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Manual No. [redacted]

25mm PROXIMITY SYSTEM

BENTLY NEVADA

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8029345

25 MM PROBE AND PROXIMITOR SYSTEM

April 1980
Revised December 1981

BENTLY NEVADA
P.O. Box 157 • Minden, Nevada USA 89423 • (702) 782-3611 • Telex: 354437

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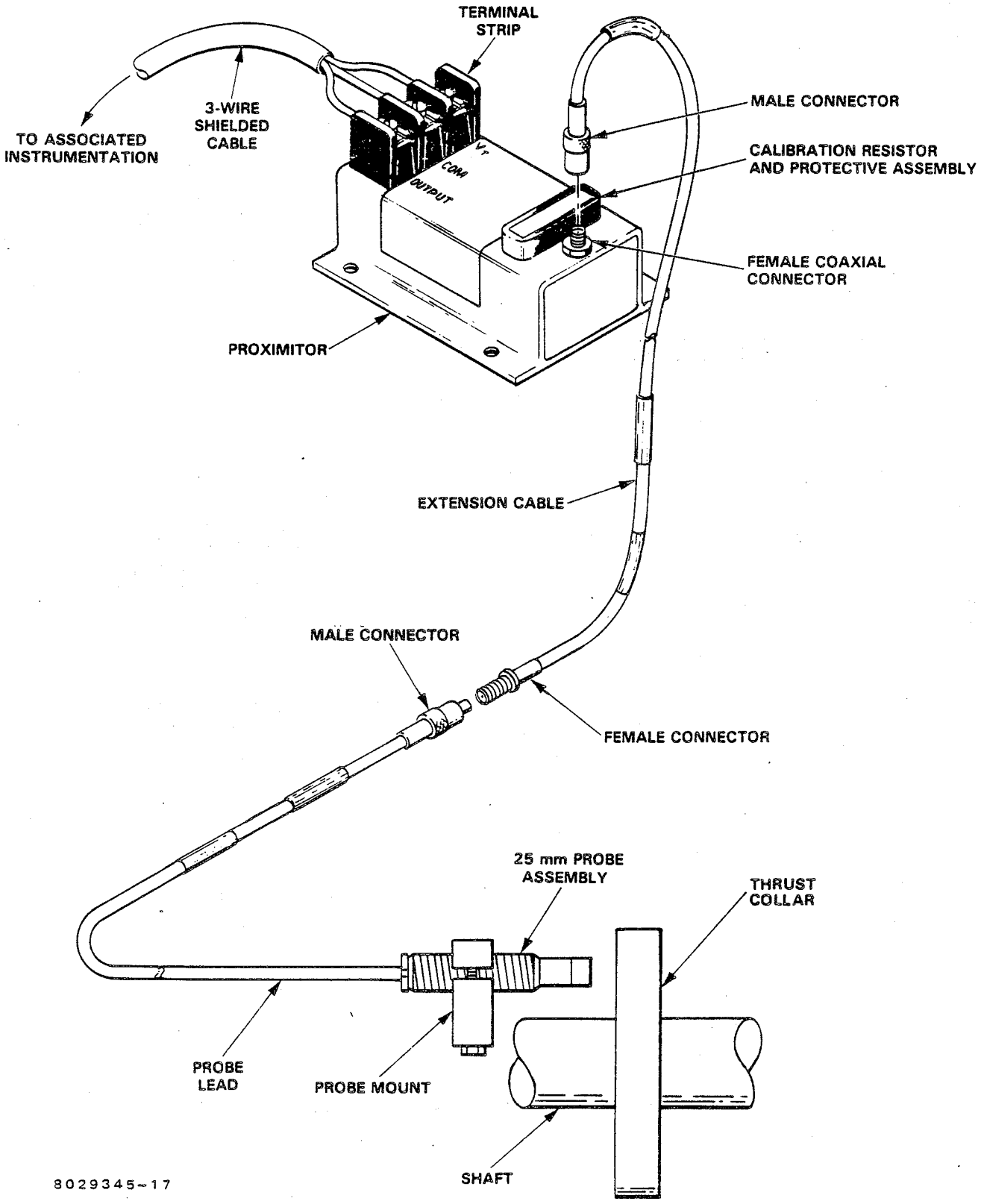


Figure 1-1. 25 mm Probe/Proximitor System, Typical

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SECTION 1

DESCRIPTION AND OPERATION

1.1 GENERAL

The 25 Millimeter Probe/Proximitor System, shown in Figure 1-1, is a transducer that converts the gap between the probe tip and an observed surface into a proportional dc output voltage. This voltage is generally input to instrumentation to indicate and monitor shaft position information.

1.2 PHYSICAL DESCRIPTION

The transducer system consists of a probe with probe lead, extension cable and Proximitor. A probe having either 5 m or 9 m lead length does not use an extension cable.

1.2.1 PROBE

The probe (Figure 1-2) consists of a tip, case, lead, label, identification sleeve, and connector. The probe tip is approximately 25 mm (1 inch) in diameter and is constructed of polyimide thermoplastic in which a fine wire coil is encapsulated. The case is 300 series stainless steel and is available nonthreaded and in two threaded versions: 1.250-12 UNF-2A and M30 x 1.5 threads. Nonthreaded probes also include a mounting clamp.

The probe lead is a high-strength, 95-ohm coaxial cable that is available in three lengths; 1.0 m, 5 m, and 9 m. The probe catalog number and serial number are printed on a label that is secured to the cable with clear Teflon shrink tubing.

A piece of the clear Teflon tubing (not shrunk) is also inserted on the cable for use during installation as a customer identification sleeve.

Probe leads are available with flexible armor. The armor is stainless steel, crimped to the probe body and covered with Teflon to prevent penetration by fluids.

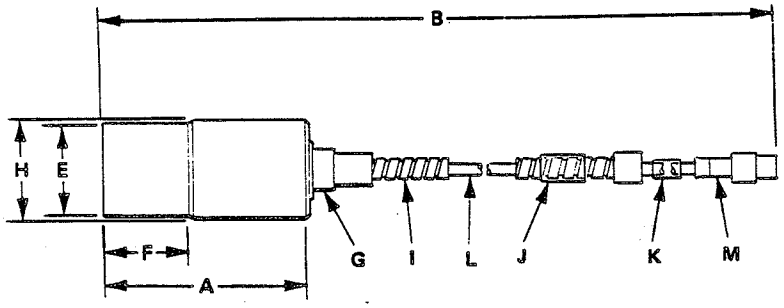
1.2.1.1 Probe Options

The probe options available to the user are documented by the catalog number and include the following: cable exit, armor, nonthreaded case length, case length, cable length, and connector. Figure 1-2 shows ordering information for the 25 mm probes. Table 1-1 lists the available types of 25 mm probes and the option codes specific to each.

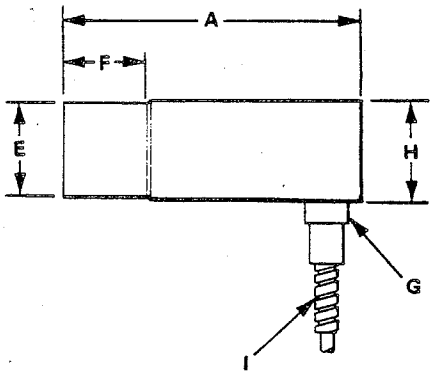
1.2.2 EXTENSION CABLE

An extension cable of the proper electrical length is required for probes having lead lengths of 1.0 m. Probes having 5 or 9 m lead lengths are connected

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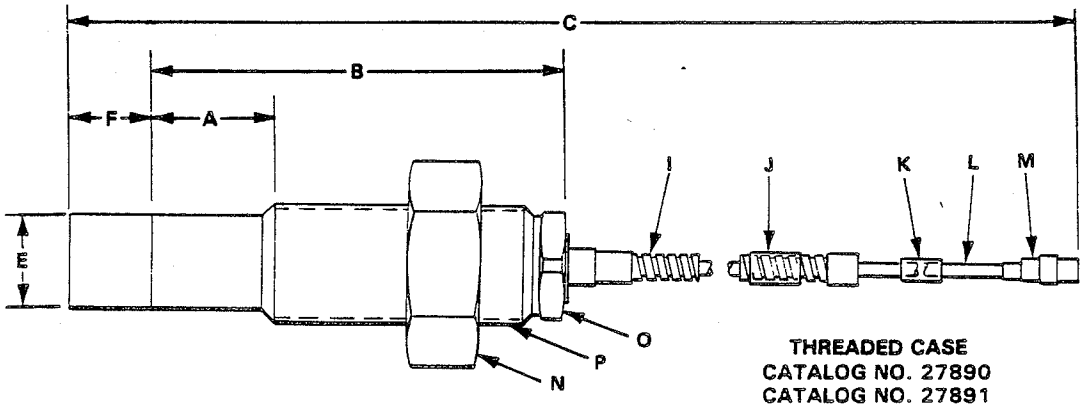


NON-THREADED CASE
REAR EXIT
CATALOG NO. 24653-2



NON-THREADED CASE
SIDE EXIT
CATALOG NO. 24653-1

KEY	NONTHREADED CASE 24653-1, 24653-2	
A	PROBE LENGTH OPTION	
B	CABLE LENGTH OPTION	
G	PROBE LEAD EXIT OPTION	
H	NONTHREADED PROBE BODY DIAMETER 1.0625 ± 0.0050 INCH (26.987 ± 0.130 mm)	
KEY	**THREADED CASE 27890, 27891**	
A	NONTHREADED CASE LENGTH OPTION	
B	PROBE CASE LENGTH OPTION	
C	CABLE LENGTH OPTION	
N	JAM NUT	PROBE 27890: 1 7/8 INCH HEX PROBE 27891: 46 mm HEX
O	WRENCH HEX	PROBE 27890: 1 1/8 INCH HEX PROBE 27891: 27 mm HEX
P	PROBE BODY THREAD	PROBE 27890: 1.25-12 UNF-2A PROBE 27891: M30 X 1.5
KEY	**NONTHREADED AND THREADED CASE**	
I	ARMOR OPTION	
J	PROBE IDENTIFICATION LABEL	
K	UNSHRUNK TUBING FOR CUSTOMER IDENTIFICATION	
L	90 OHM COAXIAL CABLE	
M	MINIATURE COAXIAL CONNECTOR, MALE	
E	PROBE TIP DIAMETER 1 INCH (25.4 mm)	
F	PROBE TIP LENGTH 0.875 INCH (22.2 mm)	



THREADED CASE
CATALOG NO. 27890
CATALOG NO. 27891

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Figure 1-2. 25 mm Probe Dimensions, Options, and Components

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Table 1-1. 25mm Probe Options

ORDERING INFORMATION

BENTLY NEVADA CATALOG NUMBER; NONTHREADED PROBE:



Option Code	Cable Exit	Option Code	Armor	Option Code	Probe Length	Option Code	Lead Cable Length*	Option Code	Miniature Coaxial Connector
1	Side	1	None		0.1 inch (2.5 mm)	10	1.0 m	0	None
2	Rear	2	With		Increments	50	5 m	2	With
				17	**	90	9 m		
				99	9.9 inches (251 mm) Maximum				

*Includes length of probe assembly.

** Minimum length 2.7 inches for side exit versions, 1.7 inches for rear exit version.

BENTLY NEVADA CATALOG NUMBER; 1.250-12 UNF-2A THREADED PROBE:



Option Code	Armor	Option Code	Nonthreaded Length	Option Code	Probe Length	Option Code	Lead Cable Length*	Option Code	Miniature Coaxial Connector
1	None		0.1 inch (2.5 mm)		0.1 inch (2.5 mm)	10	1.0 m	0	None
2	With		Increments		Increments	50	5 m	2	With
		00	0.0 inch (0.0 mm) Minimum	14	1.4 inches (36 mm) Minimum	90	9 m		
		84	8.4 inches (213 mm) Maximum	99	9.9 inches (251 mm) Maximum				

*Includes length of probe assembly.

BENTLY NEVADA CATALOG NUMBER; M30 x 1.5 THREADED PROBE:



Option Code	Armor	Option Code	Nonthreaded Length	Option Code	Probe Length	Option Code	Lead Cable Length*	Option Code	Miniature Coaxial Connector
1	None		10 mm Increments		10 mm Increments	10	1.0 m	0	None
2	With					50	5 m	2	With
		00	0 mm Minimum	03	30 mm Minimum	90	9 m		
		22	220 mm Maximum	25	250 mm Maximum				

*Includes length of probe assembly.

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directly to the appropriate Proximitor. The extension cable, shown in Figure 1-3, includes male and female coaxial cable connectors, two clear teflon sleeves and labels, and, if specified, stainless steel armor covered with teflon. The extension cable catalog number is printed on a label that is secured to the cable with clear teflon shrink tubing. A peice of the teflon tubing (not shrunk) is installed on the cable for use as a customer identification sleeve.

The 24710 extension cable is the same type of 95-ohm coaxial cable used for the probe lead.

CAUTION

The 24710 cable is not the same cable
that is used on the 5 mm system.

******

1.2.2.1 Extension Cable Options

The extension cable options are documented by the catalog number and include cable length and armor. Figure 1-3 is an outline drawing showing the available options and the extension cable catalog number.

1.2.3 PROXIMITOR

The Proximitor, shown in Figure 1-1, is an encapsulated assembly that includes a housing, terminal strip, printed circuit board assembly, coaxial connector, and calibration resistor in a protective assembly. The housing, which is an aluminum extrusion with two end caps, has an impact-resistant nylon terminal strip with three 6-32 screw-type connections. The printed circuit assembly is encapsulated in epoxy resin for environmental protection. The female coaxial connector has a gold-plated stainless steel outer shell, teflon insulator, and a gold-plated brass center contact that mates with the extension cable male connector. The calibration resistor is a metal-film, factory-selected component protected by an epoxy fiberglass shield and a silicone rubber coating.

1.2.3.1 Proximitor Options

The Proximitor options are documented by the catalog number and include operating temperature range and length of probe lead plus extension cable required for proper operation. The Proximitor catalog number and option numbers are listed in Table 1-2.

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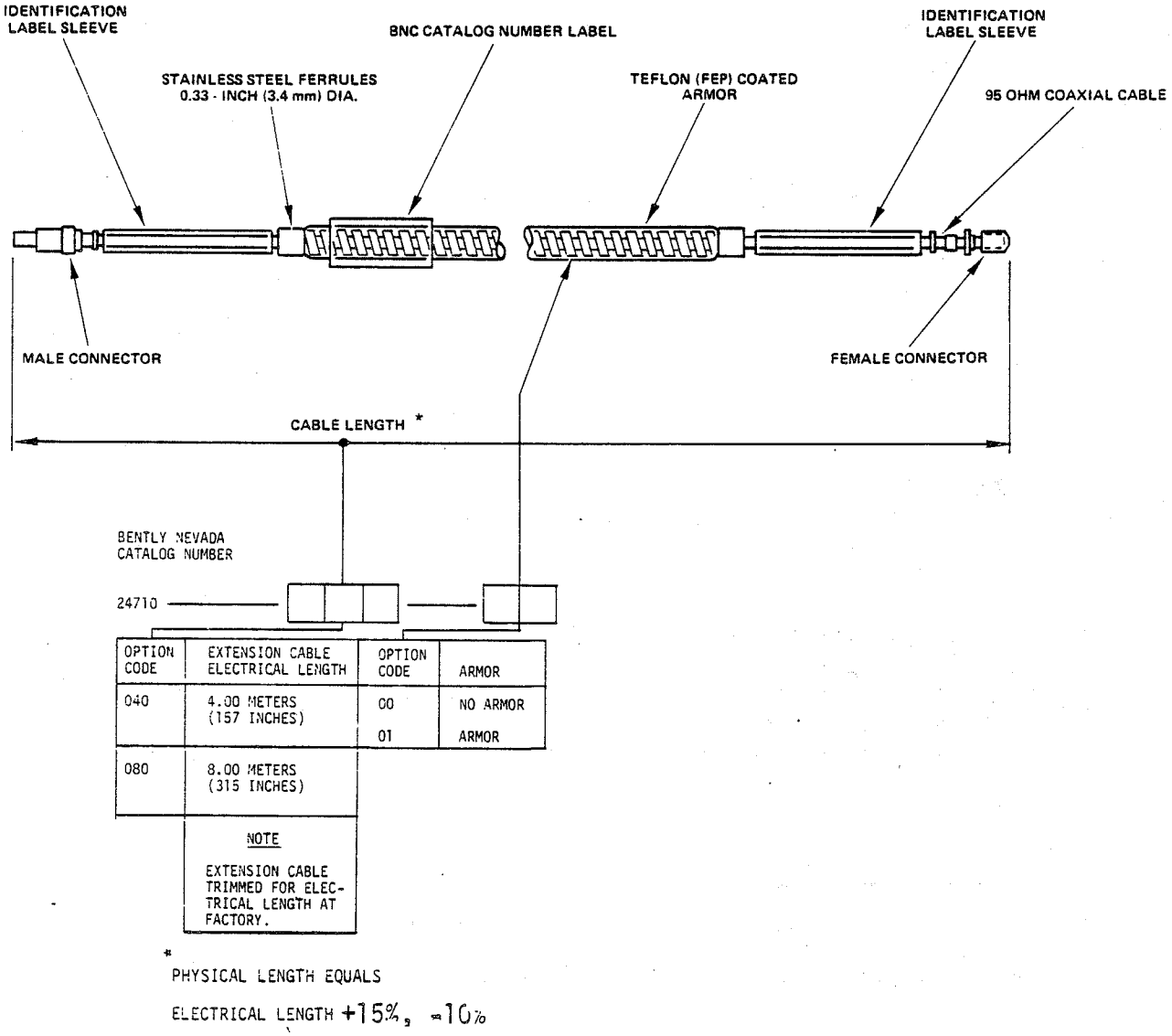


Figure 1-3. Extension Cable With Options

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Table 1-2. 25 mm Proximitor Options

BNC Catalog Number

24654-[ ][ ]

Option Code	Description
01	Requires 5 m total probe lead-plus-extension cable electrical length. Operating temp = 0°C (32°F) to 70°C (158°F).
02	Requires 9 m total probe lead-plus-extension cable electrical length. Operating temp = 0°C (32°F) to 70°C (158°F).
03	Requires 5 m total probe lead-plus-extension cable electrical length. Operating temp = -36°C (-30°F) to 100°C (212°F).
04	Requires 9 m total probe lead-plus-extension cable electrical length. Operating temp = -36°C (-30°F) to 100°C (212°F).

1.3 FUNCTIONAL DESCRIPTION

The 25 mm probe/Proximitor system is used primarily for position measurements such as shaft alignment, thrust position, and differential expansion. The system generates a signal voltage proportional to the gap between the probe tip and an observed surface.

1.3.1 GAP-TO-VOLTAGE CONVERSION

The Proximitor, powered by -18 Vdc to -24 Vdc supply voltage, generates a radio frequency (rf) output voltage which is applied through the extension cable and probe lead to the probe tip coil. The coil radiates rf energy in the form of an alternating magnetic field that induces eddy currents in the observed conductive material. The eddy currents increase in amplitude as the observed surface approaches the probe tip, thus causing a power loss in the probe/Proximitor system and a corresponding decrease in the rf voltage of the probe coil. As the conductive material moves closer to the probe tip, the voltage decreases proportionally. The Proximitor measures the peak amplitude of the rf voltage to provide a proportional dc output voltage that is applied to associated instrumentation. If the gap remains constant, the output voltage remains constant; if the gap varies as a function of time, the output voltage changes accordingly.

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SECTION 2

INSTALLATION

2.1 GENERAL

This section contains receiving inspection procedures, installation considerations, and procedures for installing the probe, extension cable, and Proximitor, which are normally shipped as separate units and must be interconnected at the installation site by the user.

2.2 RECEIVING INSPECTION

Visually inspect the probe, extension cable, and Proximitor immediately upon acceptance to determine if any shipping damage has occured. Retain all shipping forms and invoices. If shipping damage is apparent, file a claim with the carrier and submit a copy to Bently Nevada Corporation. Include the equipment catalog number, serial number, and appropriate option numbers in Tables 1-1, 1-2, and Figure 1-3 with all correspondence. The user will be advised concerning replacement in accordance with the guarantee.

2.3 INSTALLATION CONSIDERATIONS

2.3.1 OBSERVED SURFACE

The 25 mm transducer system is calibrated during production for American Iron and Steel Institute (AISI) E4140 steel. If the observed surface is a material having a conductivity or permeability that differs from 4140 steel, the transducer operation will deviate from the typical curve shown in Figure 1-4.

The Proximitor can be recalibrated for several metals other than 4140 steel by changing the calibration resistor. This is most easily done by returning the Proximitor to Bently Nevada Corporation and specifying the target material.

NOTE

Observed surfaces plated with a conductive material require special attention. The plating can alter the effective conductivity and magnetic characteristics of the observed surface thereby introducing electrical runout. Avoid chrome plating if possible. If it is necessary to observe a plated part, contact the nearest Bently Nevada office for assistance.

Residual magnetism and other conditions in an observed surface can cause electrical runout which will introduce error in the Proximitor output voltage. Electrical runout should be eliminated. The various techniques for eliminating electrical runout are described in "Electrical Runout and Eddy Current Displacement Proximity Transducers" published by Bently Nevada Corporation.

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2.3.2 CROSS-COUPLING

The magnetic fields of probe tips mounted too close together will cross-couple, causing a small-amplitude apparent vibration signal to be superimposed on the Proximitor outputs. To prevent cross-coupling, probe tips should be mounted at least 4 inches (100 mm) apart.

2.3.3 SIDE CLEARANCE

The probe magnetic field radiates primarily in an axial direction from the tip of the probe, but also radiates partially from the sides of the probe tip. Conductive material at the side of the probe, therefore, will be sensed and will affect system calibration. To reduce this effect to a negligible level, the conductive material on the sides of the probe should be no closer than the minimum distance from the tip shown in Figure 2-1. A counterbore can be used to obtain the required clearance if brackets or machine parts are too close to the observed surface. The typical effect on flat surface side clearance on transducer performance is graphed in Figure 2-2. This effect will vary in actual applications due to surface material and mounting configurations.

NOTE

If it is not possible to obtain the required clearance, the transducer can be recalibrated with the probe in position. This is difficult and should be performed only as a last resort. If transducer recalibration is necessary to compensate for a below minimum side clearance, contact Bently Nevada Corporation for assistance.

2.3.4 BRACKET CONTRUCTION

User-supplied brackets or other structural members used to mount probes must be rigid. A flexible bracket will permit unwanted relative motion between the probe and the observed surface, resulting in false vibration signals. Natural bracket frequencies should be at least ten times the speed of the rotating machinery.

Brackets must support the probe perpendicular to the observed surface to orient the probe face parallel to the surface. The probe axis can vary approximately five degrees from perpendicular without significantly affecting the performance of the transducer system.

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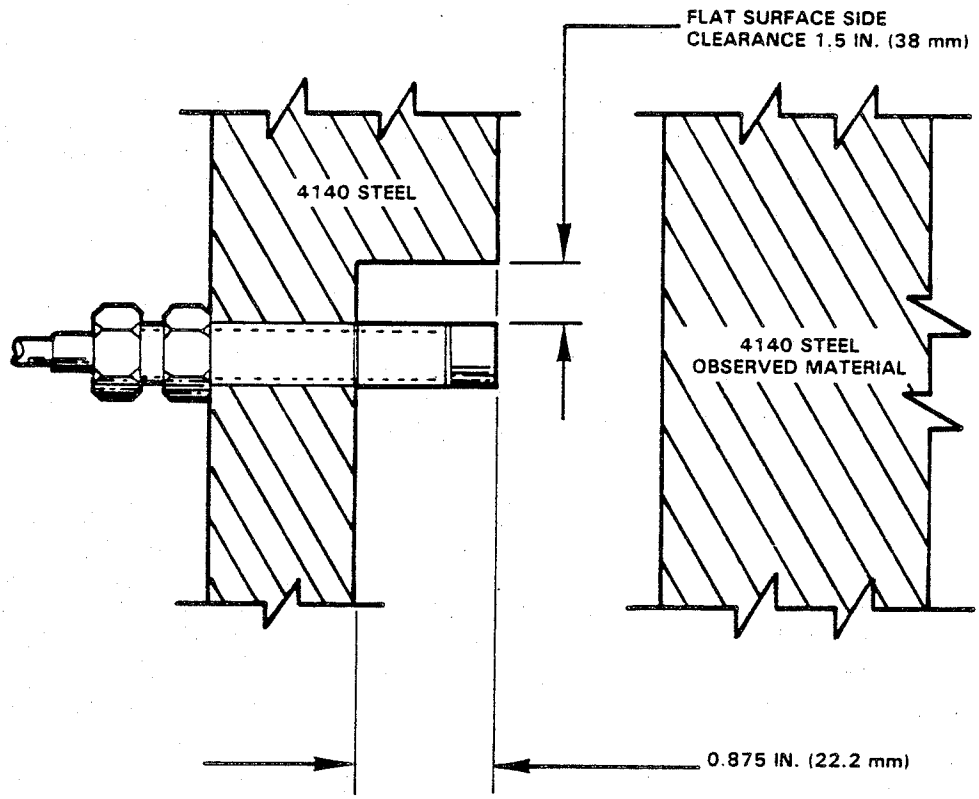
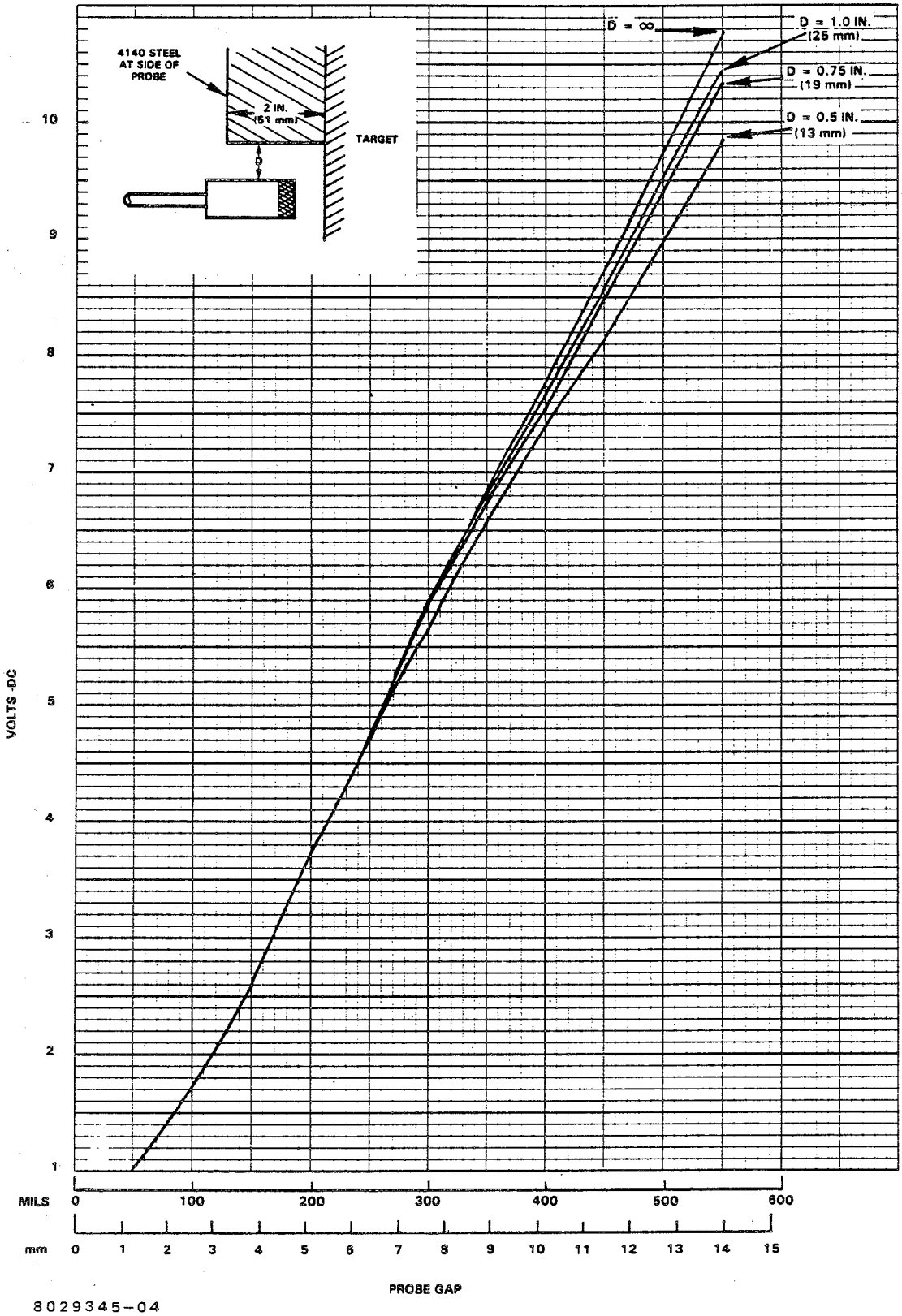


Figure 2-1. Probe Side Clearance Recommendations

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Figure 2-2. Calibration Deviation Caused by Insufficient Side Clearance

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2.3.5 CHEMICAL COMPATIBILITY

The probes are unaffected by exposure to petroleum-based greases and oils. They have good resistance to mild (less than 25%) concentrations of organic and inorganic acids, and to most solvents when exposure is short-term. Exposure to mineral acids, strong alkalies (ammonium hydroxide) and oxidizing agents should be avoided.

2.3.6 TEMPERATURE LIMITATIONS

2.3.6.1 Probe

Probe temperature sensitivity curves showing deviation from a straight line are shown in Figure 1-8. The extension cable temperature sensitivity curve is shown in Figure 1-9. In high temperature environments, it may be necessary to route the probe lead and extension cable inside lubrication oil lines or other temperature protected areas. Ensure the probe lead and extension cable are not subjected to temperatures consistently exceeding 177°C (350°F). The probe assembly can withstand temperatures up to 260°C (500°F) during brief periods.

2.3.6.2 Proximitor

The Proximitor must be mounted in a temperature environment that is neither higher nor lower than the operating temperatures shown for the Proximitor under paragraph 1.4.1, Specifications.

2.4 INSTALLATION PROCEDURES

2.4.1 PROBE

Probe mounting procedures differ depending on whether the probe body is nonthreaded or threaded and whether the probe-to-target gap is accessible for measurement. The probe mount can be a user-designed component, or for nonthreaded probes, the standard probe mount shown in Figure 2-3 can be used. The design may be configured for either nonthreaded or threaded probes. The mount may be attached to the machine case either directly or by means of a user-supplied bracket.

2.4.1.1 Mounting Probe

During probe mounting procedure, observe the following cautions:

CAUTION

1) Observed surface (target must be static.

2) Probe mounting hole or threads must be clean.

3) Probe lead cable must be free to turn with probe to prevent torque damage.

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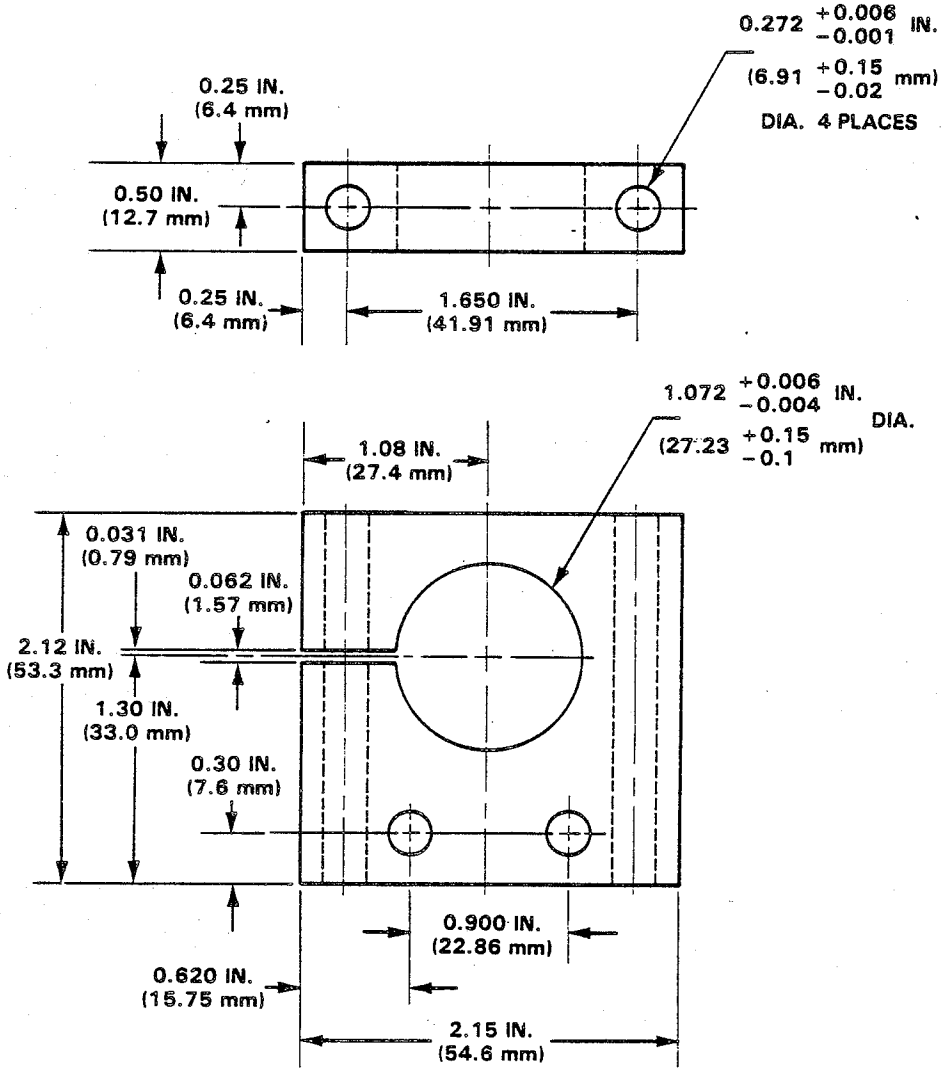


Figure 2-3. Probe Mount

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A general probe mounting procedure follows. Perform operations specific to the installation at appropriate places in the general procedure.

a. Determine the correct probe gap for the monitoring application. For position or expansion measurement, the gap must produce a signal voltage representative of the present position or expansion of the observed component. Refer to the monitor manual for range, gap, and scale information necessary to determine proper gap. Incorrect gap will cause monitor readout error and can prevent detection of an alarm condition.

b. Insert or thread the probe into the mount. If gap is not accessible for adjustment with a gauge, proceed to Step d.

c. Place a shim or gauge block equal to the desired probe gap against the target. Slide or thread the probe until it lightly touches the gauge; excessive contact force can damage the probe. Tighten the probe jam nut, clamp, or other retainer. Proceed to Paragraph 2.4.1.2.

d. Insert probe approximately three threads or 0.25 inch (6 mm) into the mount.

e. Connect probe lead (and extension cable if used) to Proximitor. Apply proper input voltage to Proximitor. Connect the digital multimeter between COM and OUTPUT at the Proximitor. The Proximitor output voltage indicates probe gap. Decreasing negative voltage results from decreasing gap. If the probe tip is close to conductive material located off to the side, the actual gap could be greater than indicated by voltage; see Figure 2-4.

f. Carefully slide or thread the probe toward target until Proximitor output voltage indicates the desired gap. Tighten the probe clamp, jam nut, or other retainer.

2.4.1.2 Securing the Probe Lead

With the probe secured in position, fasten the probe lead to a rigid surface with clips or other cable holding devices. Do not exert excessive pressure when tightening the clips or the Teflon insulation can cold flow.

NOTE

Ensure the length of the probe lead is sufficient to allow connection with the extension cable or Proximitor outside the mounting case. This permits repair or replacement of a connector or extension cable without disassembling the machine.

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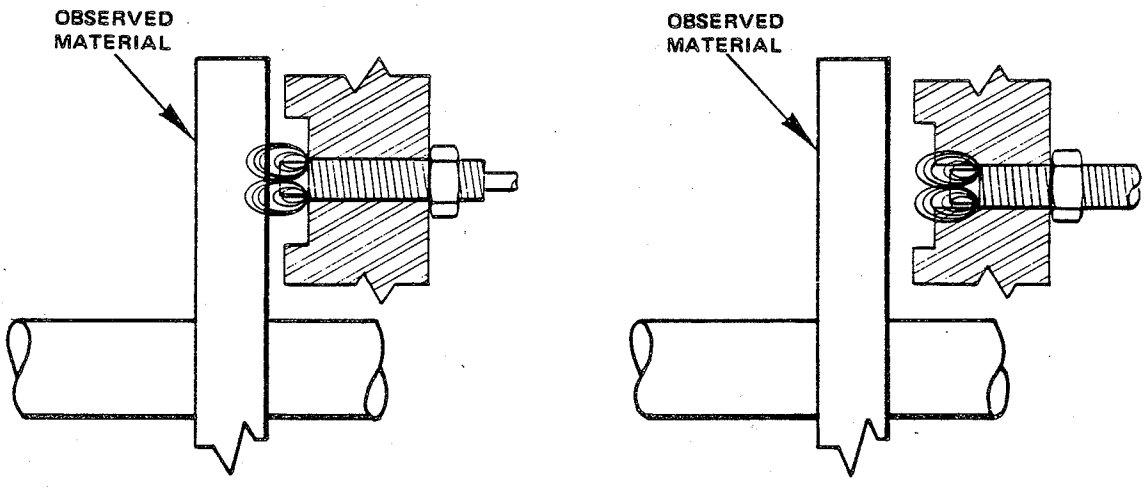


Figure 2-4. Gap Indications During Mounting

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2.4.1.3 Routing 5 or 9-Meter Probe Lead

A 5 or 9-meter length probe lead should be routed inside conduit. The probe-end of the conduit should connect to the machine case, and the other end should connect to the Proximitor enclosure. An extension cable is not used with a 5 or 9-meter probe lead.

2.4.1.4 Connecting Probe Lead to Extension Cable

The connectors are not watertight and must be kept from coming loose and becoming contaminated. The connector must also be electrically insulated to maintain transducer isolation. Therefore, connect the probe lead to the extension cable and either (1) wrap the connectors with Teflon tape, (2) cover with Teflon shrink tubing, or (3) encapsulate with RTV that does not have an acetic acid base.

2.4.2 EXTENSION CABLE

2.4.2.1 System Cable Length Requirements

Proximitors in the 25 mm Probe/Proximitor System operate with a total coaxial cable electrical length (probe plus probe lead plus extension cable) that is either 5 or 9 meters. Before installing the extension cable, ensure its electrical length plus the electrical length of the probe plus probe lead equals the total electrical cable length required by the corresponding Proximitor. Determine the electrical length by referring to Figures 1-2 and 1-3; and Table 1-1.

For example, the Proximitor with catalog number 24654-01 requires a 5-meter total coaxial cable electrical length and, therefore, can be connected to an extension cable with catalog number 24710-040-XX (4.0 meters) and a 25 mm probe having the 1.0 m lead cable length option number within the catalog number.

2.4.2.2 Routing the Extension Cable

Before routing the cable, insert the identification labels (provided by 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°F (149°C). If the cable is armor clad, install the label on the armor.

The extension cable should be routed inside conduit. One end of the conduit should be connected to a junction box containing the connection between the probe lead and extension cable, and the other end should be connected to an enclosure containing the Proximitor.

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NOTE

When routing the extension cable through conduit, wrap tape or a similar insulating and protective covering around the connectors prior to pulling the cable through the conduit. To prevent loss of isolation and damage, ensure the cable does not rub against rough or sharp surfaces.

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 damage. The armor should be terminated at one end in a junction box and at the other end in the Proximitor enclosure.

2.4.3 PROXIMITOR INSTALLATION

Proximitor installation requires consideration of location, mechanical and environmental protection, and power and signal connections as described in the following subsections. Refer to Figure 2-5 for Proximitor size and mounting dimensions.

2.4.3.1 Physical Location

Proximitors with part number 24654-01 and 24654-03 are designed to operate with 5 electrical meters (16.4 feet) of cable, but must be located within 4.5 meters (14.8 feet) of the probe tip because of coaxial cable manufacturing tolerances. Proximitors with part number 24654-02 and 24654-04, designed to operate with 9 electrical meters (29.5 feet) of cable, must be located within 8.1 meters (26.6 feet) of the probe tip.

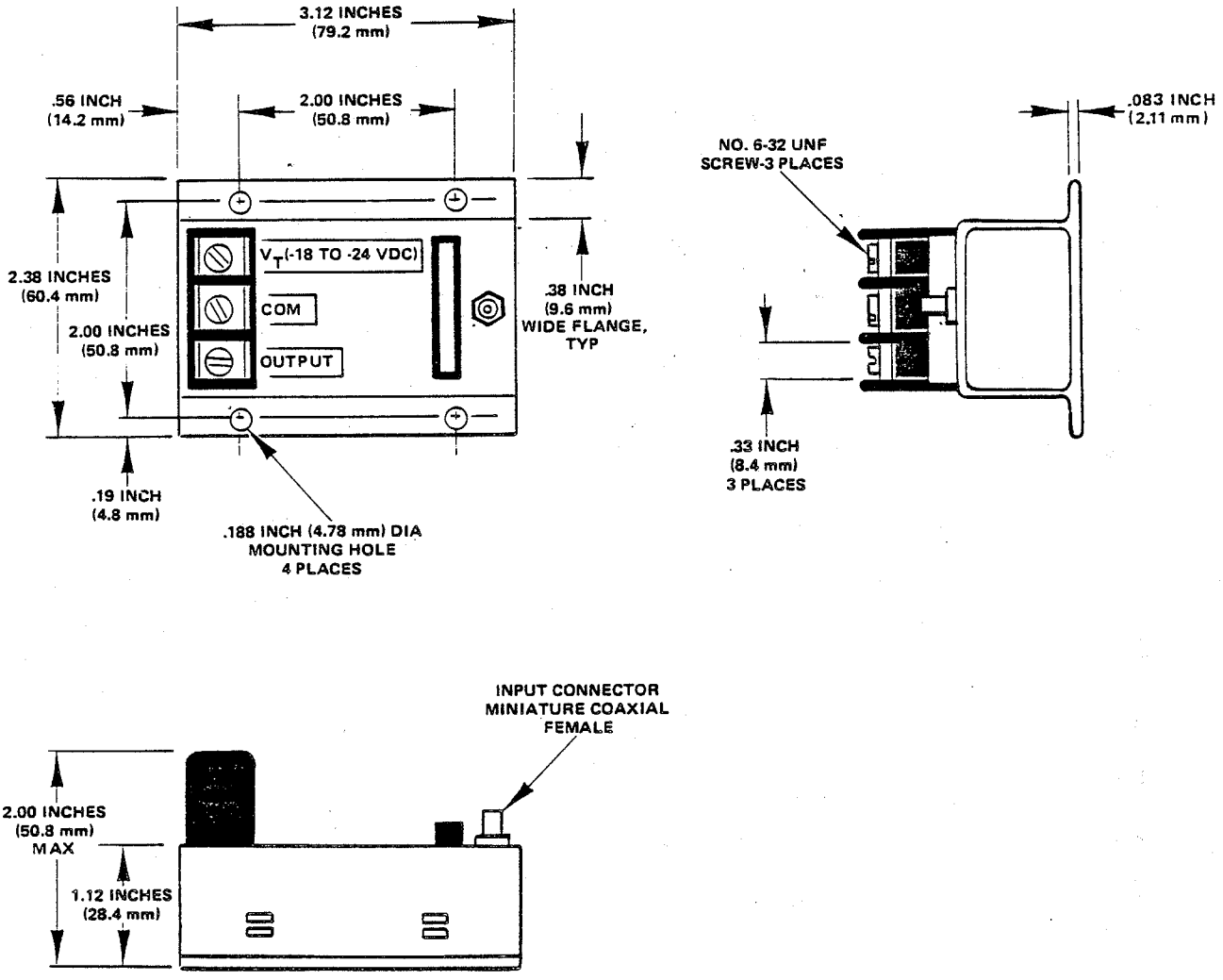
2.4.3.2 Proximitor Isolation/Shield Grounding

Proper isolation and shield grounding ensure that a minimum amount of noise will be induced in the signal conductors. Variations in transducer applications can require different isolation/shield grounding techniques. If the transducer applications described in this manual do not cover the user's installation, contact Applications Engineering, Bently Nevada Corporation for additional information.

Proximitor Isolation

The Proximitor should be electrically isolated from its mounting. One method of isolation is to mount the Proximitor unit in an optional weatherproof housing that has an isolated mounting plate. Housing part and option numbers are listed in Table 2-1. The housing sizes available from Bently Nevada Corporation are sufficient to mount multiple units.

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Figure 2-5. Proximitor Installation Data

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Proximitor isolation can also be accomplished as shown in Figure 2-6 by installing Isolation Kit 19094-01. The probe is internally insulated to provide shield isolation at the probe end. See Figure 2-7. The probe lead and extension cable shields, which are electrically connected to the Proximitor case, are also isolated from earth ground with teflon insulation. However, the connector joining the probe lead and extension cable is exposed, and therefore, must be insulated with a covering of non-conductive oil and water resistant tape or with Teflon shrink tubing.

Table 2-1. Weatherproof Proximitor Housings

BNC Catalog Number

7238(N) — 0 2 — [ ] [ ]

N	Housing Capacity
1	Two Proximitors
2	Four Proximitors
3	Six Proximitors

	Mounting Plate
02	Isolated

	Conduit Fittings
00	Without
02	With (2 Prox. Housing)
03	With (4 Prox. Housing)
C4	With (6 Prox. Housing)

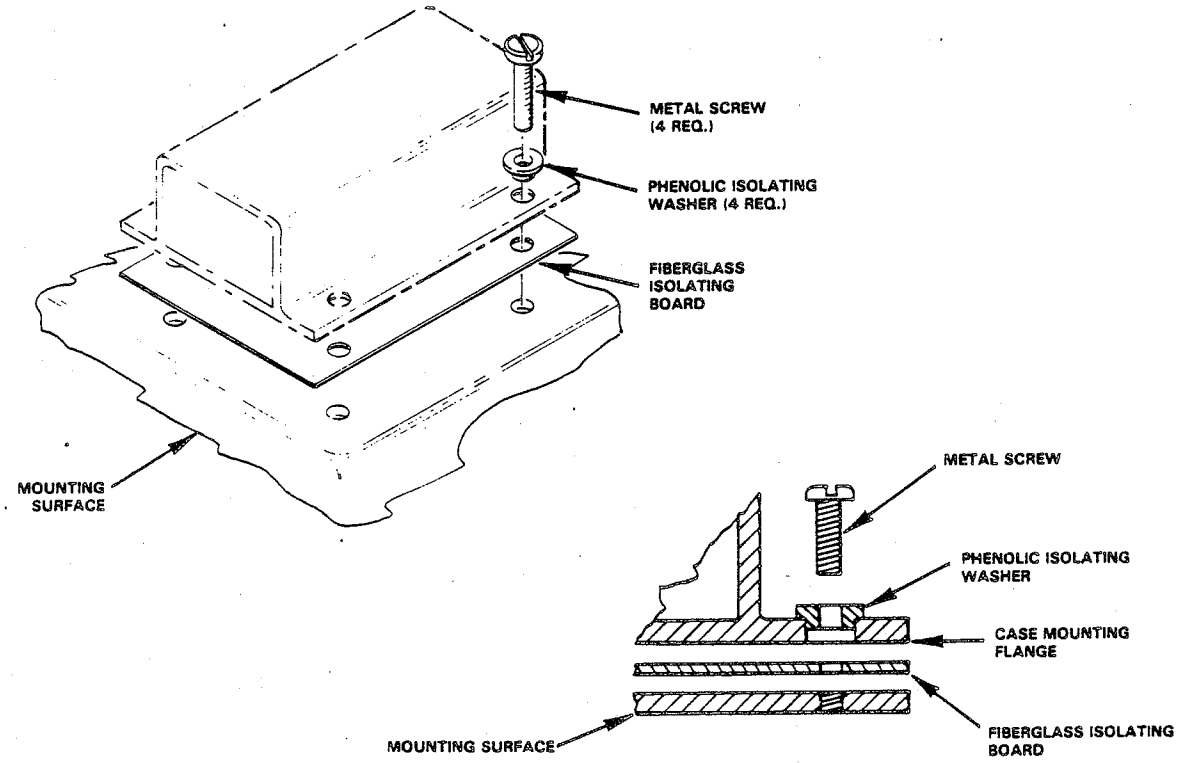


Figure 2-6. Proximitor Isolation

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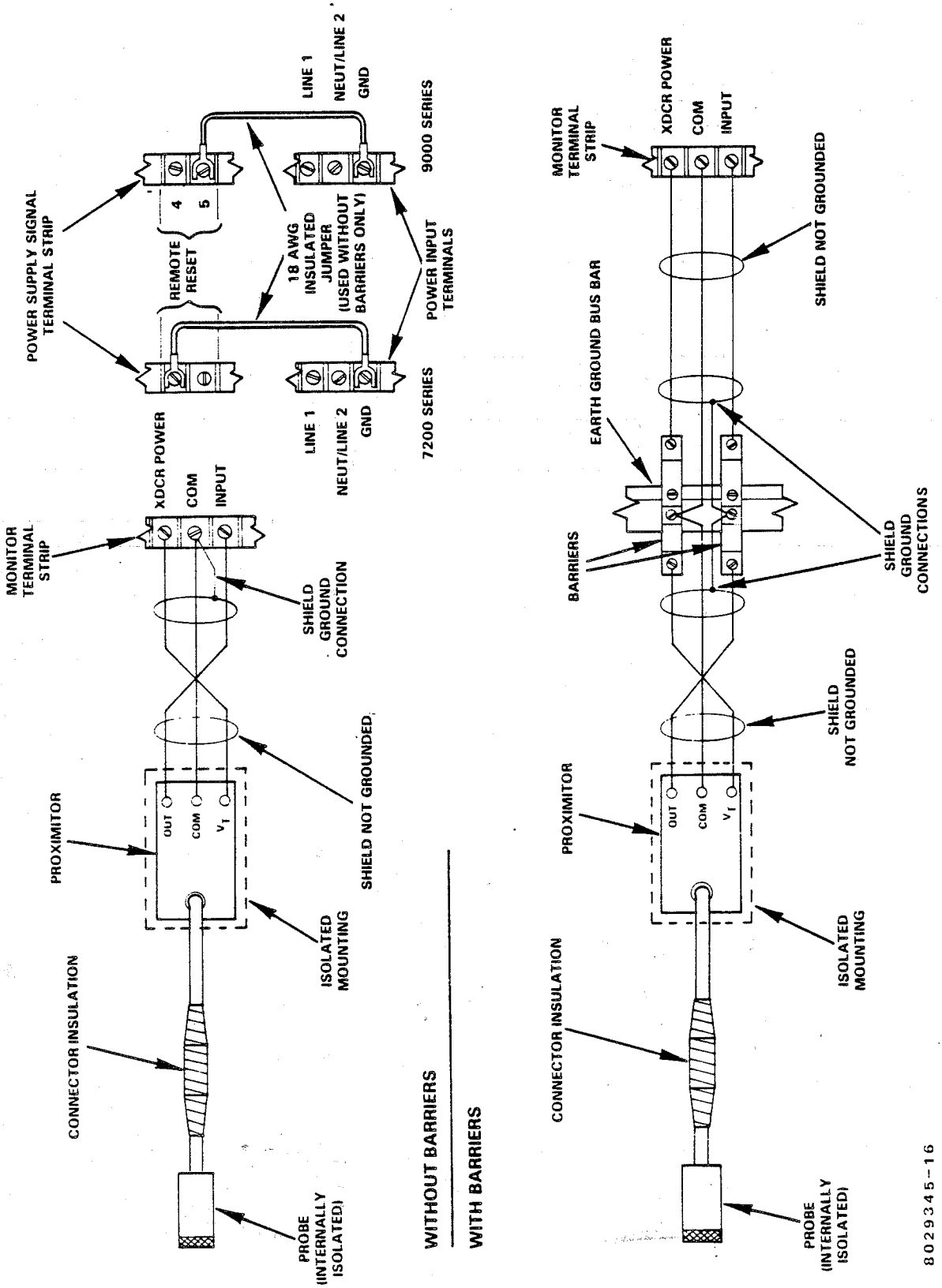


Figure 2-7. Proximitor Field Wiring/Shield Grounding

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Shield Grounding

The shield of each field wiring cable should be earth grounded at only one end; the other end should remain unconnected. All shields of field wiring connected to monitors in the same rack should connect to the same earth ground.

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 terminal as shown in Figure 2-7. Routing of the wire is at the user's discretion.

If safety barriers are used, shields are connected to the earth ground bus as shown in Figure 2-7.

If Proximitors are not isolated from ground, ground each Proximitor signal common and the cable shield to earth ground at the Proximitor (Proximitor COM is shorted to the case). Only one end of the shield should be grounded; the grounding of both ends is not recommended. If two or more Proximitors have earth grounds with different electrical potentials, the Proximitors should be connected together by a suitable grounding bus.

NOTE

If safety barriers are used or if the application requires earth grounding at a point removed from the rack (such as nonisolated Proximitors) the jumper wire between the remote reset terminal and earth ground must not be installed.

2.4.3.3 Mechanical and Environmental Protection

The Proximitor should be mounted in an enclosure that provides protection from mechanical damage and contamination. Weatherproof and explosion-proof 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.

NOTE

The protective enclosure should be free of foreign material such as loose metal parts that can 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.

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Bently Nevada Corporation recommends placing as many Proximitors as feasible 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 associated instrumentation.

2.4.3.4 Power and Signal Connections

Ensure the Proximitor supply voltage is within -17.5 Vdc to -26 Vdc (referenced to supply common) before installing power and signal connections.

CAUTION

To prevent damage to the Proximitor, ensure that the voltage applied to the Proximitor terminals is not excessive or reversed in polarity.

******

The connecting cables are generaly fabricated by the user unless a specific request is made to have Bently Nevada Corporation fabricate them. Shielded three-wire cable should be used to connect the Proximitor to associated instrumentation. Precautions should be taken to keep electromagnetic interference away from cable by routing it through steel conduit and away from power lines.

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SECTION 3

MAINTENANCE

3.1 GENERAL

This section contains calibration and troubleshooting procedures. If malfunctions are suspected, ensure the test equipment is operational and the transducer is properly connected before performing the troubleshooting procedure. If replacement of the probe, extension cable, or Proximitor is required; use the specific catalog number (see Table 1-1, Figure 1-3, or Table 1-2 as appropriate). The recommended maintenance equipment is given in Table 3-1. If the recommended equipment is not available, equivalent instruments can be used.

Table 3-1. Recommended Maintenance Equipment

ITEM	MINIMUM SPECIFICATIONS	RECOMMENDED EQUIPMENT
Digital Multimeter (DMM)	4-1/2 digit display; 0 to 1 megohms; 0 to -30 Vdc	Hewlett-Packard Model 3465 A/B
Probe Test Fixture	Accurate gap measurement: from 50 to 550 mils in 50 mil increments or from 1 to 14 mm in 1 mm increments	User-supplied; see Figure 3-2
Variable Resistor	0 to 10 K ohms	
Soldering Iron	25 Watts, 1/8-inch tip	Weller Model SP23
Power Supply	-18 to -24 Vdc output, 15 mA minimum output current	Hewlett-Packard Model 6215A

3.2 CALIBRATION CHECK

3.2.1 CALIBRATION AT INSTALLATION

In the actual installation, if there is no surrounding metal closer than two inches around the sides of the probe, other than the observed surface, the following procedure will assure proper Proximitor calibration.

Most installation situations will not have a two-inch clearance around the probe. If possible, a calibration should be used with the probe mounted in the machine as close as possible to the actual mounting position and observing the same surface it will observe in actual operation.

Because of the many installation types, it is not possible to provide a procedure for each one. Figure 3-1 shows one technique that can be used.

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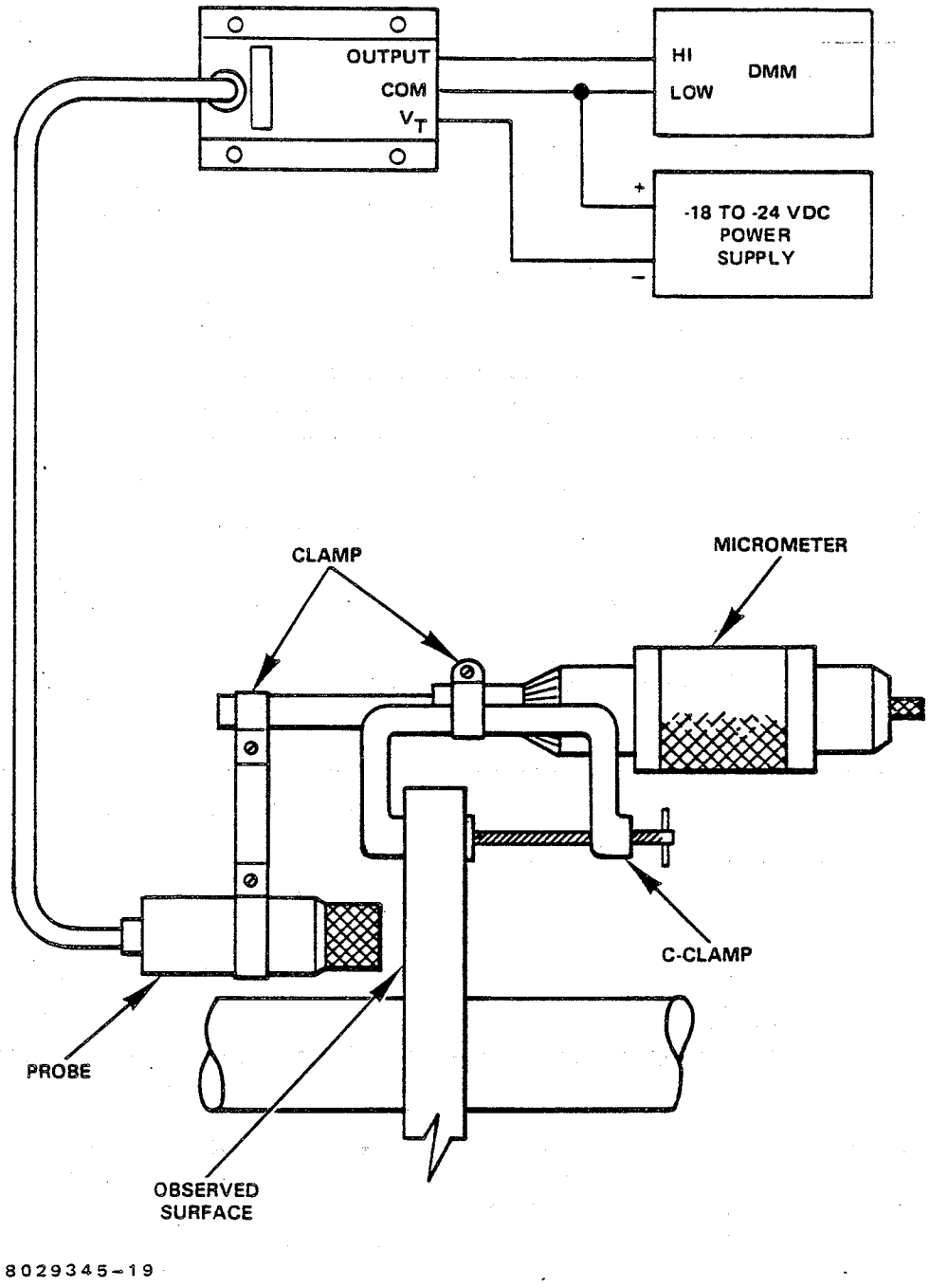


Figure 3-1. Calibration at Installation, Test Equipment and Equipment

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This procedure employs a user-supplied micrometer, C-clamps, and clamps to attach the probe to the micrometer shaft. The calibration procedure is as follows:

a. Observing the proper polarity, connect the power supply between the Proximitor COM and V_T terminals.

b. Connect the DMM between the Proximitor COM and output terminals.

c. Adjust the micrometer spindel until it indicates zero.

d. Insert the probe into the clamp and adjust until the probe tip lightly contacts the probe target.

e. Record the Proximitor output voltage.

f. Adjust the micrometer spindle to increase the gap by 50 mil (1 mm) increments and record the Proximitor output voltage at each increment until a 550 mil (14 mm) gap is recorded.

g. Plot each voltage indication obtained in Step f versus the gap. This gives a curve calibrated under the actual operating conditions.

3.2.2 Calibration in Test Fixture

This procedure employs a user-supplied test fixture in which the probe is mounted. Figure 3-2 illustrates basic test setup and connections.

a. Observing proper polarity, connect the power supply between the Proximitor COM and V_T terminals.

b. Connect the DMM between the Proximitor COM and OUTPUT terminals.

c. Adjust the micrometer spindle until it indicates zero.

d. Insert the probe into the test fixture until the probe tip lightly contacts the probe target.

e. Record the Proximitor output voltage.

f. Adjust the micrometer spindle to increase the gap by 50 mil (or 1 mm) increments and record Proximitor output voltage at each increment until 550 mil (14 mm) gap is recorded.

g. Either plot each voltage indication obtained in Step f, or compare it to the desired calibration curve (see Figure 1-4).

h. If the transducer is out of tolerance (refer to the Specifications), perform the procedure in Paragraph 3.3.

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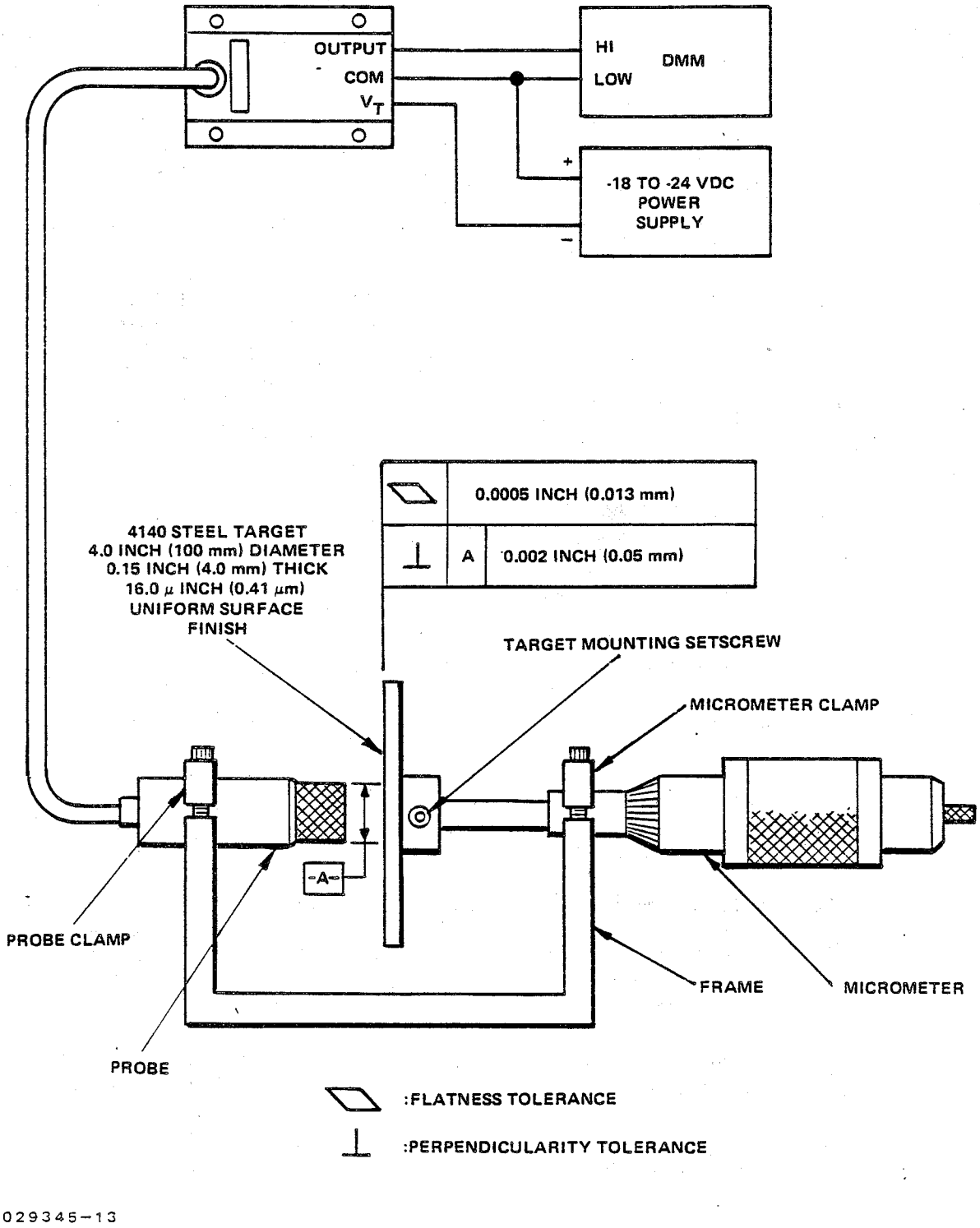


Figure 3-2. Typical Setup for Laboratory Calibration on Test Fixture

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3.3 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.

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

c. Perform the procedure in Paragraph 3.2 and adjust the variable resistor as appropriate until the desired calibration curve is obtained.

NOTE

Increasing the resistance between the calibration terminals will decrease the absolute value and slope of the calibration curve; decreasing the resistance will cause the absolute value and slope to increase.

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

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

f. Remove the 3110 RTV from the epoxy fiberglass shroud.

g. Install the shroud over the calibration resistor(s) and encapsulate with RTV that does not have an acetic acid base.

3.4 TROUBLESHOOTING

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

If 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 the DMM listed in Table 3-1 to perform voltage and resistance measurements.

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Table 3-2. Fault Isolation and Correction, 25mm Probe/Proximitor

FAULT INDICATION	PROBABLE CAUSE	CORRECTIVE ACTION
Voltage between Proximitor 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. 3. Faulty Proximitor	Disconnect output wiring from power source. Measure power source output voltage. If not within proper range, replace power source. If power source output voltage is within range, fault exists in wiring between power source and Proximitor or in the Proximitor. Reconnect wiring at power supply and disconnect Proximitor. If voltage at wire terminals which connect to Proximitor is not correct, replace faulty wiring. If voltage is correct, replace Proximitor.
Voltage between Proximitor OUTPUT and COM terminals remains at 0 volts.	1. Short 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 Proximitor OUTPUT and COM terminals remains at more than 0 but less than -1 volts.	1. Short in probe or cable. 2. Short in probe lead or extension cable connector. 3. Probe gapped too close to target. 4. Probe observing counterbore, not target.	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 exists in probe or extension cable. Clean probe lead 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 extension cable. If still 0 volts, replace probe.
Voltage between Proximitor OUTPUT and COM terminals remains within a few volts of (but is not identical to) the voltage between COM and V_T terminals.	1. Faulty Proximitor 2. Open in probe or cable. A gap between the probe tip and observed surface that exceeds transducer range could cause an indication similar to an open probe or extension cable.	Disconnect extension cable from Proximitor. Short center conductor or Proximitor coaxial connector to outer shell. Remeasure voltage If greater than -1 volt, replace Proximitor. If less than -1 volt, an open exists in probe or extension cable. Use DMM to make separate continuity checks of probe and extension cable. Normal resistance of probe is 53 to 56 ohms; extension cable center conductor is approximately 5 to 12 ohms plus 53 to 56 ohms for probe tip coil extension cable outer braid is 0 to 1 ohm. Replace faulty probe or extension cable.
Voltage between Proximitor OUTPUT and COM terminals remains identical to voltage between COM and V_T terminals.	1. Short 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 exists in wiring between Proximitor OUTPUT and V_T terminals. If voltage is unchanged, replace Proximitor.

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SECTION 4

RECOMMENDED SPARE PARTS

4.1 GENERAL

Table 4-1 contains a list of recommended spare parts for field maintenance. Repairs other than replacement of the listed parts should be performed by the factory or its designated representative.

Spare assemblies are shipped from the factory fully tested. When a unit is replaced, the field testing procedures in Section 3 of this manual need not be performed except to verify proper system performance.

Bently Nevada Corporation recommends that at least one of each type of assembly be kept on hand as a spare. If the instrument system is located in a remote area (outside the U.S.A.) or is used on an extremely critical application, several spares may be desired.

To order replacement parts, specify the complete part number according to Table 4-1. If the assembly has been modified, specify the modification number on the parts order.

Table 4-1. Recommended Spare Parts

QUANTITY PER SYSTEM	DESCRIPTION	PART NUMBER	
1	25 mm Probe	[ ][ ][ ][ ][ ]	See Figure 1-2 and Table 1-1.
1	Extension Cable	24710	See Figure 1-3.
1	Proximitor	24654	See Table 1-2.

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APPENDIX

PERFORMANCE SPECIFICATIONS

FOR

25 MM PROXIMITY SYSTEMS

DEC 1981

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SECTION 1

PROXIMITY SYSTEM SPECIFICATIONS

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 with accuracy as specified by BNC Specification 150980 is used.

A.	Calibration Range	500 mils (12.7 mm) beginning at -1.50 Vdc (approximately 50 to 550 mils) (1.27 mm to 13.97 mm)
B.	Average Scale Factor Over Calibration Range Using Probes with a 5.0 or 9.0 Meter Lead	
	1. Typical (90%)	20.0 + 0.5 mV/mil (0.79 ± 0.02 V/mm)
	2. Worst Case (99.7%)	20.0 + 0.8 mV/mil (0.79 ± 0.03 V/mm)
	3. Bench Calibration	Can be adjusted with the Proximitor calibration resistor for exactly 20.0 mv/mil
C.	Deviation from best straight line over the calibration range. Error is referenced to the straight line which is centered to yield minimum error and which has a 20.0 mV/mil (0.79 V/mm) slope. Using Probes with a 5.0 or 9.0 Meter Lead	
	1. Typical (90%)	less than 6 mils (0.16 mm)
	2. Worst Case (99.7%)	less than 9 mils (0.2 mm)
	3. Bench Calibration (Average Scale Factor Adjusted for 20.0 mV/mil Typical)	less than 6 mils (0.2 mm)

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D.	Average Scale Factor Over Calibration Range Using Probes with a 1.0 Meter Lead	
	1. Typical (90%)	20.0 ± 0.8 mV/mil (0.79 ± 0.03 V/mm)
	2. Worst Case (99.7%)	20.0 ± 1.2 mV/mil (0.79 ± 0.04 V/mm)
	3. Bench Calibration	Can be adjusted with the Proximitor calibration resistor for exactly 20.0 mV/mil
E.	Deviation from best straight line over the calibration range. Error is referenced to the straight line which is centered to yield minimum error and which has a 20.0 mV/mil (0.79 V/mm) slope using Probes with a 1.0 meter lead	
	1. Typical (90%)	less than 9 mils (0.24 mm)
	2. Worst Case (99.7%)	less than 13 mils (0.33 mm)
	3. Bench Calibration (Average Scale Factor Adjusted for 20.0 mV/mil) Typical	less than 6 mils (0.15 mm)
F.	Gap at -1.50 Vdc	50 ± 33 mils (1.27 ± 0.84 mm)
G.	Temperature Sensitivity	
	1. Probe Tip Only	See Figure 1
	2. Cable Only	See Figure 2
	3. Proximitor Only	See Figure 3
	4. Probe, Cable, and Proximitor	See Figure 4

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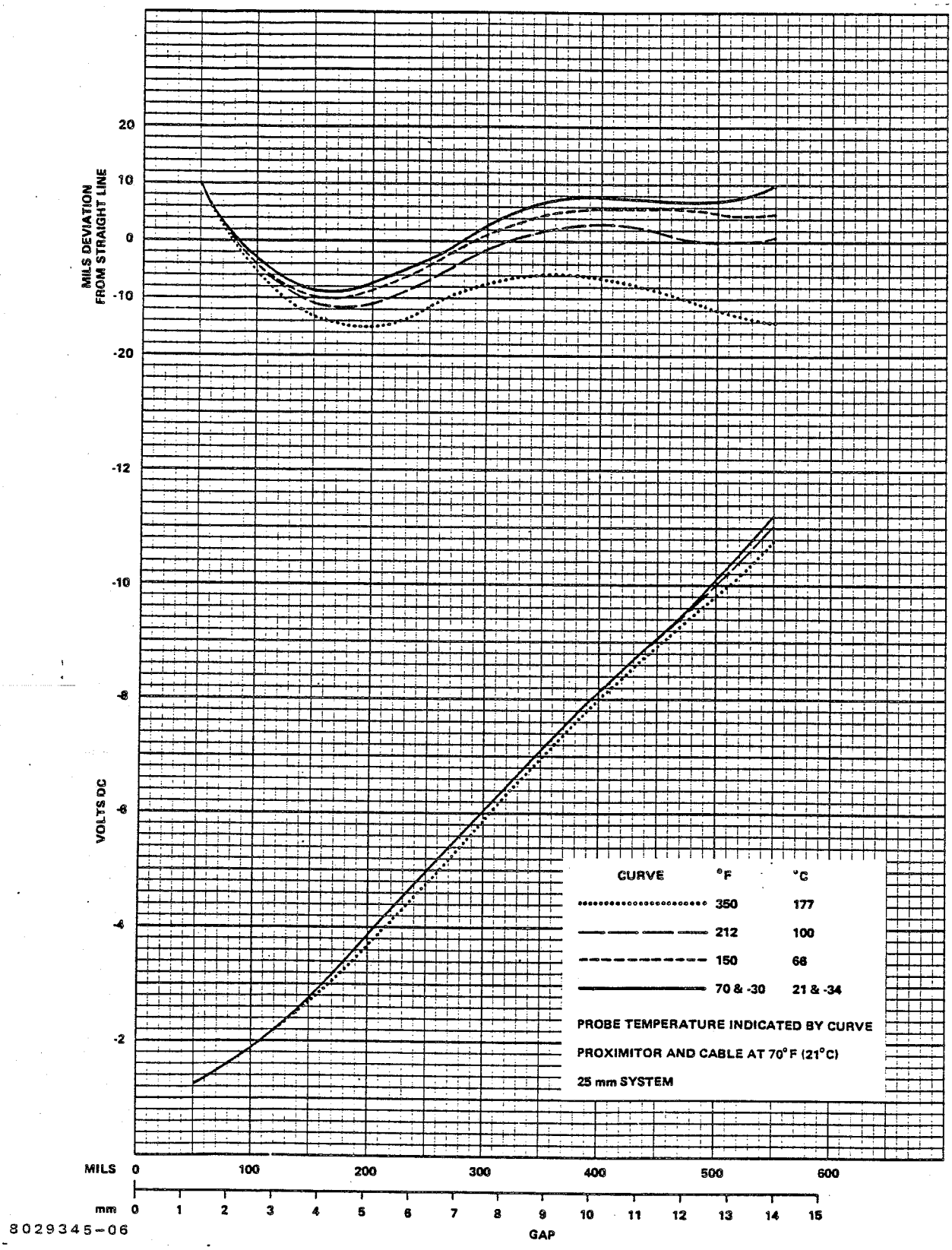


Figure 1. Probe Temperature Sensitivity, Typical

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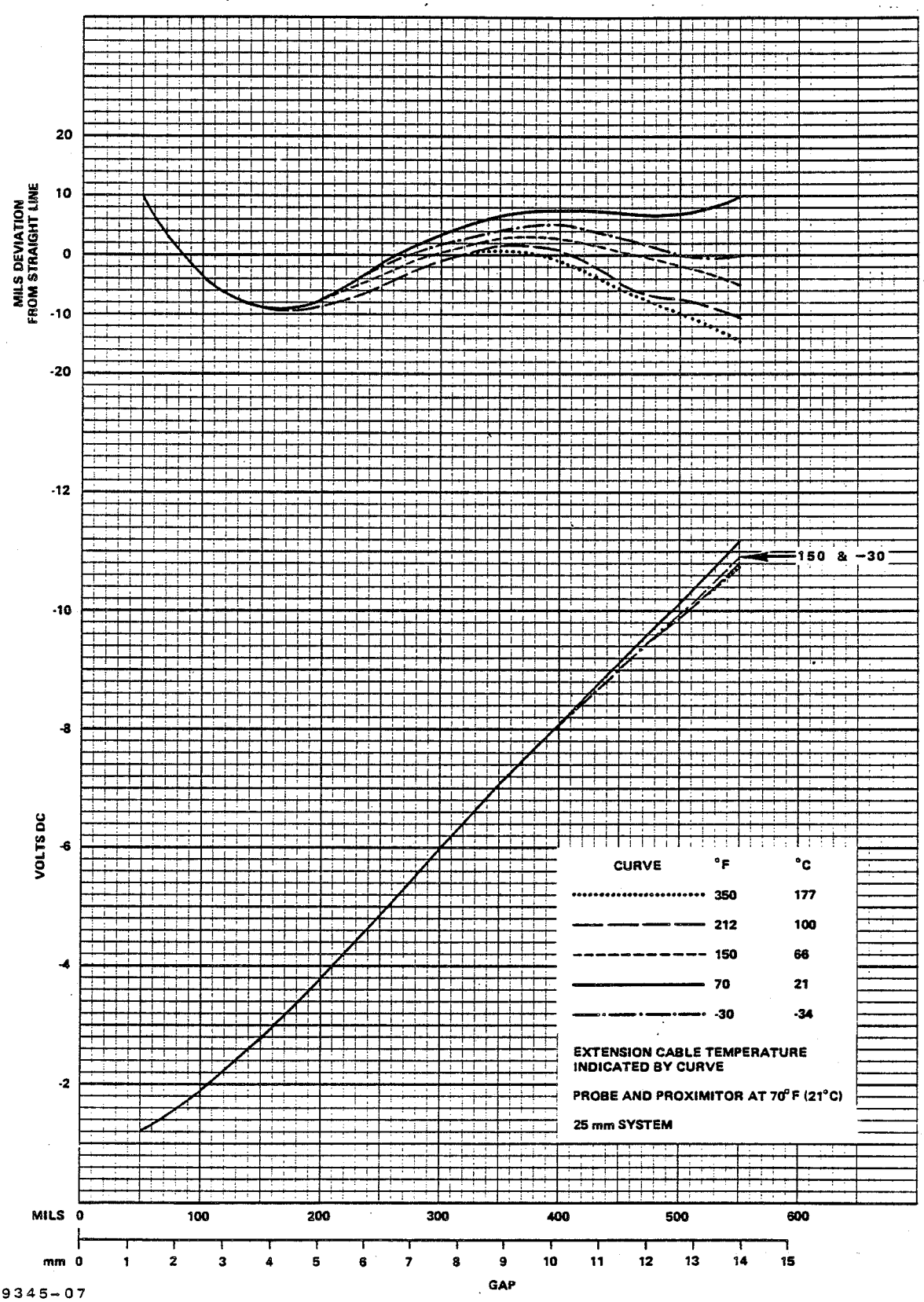


Figure 2. Extension Cable Temperature Sensitivity, Typical

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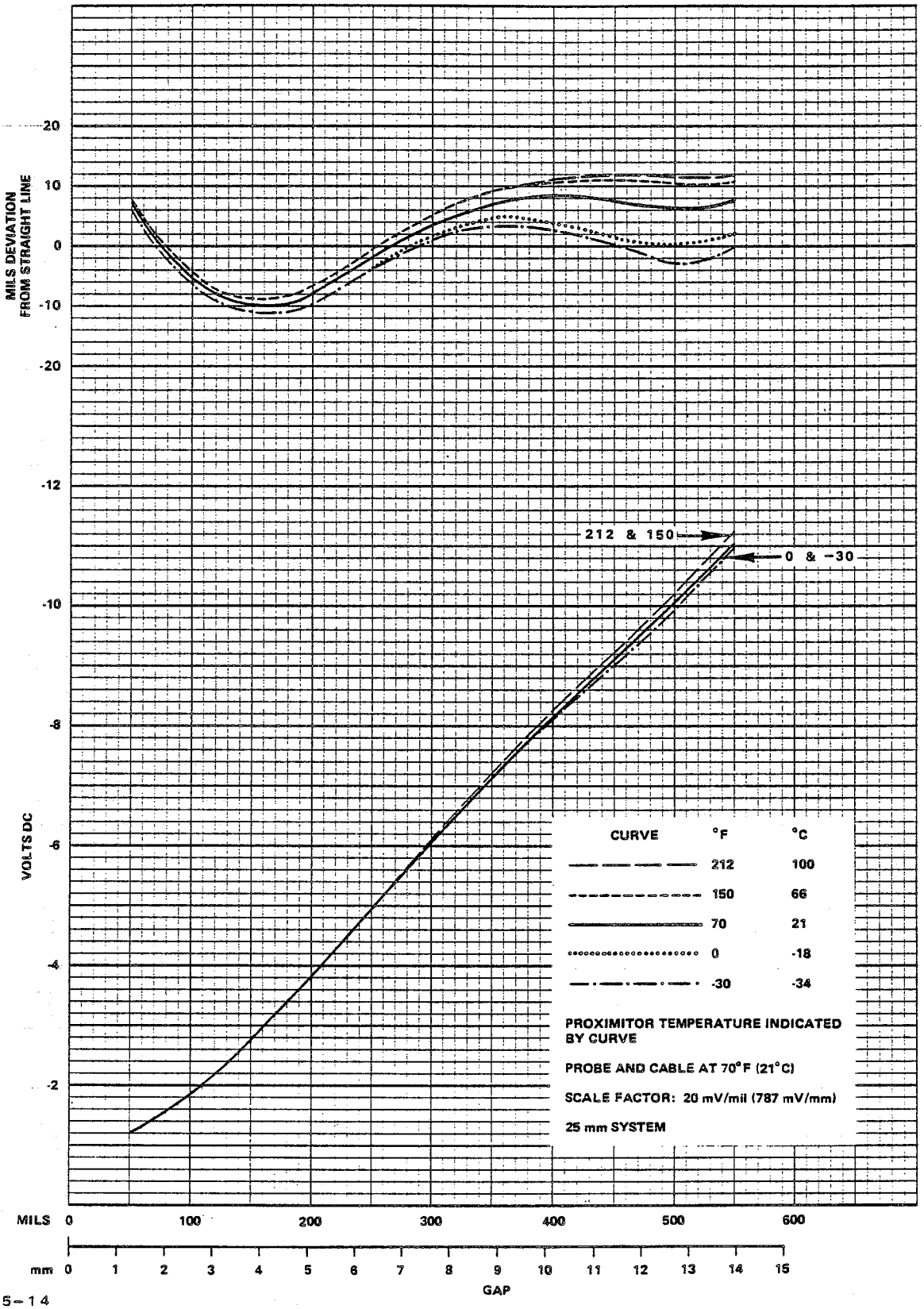


Figure 3. Proximitor Temperature Sensitivity, Typical

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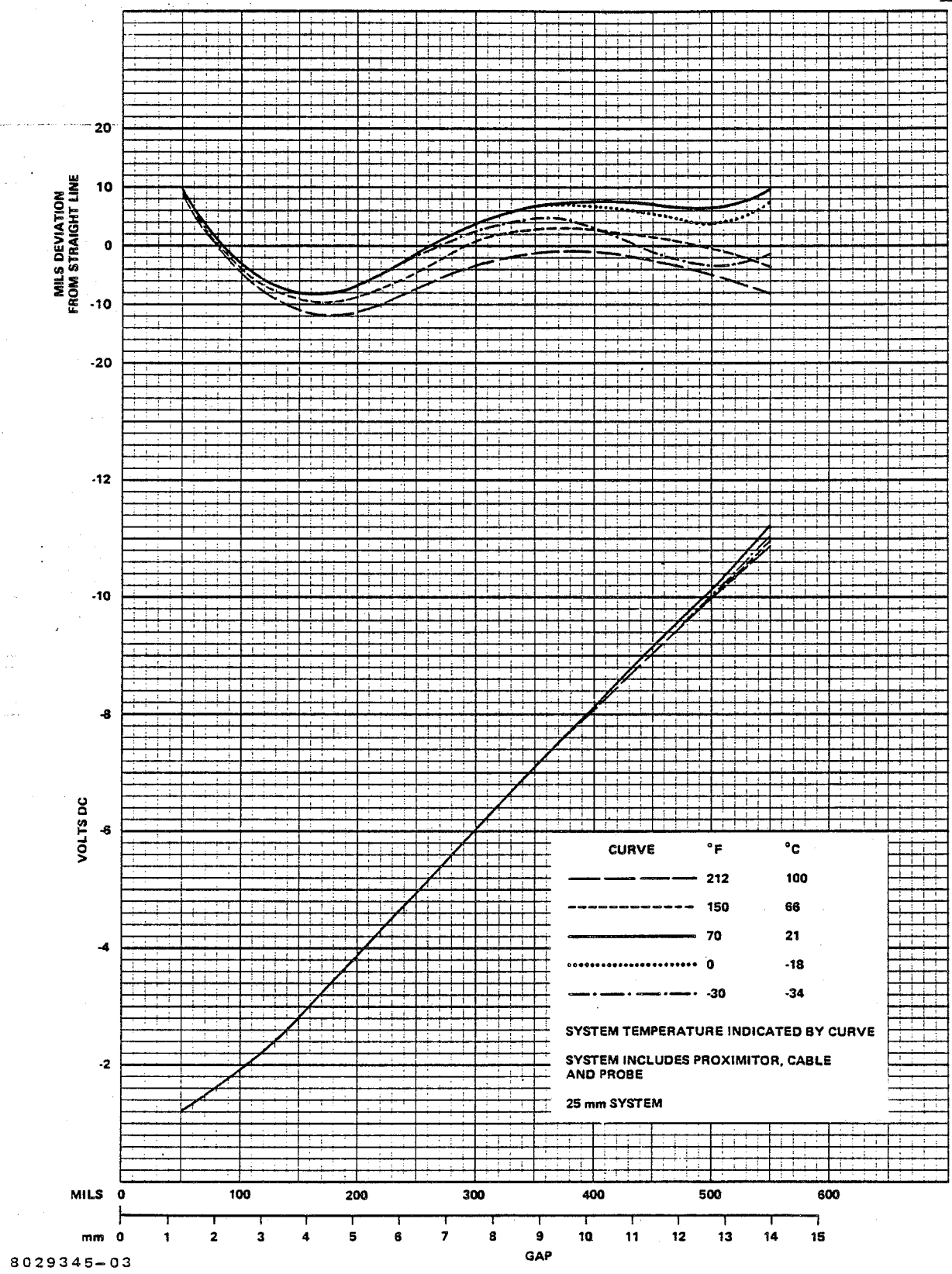


Figure 4. System Calibration and Temperature Sensitivity, Typical

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SECTION 2

PROXIMITOR (MODEL 24583) SPECIFICATIONS

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

I. ELECTRICAL CHARACTERISTICS

A.	Calibration Range	500 mils (12.7 mm) beginning at -1.50 Vcd (approximately 50 to 550 mils) (1.27 mm to 13.97 mm)
B.	Interchangeability Error	
1.	Average Scale Factor Change (Over Calibration Range)	
	Typical (90%)	Less than 0.2 mV/mil (9 mV/mm)
	Maximum (99.7%)	Less than 0.4 mV/mil (14 mV/mm)
2.	Voltage Change (Maximum)	
	At midrange, 300 mils (7.6 mm)	0.7 Vdc
	Near beginning of range, 50 mils (1.3 mm)	0.5 Vdc
C.	Supply Sensitivity	See Figure 5
D.	Supply Voltage Range	-18 Vdc to -24 Vdc
E.	Current Draw	24 mA max with 10K ohm load
F.	Output Resistance	50 ohms
G.	Short Circuit Duration	Continuous
H.	Output Load	Calibrated into a 10K ohm resistive load
I.	Frequency Response	
1.	+0%, -5%	0 to 600K rpm
2.	Capacitive Load	See Figure 6

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J.	Output Noise	Less than 10 millivolts peak-to-peak plus any high frequency noise which may be present on the supply when connected to a monitor or with a 0.01 microfarad capacitor on output.
J.	Output Noise	
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 Series monitor, the Proximitor can be wired wrong in any manner with no resulting damage.

II. MECHANICAL CHARACTERISTICS

A. Materials

1. Coaxial Connector: Gold-plated stainless steel
2. Barrier Strip: Nylon
3. Case: Aluminum; Finish -- gold chromate conversion process
4. Calibration Terminals: Gold-plated brass
5. Calibration Resistor Sealant: Dow Corning 3110 RTV
6. Calibration Terminal Grommet: Teflon
7. Label: Mylar (acetate laminate finish)

B. Weight 6.4 ozs (180 grams)

III. ENVIRONMENTAL RESTRICTIONS

A. Temperature

1. Storage

-30·F to 212·F (-34·C to 100·C)

2. Operating

24654-01, 02	32·F to 158·F (0·C to 70·C)
24654-03, 04	-30·F to 212·F (-34·C to 100·C)

B. Relative Humidity

35·F to 212·F	95% noncondensing

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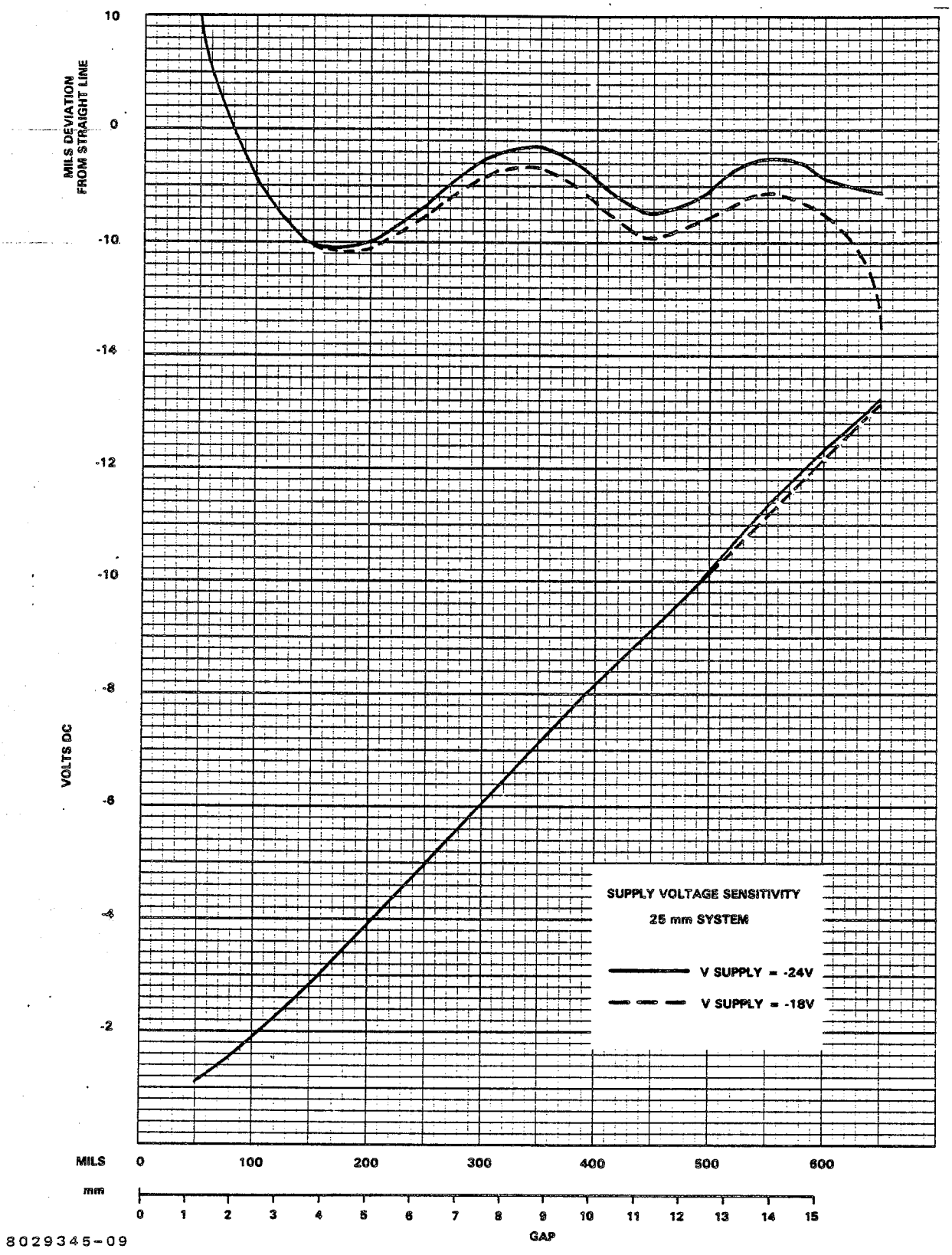


Figure 5. Proximitor Supply Voltage Sensitivity

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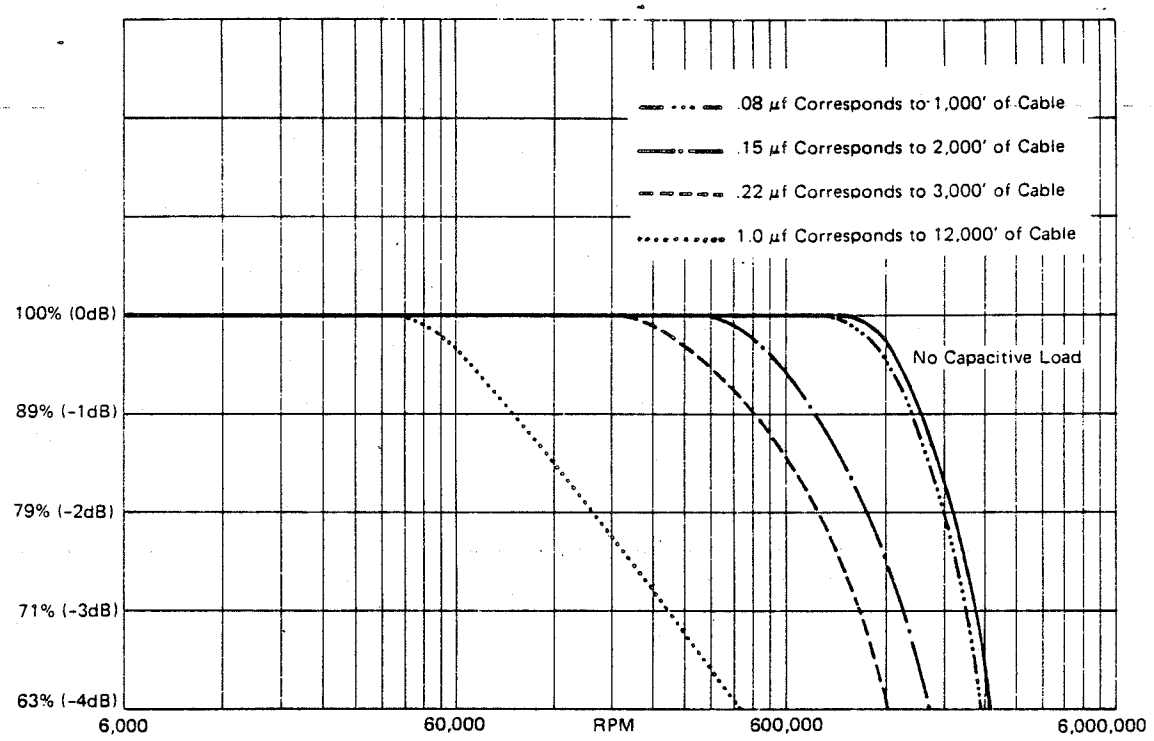


Figure 6. Capacitive Load or Cable Length Effect on System Frequency Response

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SECTION 3

PROBE (MODELS 28480 AND 24582) SPECIFICATIONS

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

I. ELECTRICAL CHARACTERISTICS

A. Calibration Range — 500 mils (12.7 mm) beginning at -1.50 Vdc (approximately 50 to 550 mils) (1.27 mm to 13.97 mm)

B. Interchangeability Error

1. Average Scale Factor Change (Over Calibration Range) Using Probes with a 5.0 or 9.0 Meter Lead

Typical (90%)	Less than 0.3 mV/mil	(11 mV/mm)
Maximum (99.7%)	Less than 0.4 mV/mil	(16 mV/mm)

2. Average Scale Factor Change (Over Calibration Range) Using Probes with a 1.0 Meter Lead

Typical (90%)	Less than 0.4 mV/mil	(15 mV/mm)
Maximum (99.7%)	Less than 0.6 mV/mil	(24 mV/mm)

3. Voltage Change at Same Physical Gap (Max)

At midrange, 300 mils (7.6 mm)	1.5 Vdc
Near beginning of range, 50 mils (1.3 mm)	1.2 Vdc

C. DC Resistance, Nominal

1. Probe Coil — 54 ohms
2. Lead Center Conductor — 0.325 ohms/ft (1.07 ohms/meter)
3. 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.

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II. MECHANICAL CHARACTERISTICS

A. Materials

1. Lead Jacket and Core -- Teflon
2. Tip -- Thermoplastic Polyimide
3. Case -- 300 Series Stainless Steel
4. Armor (if Applicable) -- Stainless Steel
5. Shrink Tubing -- Teflon
6. Connector -- Silver Plated Brass with Teflon Dielectric Insert

B. Case Torque (Maximum Rated)

1.	1.250-12 Case	50 lb-ft (68 N-M)
2.	M30 x 1.5 Case	50 lb-ft (68 N-M)

C. Torque (Maximum Rated)

1.	Tip to Case	1 in-lb (1.15 Kg-cm)
2.	Tip to Lead	1 in-lb (1.15 Kg-cm)

D. Tensile Strength (Maximum Rated)

1.	Tip to Case	5 lbs (2.27 Kg)
2.	Case to Connector	30 lbs (13.64 Kg)

III. ENVIRONMENTAL RESTRICTIONS

A. Temperature

1.	Operating	-0·F to 350·F (-18·C to 177·C)
2.	Storage	-30·F to 350·F (-34·C to 177·C)
3.	Short Term Storage	-30·F to 500·F (-34·C to 260·C) (Less than 20 hours at 500·F)

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SECTION 4

EXTENSION CABLE (MODEL 24710) SPECIFICATION

The following specifications apply at 72°F (22.2°C) with AISI E4140 steel target and when test equipment with accuracy as specified by BNC Specification 150980 is used.

I. ELECTRICAL CHARACTERISTICS

A.	Calibration Range	500 mils (25.4) beginning at -1.50 Vdc (approximately 50 to 550 mils (1.27 to 13.97))
B.	Interchangeability Error with 25 mm System.	
1.	Average Scale Factor Change	
	Applicable for range between -2.0 Vdc and 500 mils (12.7 mm) above -2.0 Vdc (approximately 50 to 550 mils).	
	Typical (90%)	Less than 0.4 mV/mil (16 mV/mm)
	Maximum (99.7%)	Less than 0.6 mV/mil (24 mV/mm)
2.	Voltage Change at Same Gap (Max)	
	At midrange, 300 mils (7.6 mm)	0.25 Vdc
	Near beginning of range, 50 mils (1.3 mm)	0.05 Vdc
C.	DC Resistance, Nominal	
1.	Center Conductor	0.32 ohms/ft. (0.10 ohms/meter)
2.	Shield	0.02 ohms/ft. (0.06 ohms/meter)
D.	Capacitance	15.4 pF/ft (50.5 pF/meter)
E.	Characteristic Impedance	95 ohms

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II. MECHANICAL CHARACTERISTICS

A. Materials

1. Jack and Core -- Teflon
2. Armor (if Applicable) -- Stainless Steel
3. Armor Covering (if Applicable) -- Teflon
4. Shrink Tubing -- Teflon
5. Connector -- Silver Plated Brass with Teflon Dielectric insert

B. Tensile Strength (Connector to Connector) 30 lbs.

III. ENVIRONMENTAL RESTRICTIONS

A. Storage -60°F to 350°F (-51°C to 177°C)

B. Operating -60°F to 350°F (-51°C to 177°C)

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