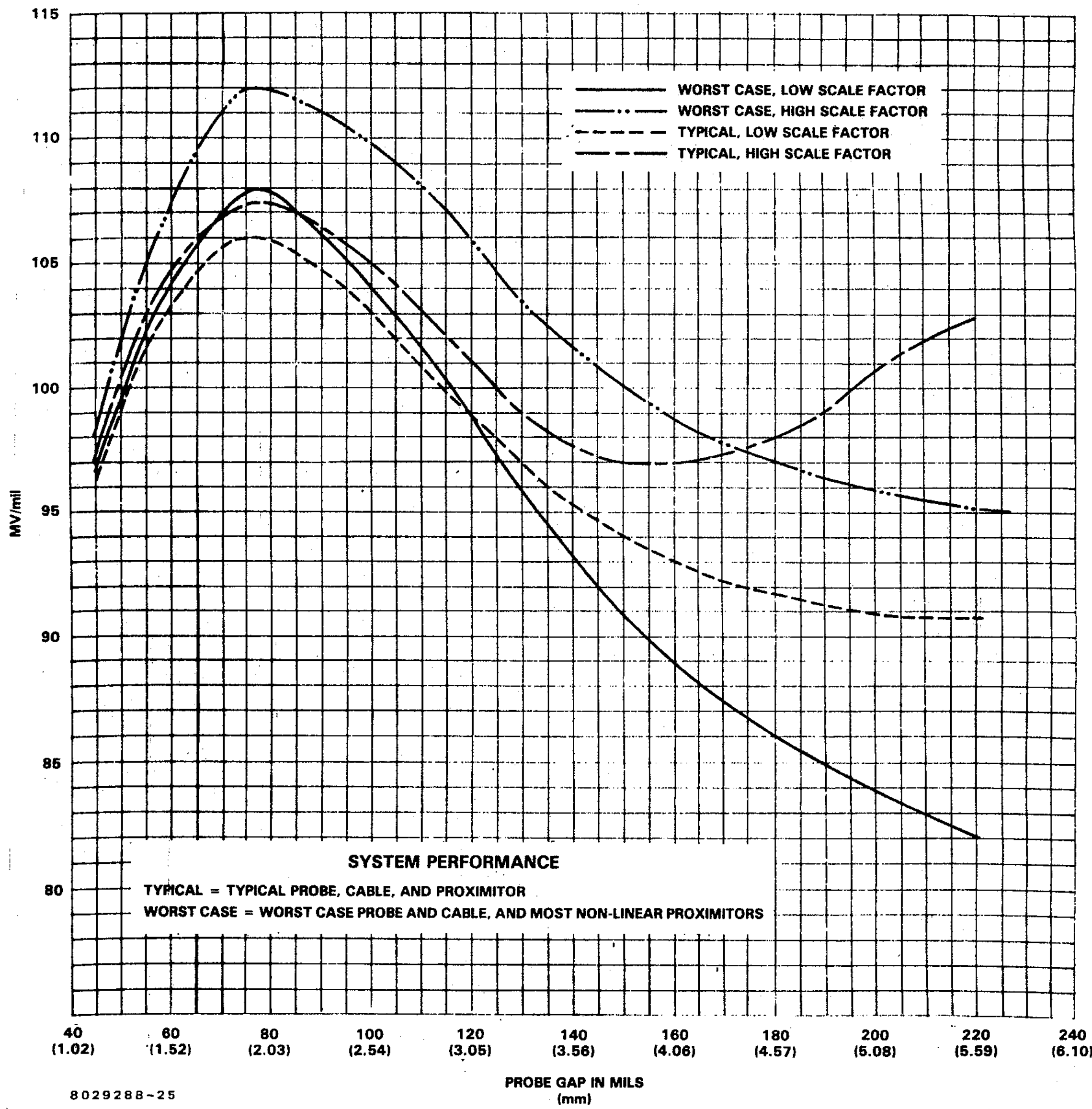


Figure C-1. System Incremental Scale Factor

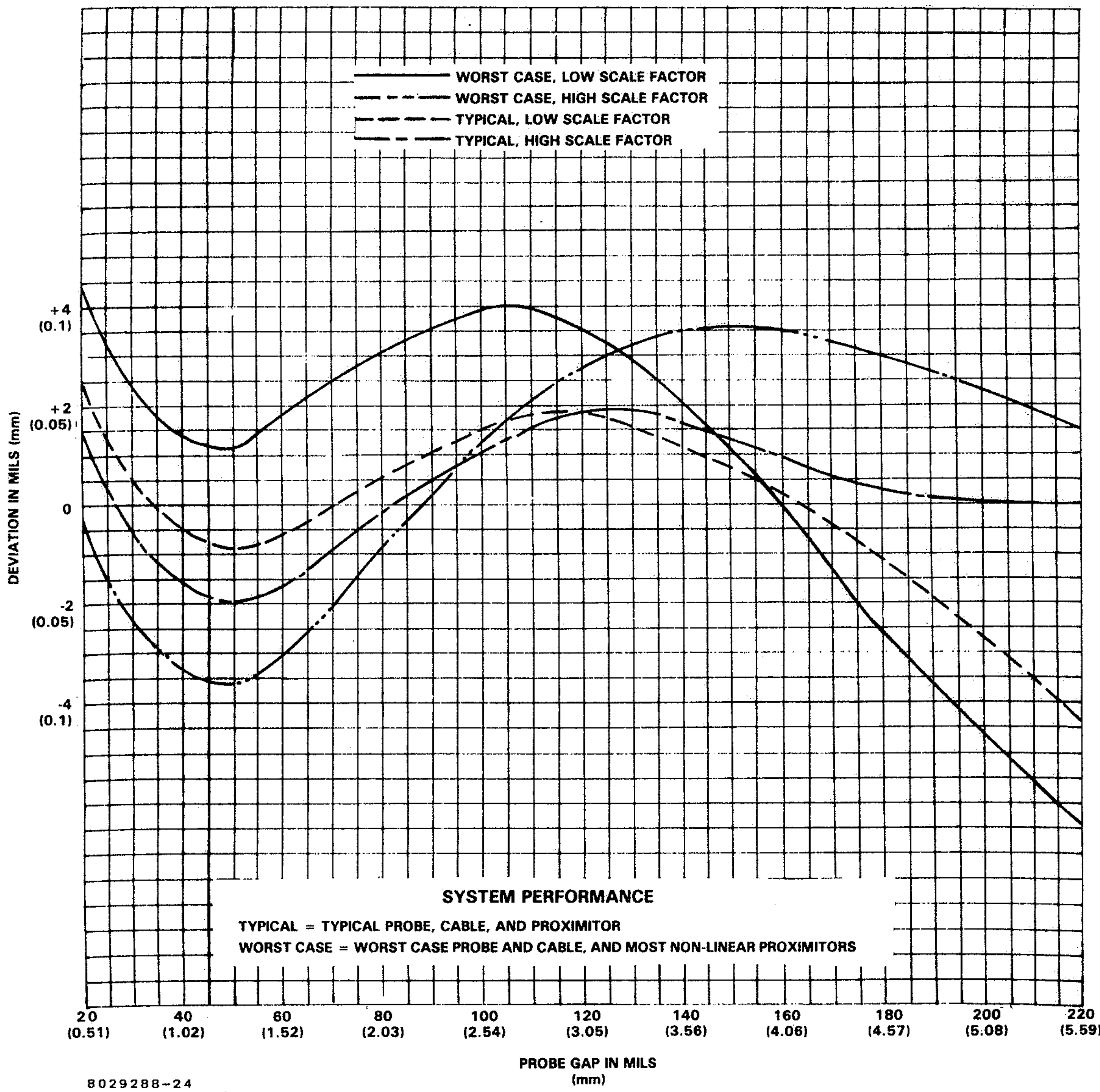


Figure C-2. Deviation from Best Straight Line with Slope of 100 mV/mil (3.94 V/millimeter)

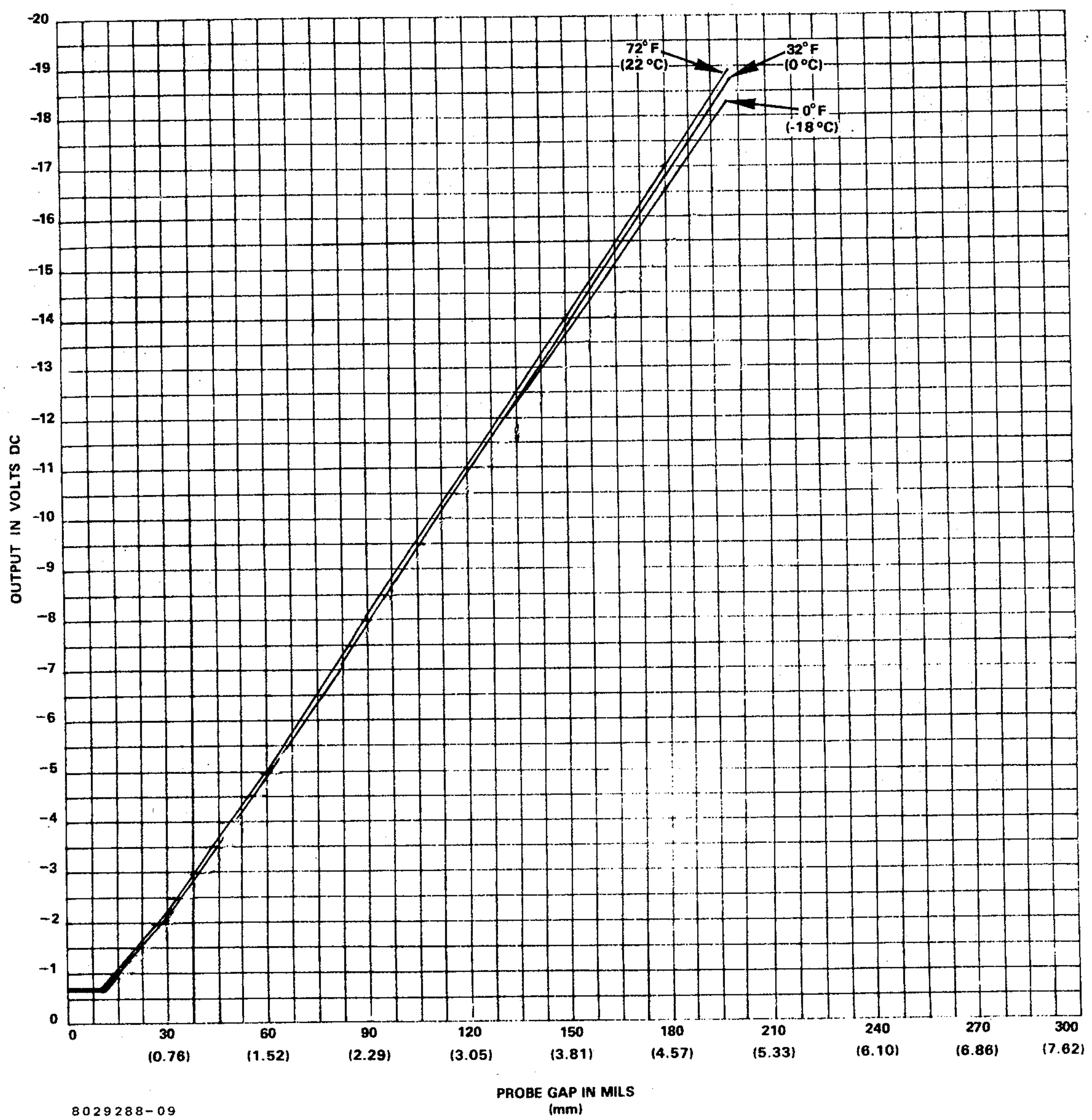


Figure C-3. 11 Millimeter Probe - Low Temperature Sensitivity

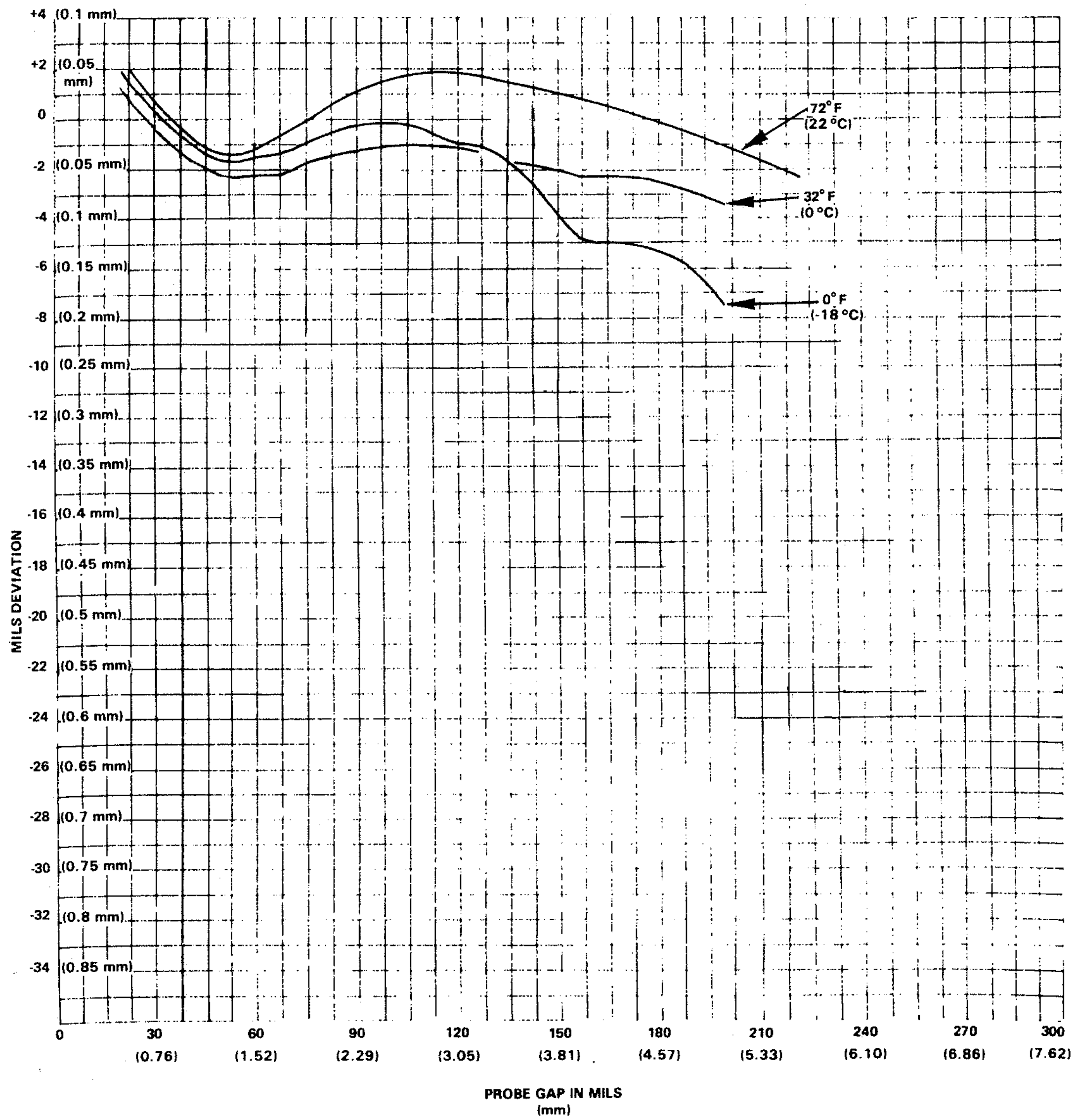


Figure C-4. Typical Deviation from Straight Line - Low Temperature

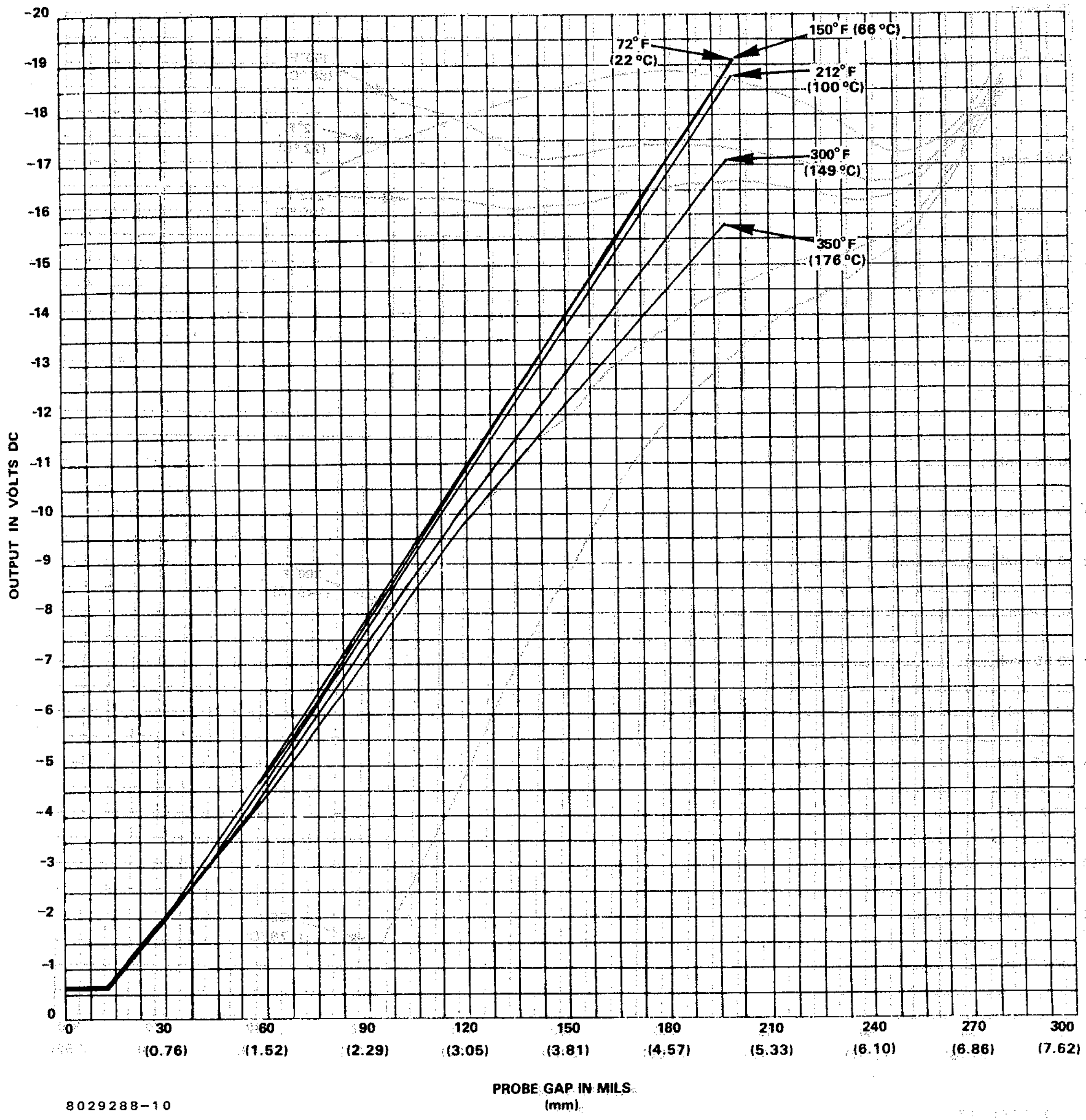


Figure C-5. 11 Millimeter Probe - High Temperature Sensitivity

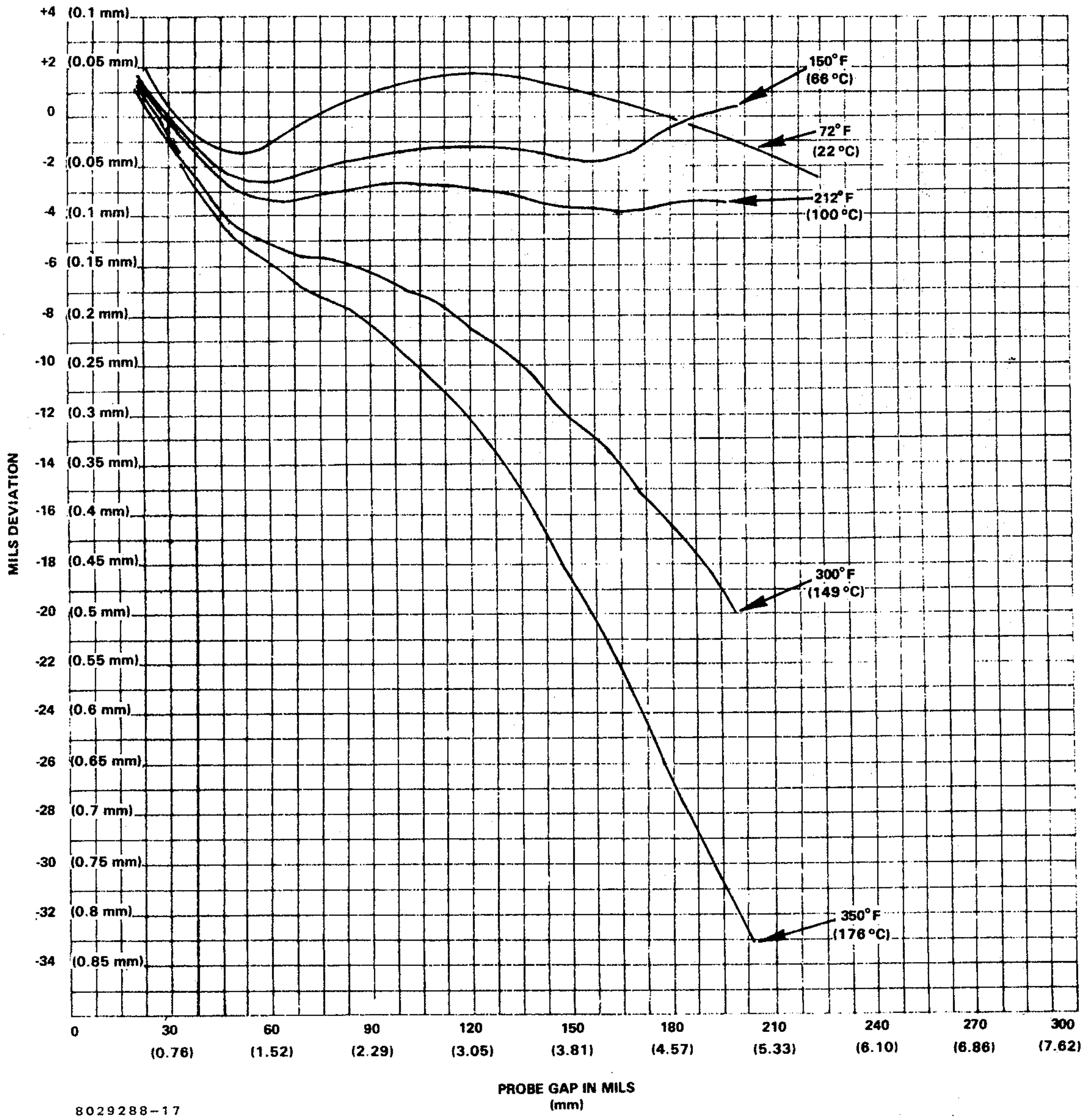


Figure C-6. Typical Deviation from Straight Line - High Temperature

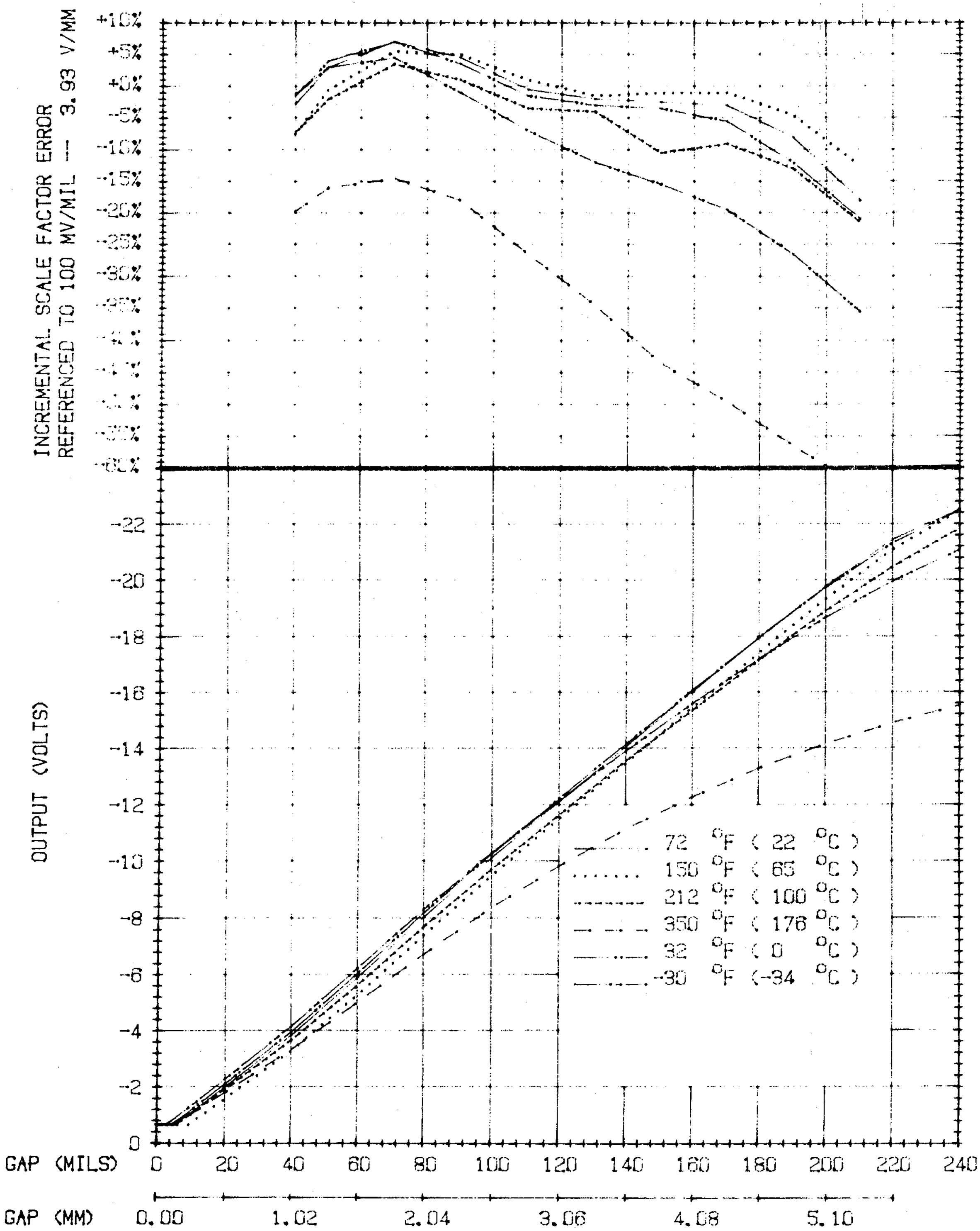


Figure C-7. Probe and 1 Foot (0.304 Meters) of Cable

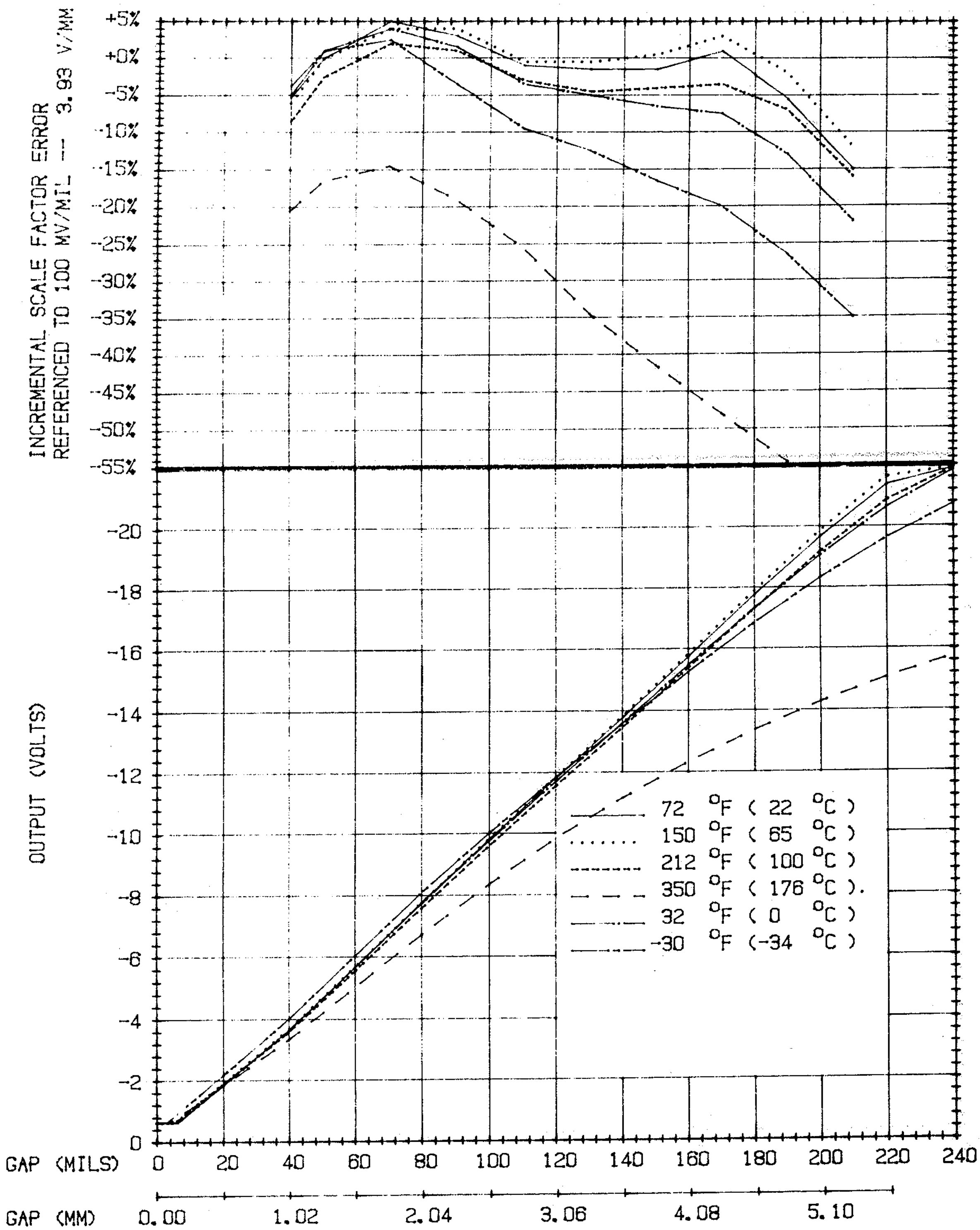


Figure C-8. Probe and 1 Meter of Cable

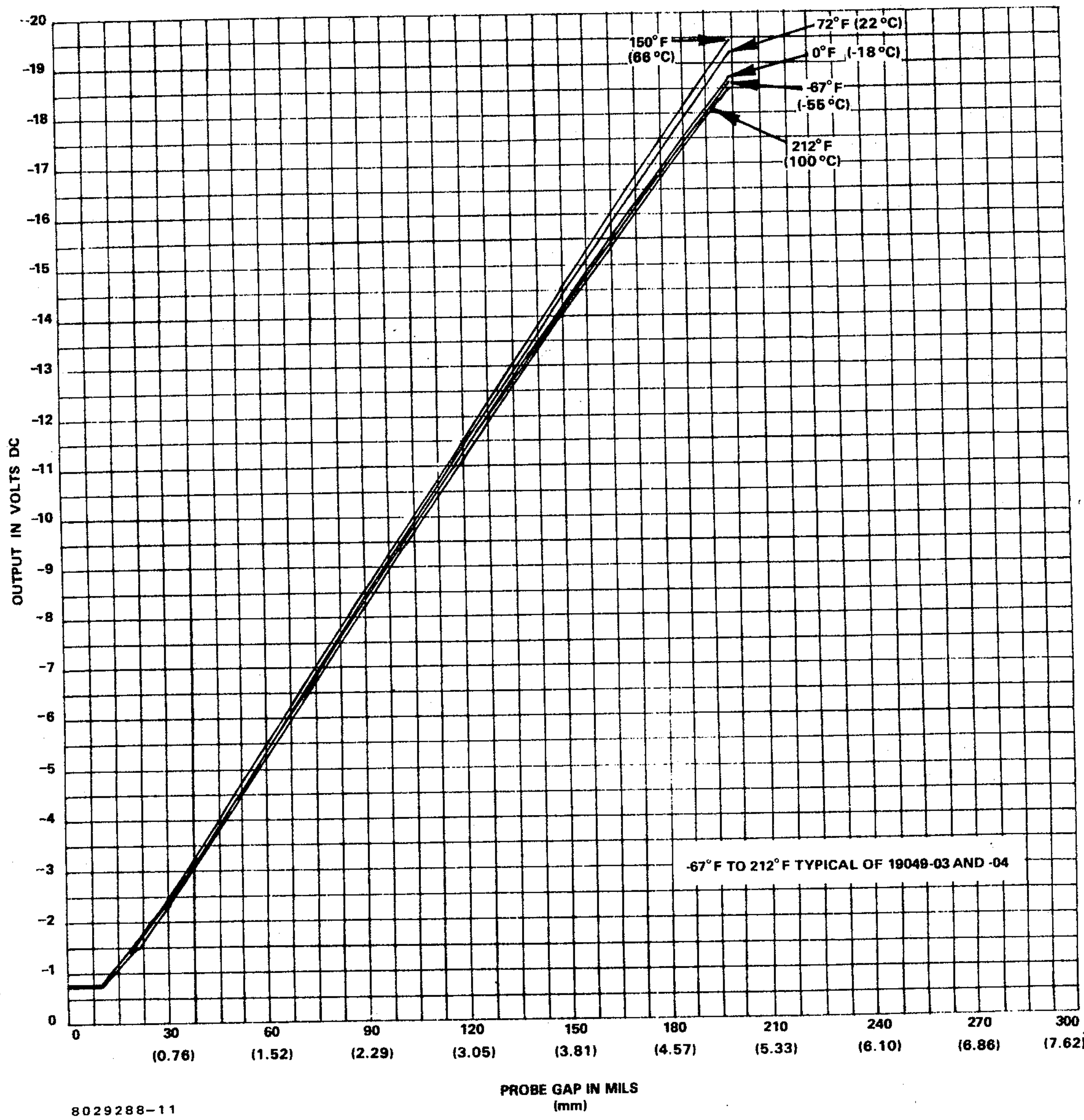


Figure C-9. 11 Millmeter Proximitor (Model 19049) Temperature Sensitivity

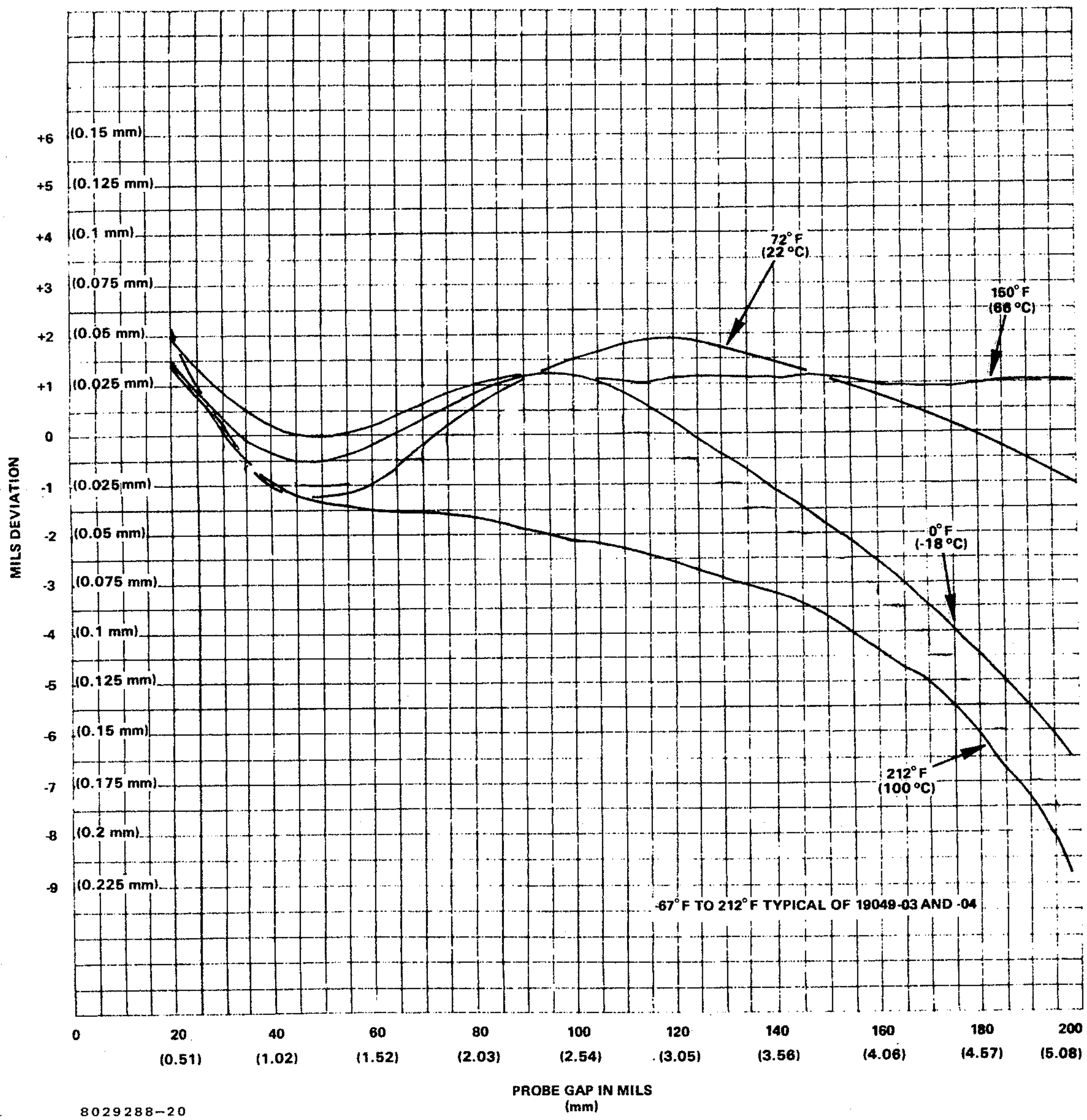


Figure C-10. Typical Deviation from Straight Line - Proximitor at Temperature

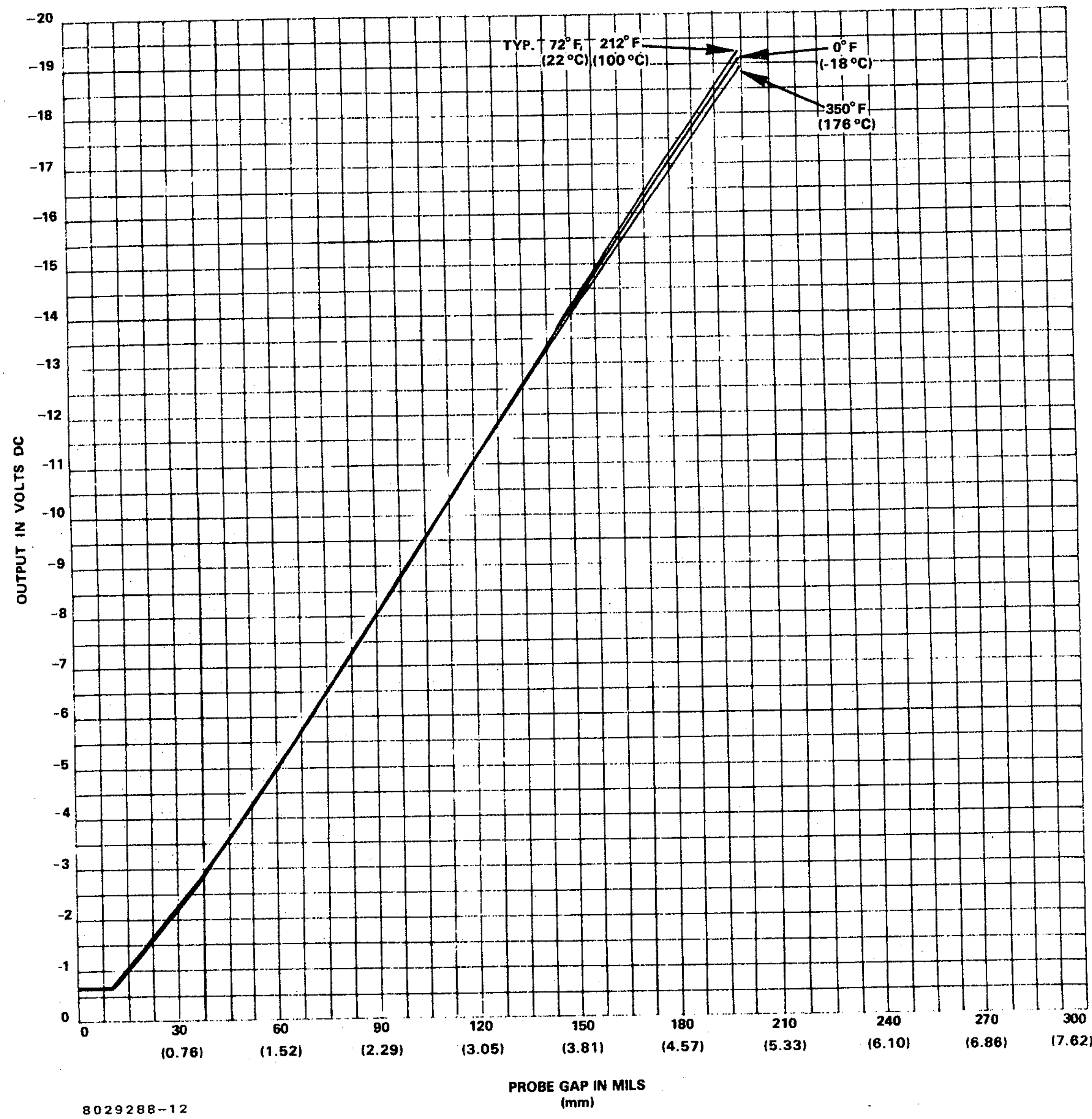


Figure C-11. Extension Cable Temperature Effects

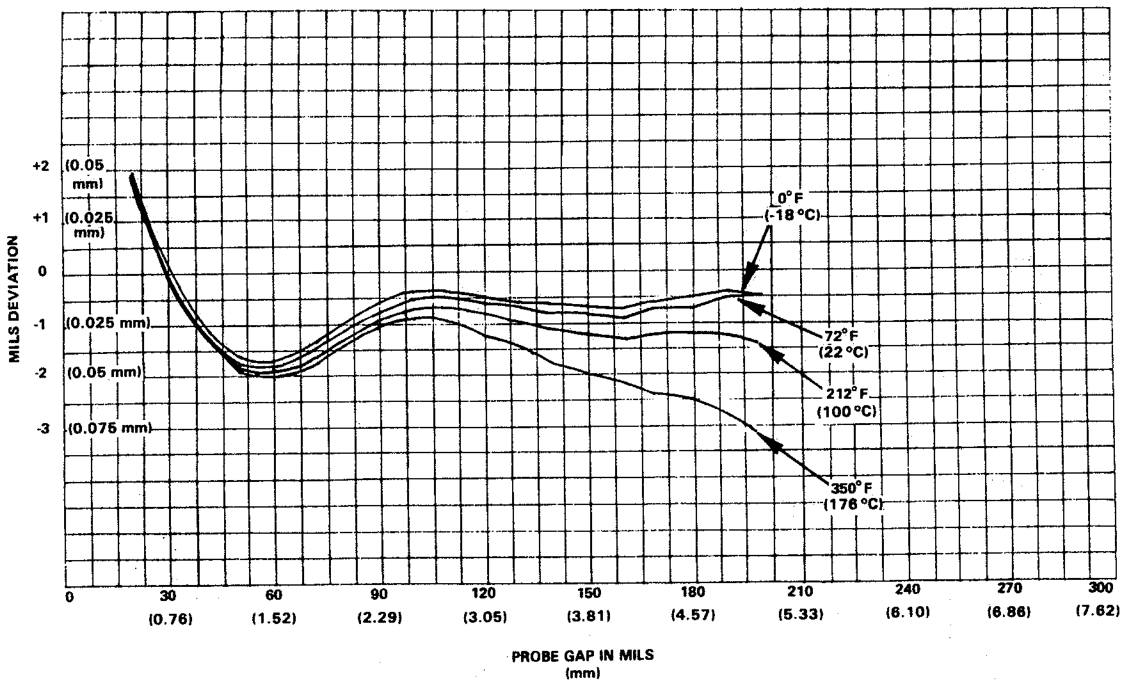


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Figure C-12. Typical Deviation from Straight Line – Extension Cable at Temperature

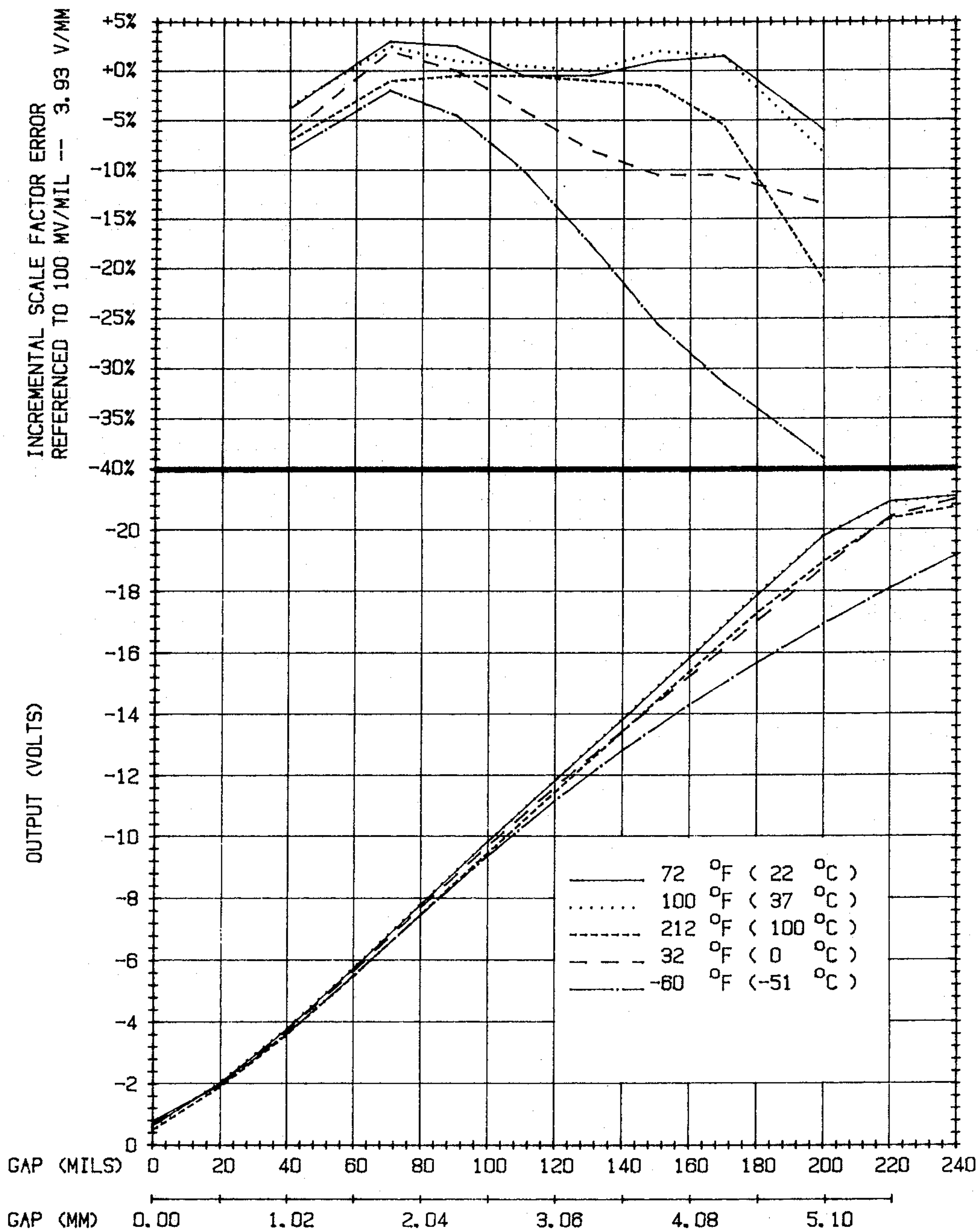

Figure C-13. Probe and 1 Meter of Cable at 150° F (65° C), Proximitor and Remaining Cable at Temperature

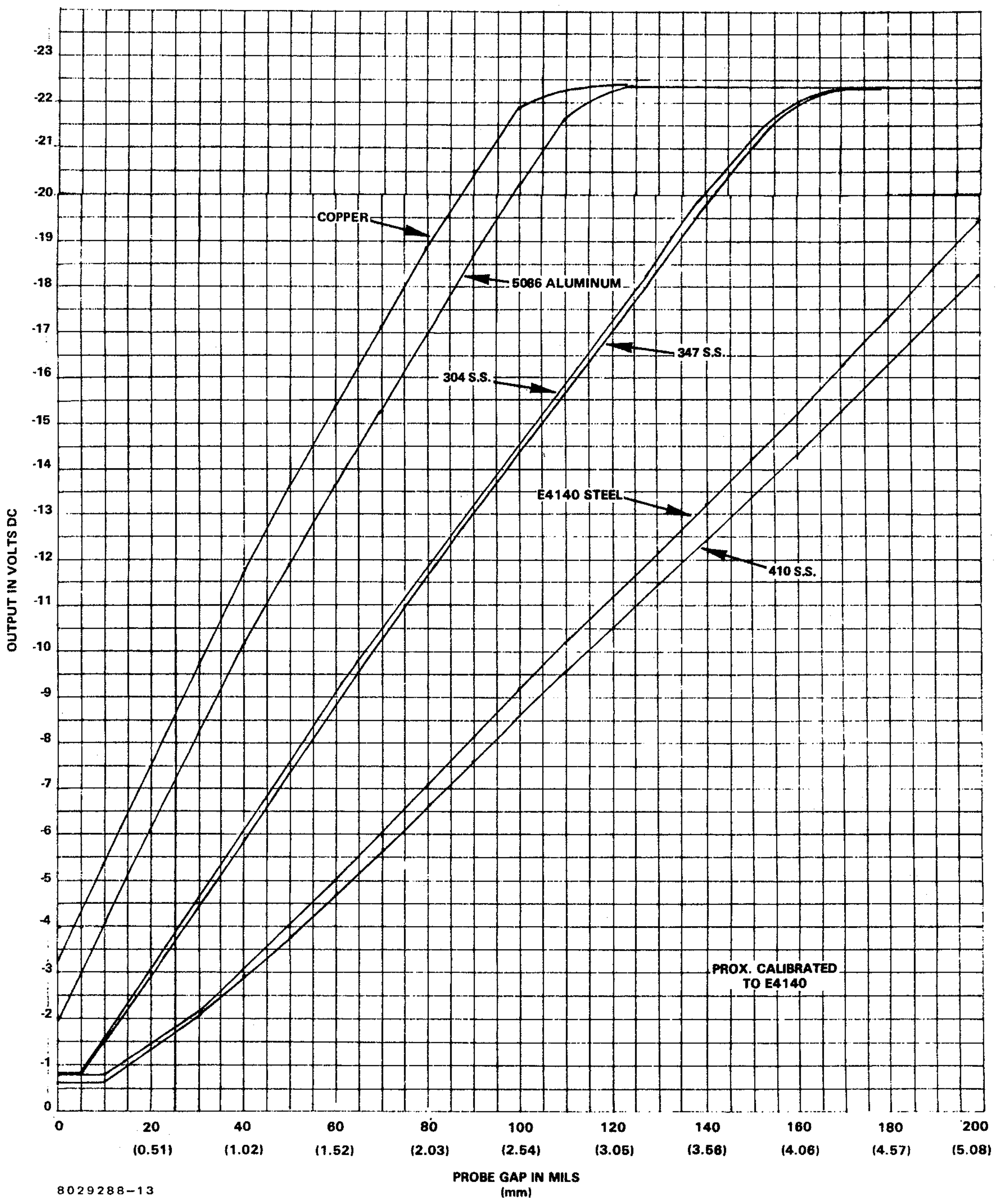

Figure C-14. Curves for Various Metals with Prox. Calibrated for E4140 Steel

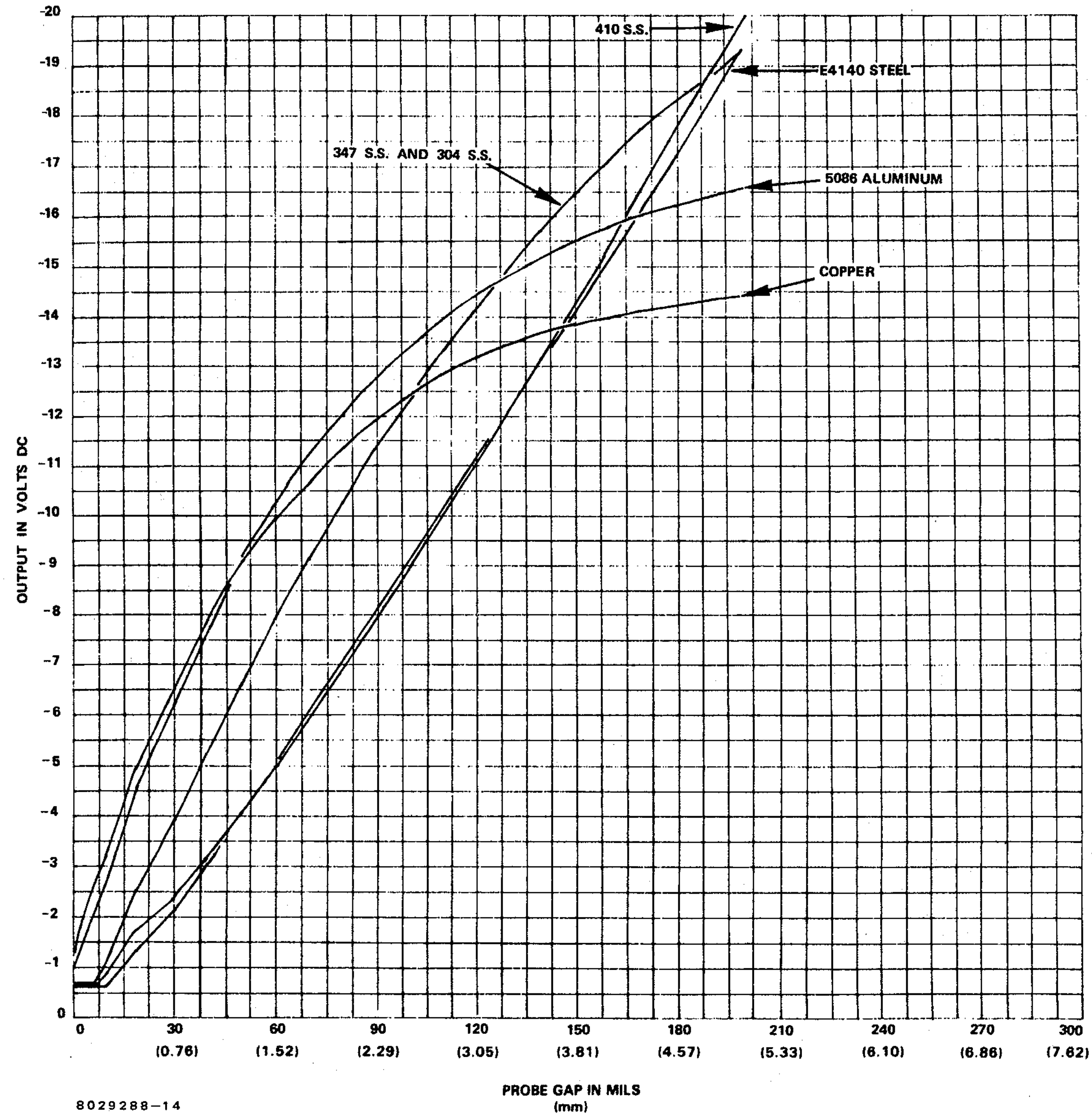

Figure C-15. Curves for Proximitor Recalibrated for Various Metals

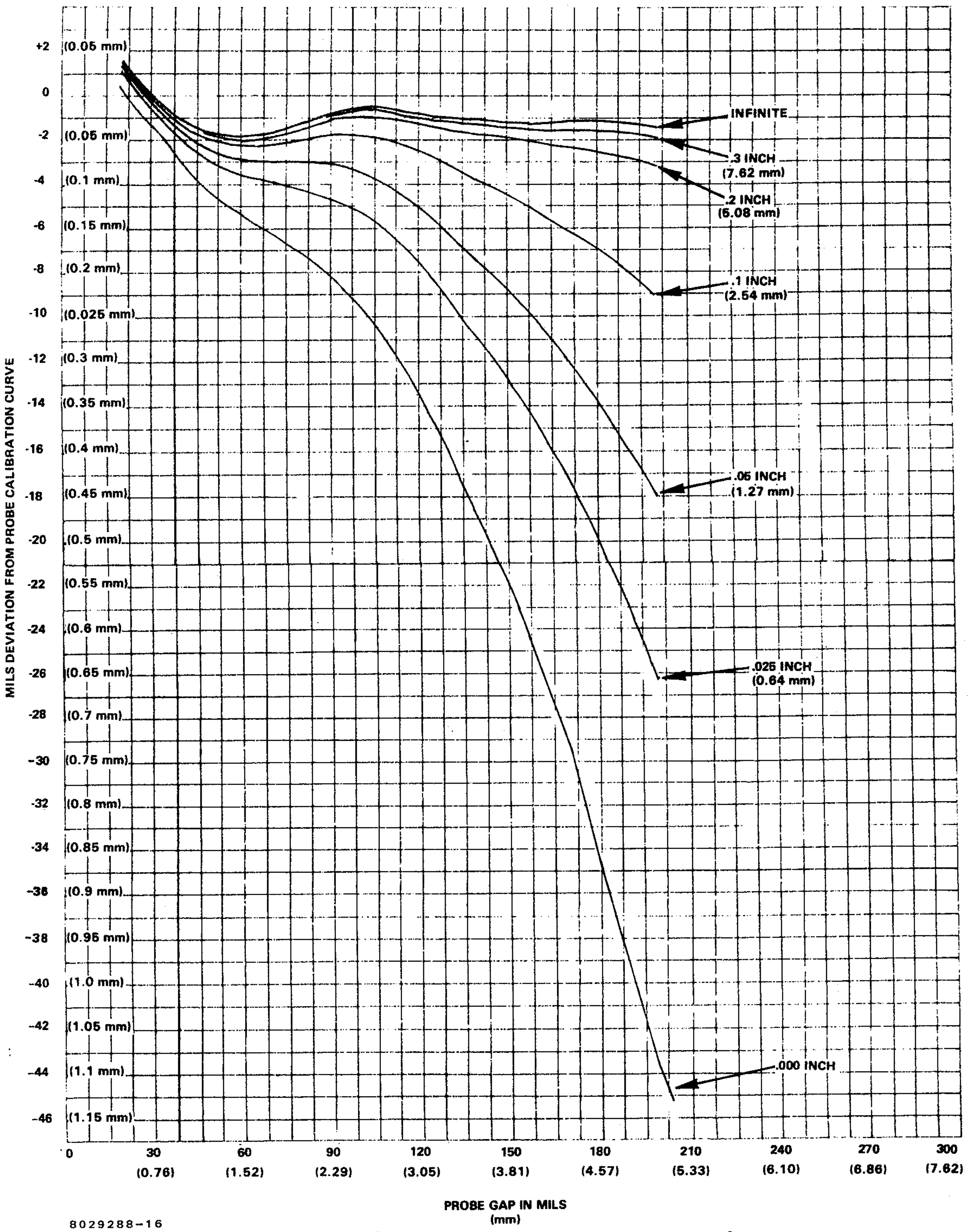

Figure C-16. Effects of Flat Surface Side Clearance

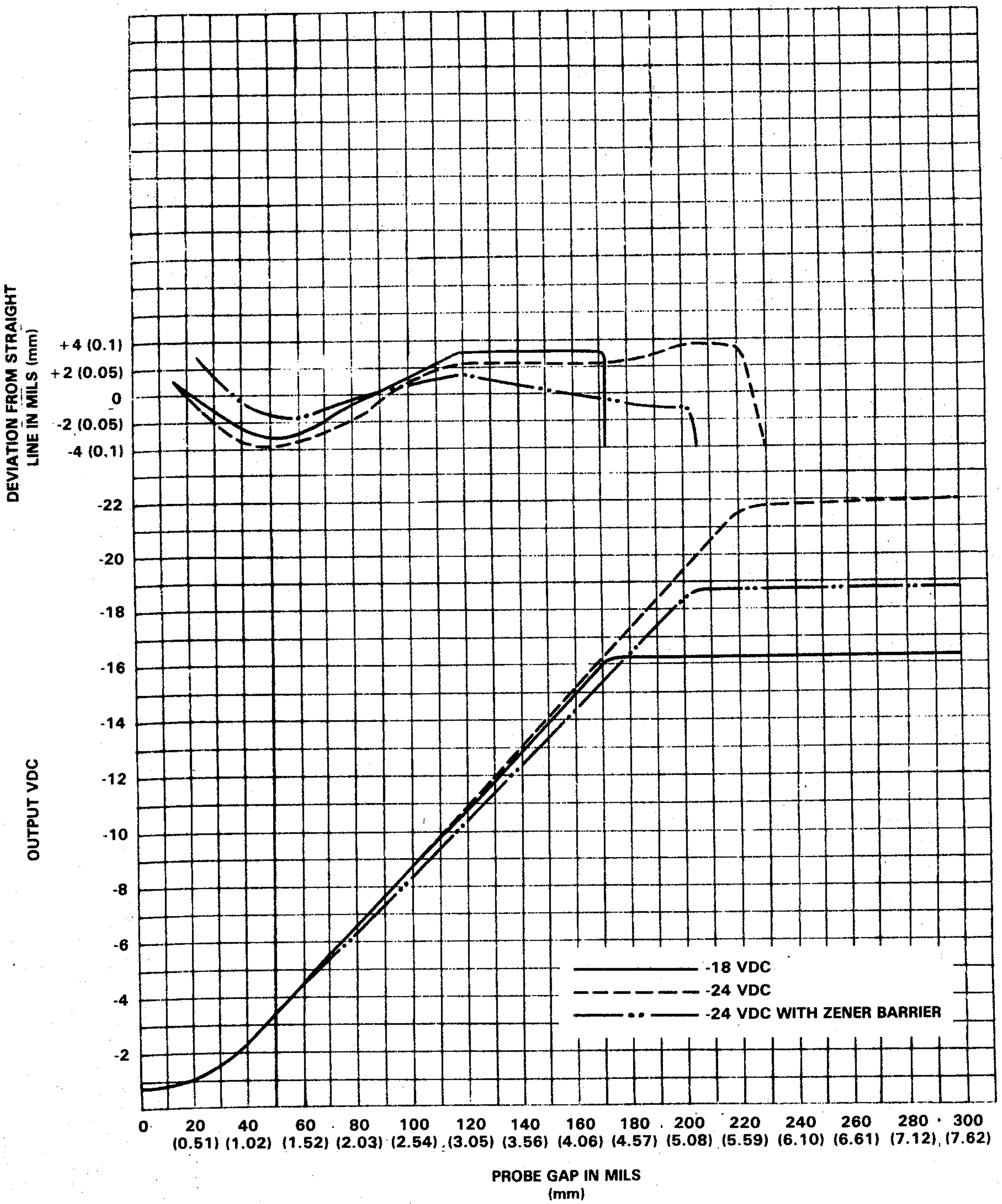

Figure C-17. Typical Proximitor Supply Sensitivity

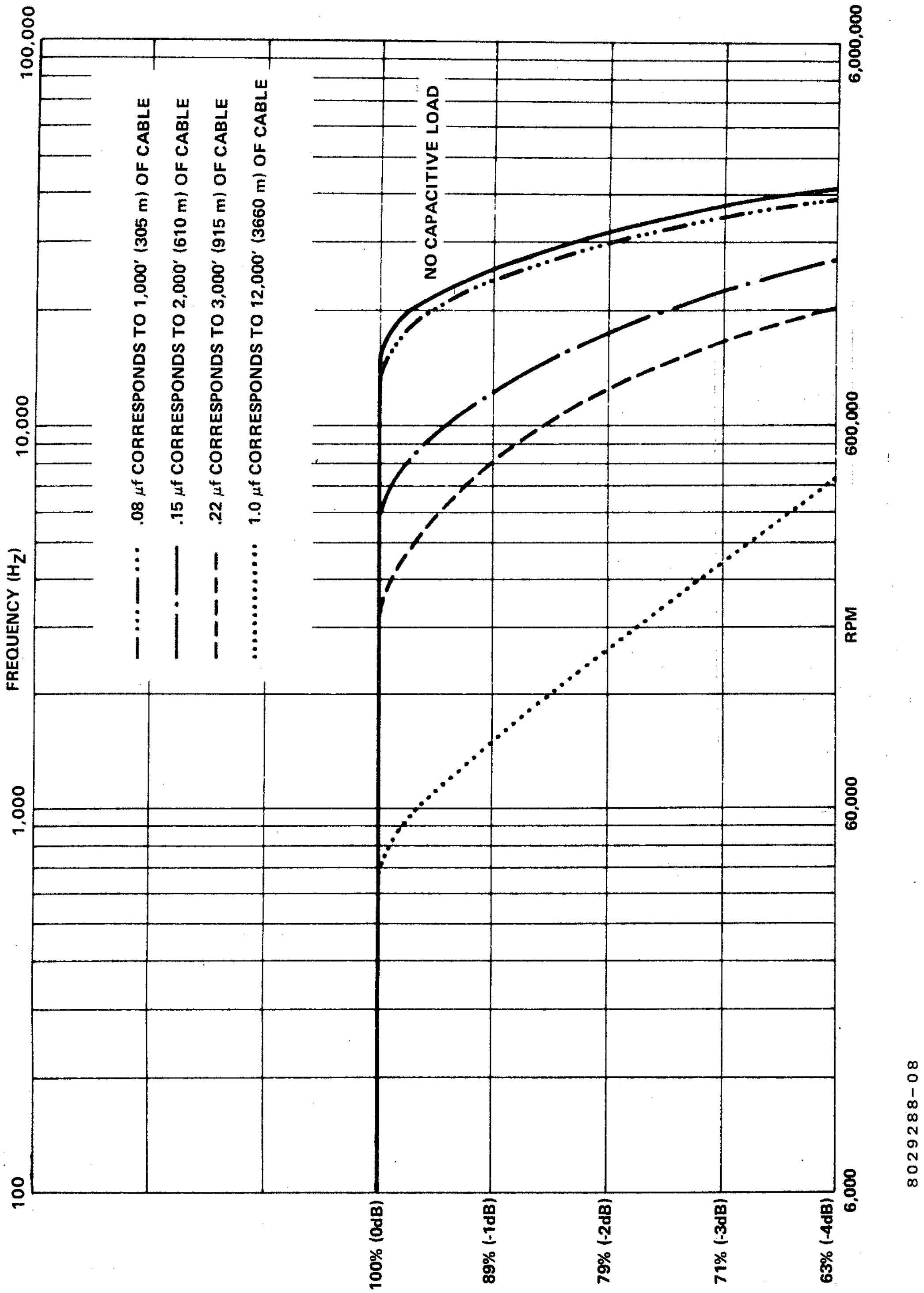

Figure C-18. Effect of Capacitive Load or Cable Length on Proximitor Frequency Response