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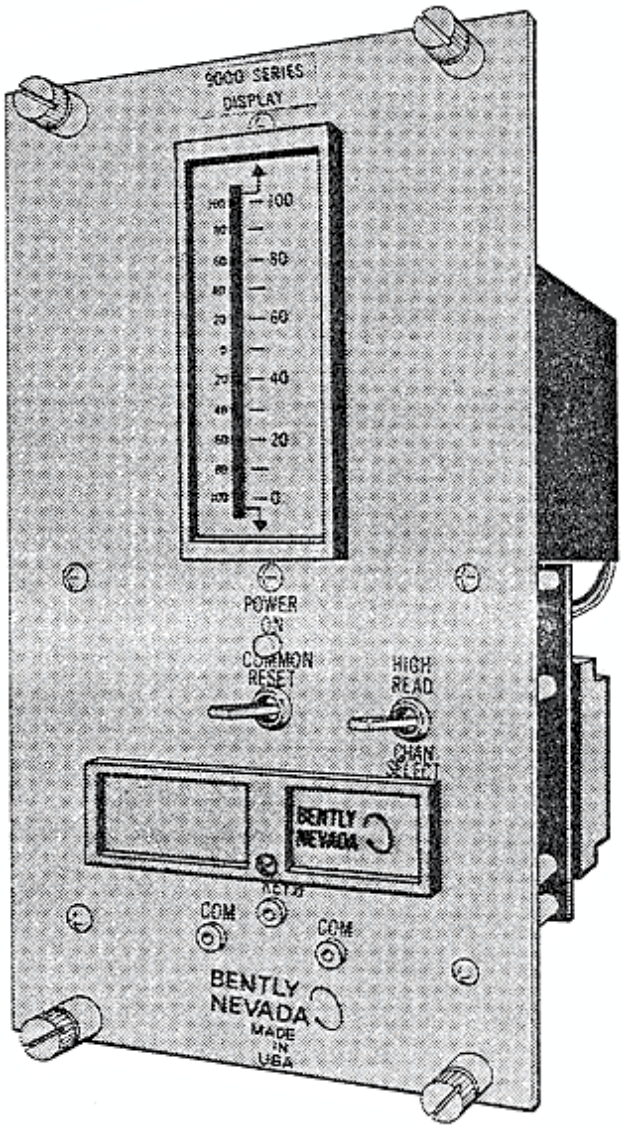
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OPERATION AND MAINTENANCE MANUAL



9000 SERIES LED ANALOG DISPLAY MODULE MODEL 90380

NOV 1978

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SPECIFICATIONS

90380 LED ANALOG READOUT

METER	
Error	± 0.5% maximum at full scale*
Accuracy	± 1.25% of full scale maximum*
Linearity	± 0.25% of full scale maximum*
Temperature Coefficient	< ± 100 ppm /°C typical
Overshoot	None
	*At 25°C
POWER CONSUMPTION	1 watt nominal
ENVIRONMENTAL LIMITS	
Rated Performance	0 to 65°C
Long Term Storage	-40 to 85°C
Relative Humidity	To 95% noncondensing

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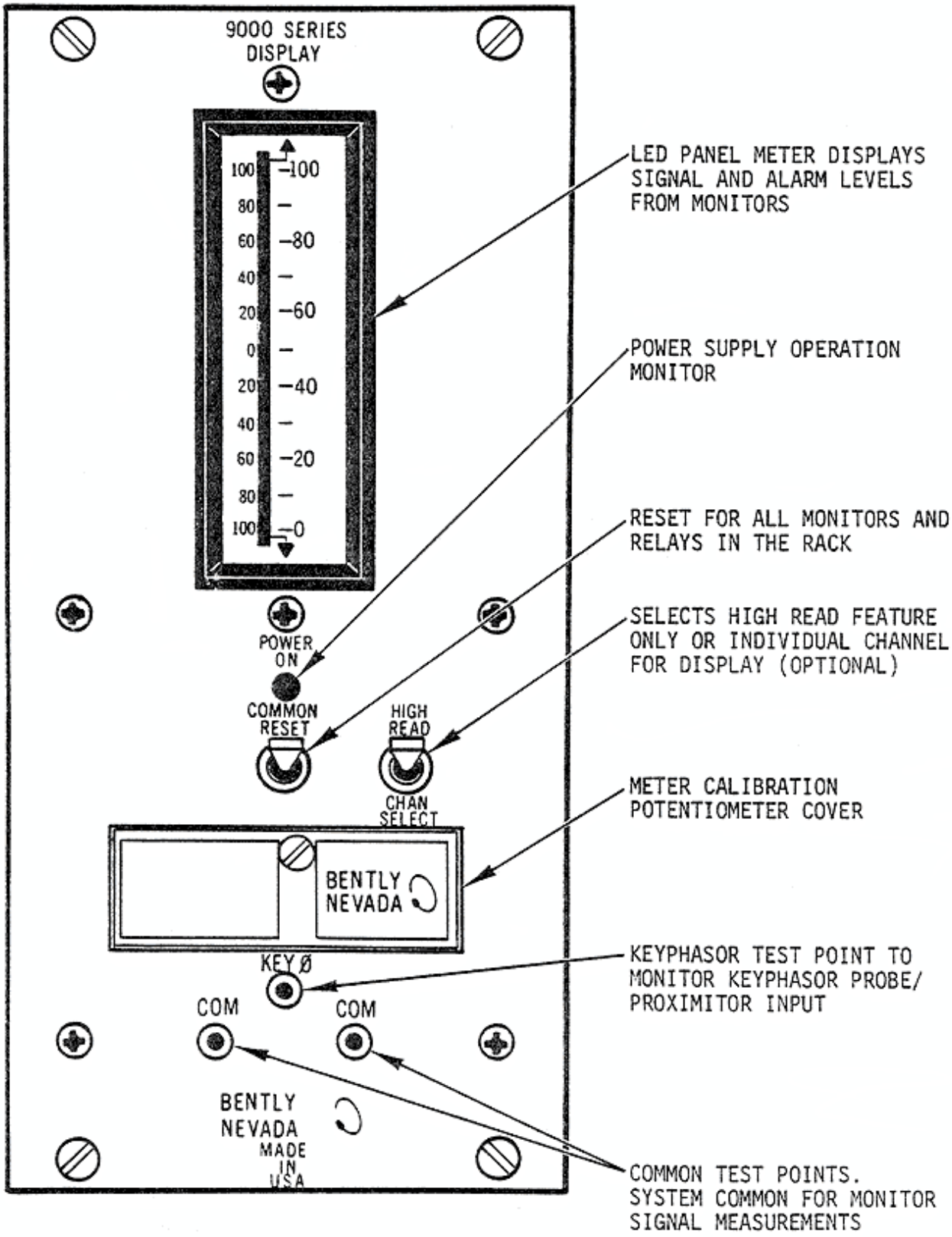


Figure 1-1. LED Analog Display Module Front Panel

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SECTION I

GENERAL INFORMATON

1-1 GENERAL DESCRIPTION

1-2 The 9000 Series LED Analog Display Module is used to display switch selected signals and alarm levels from the monitors. The module contains an LED panel meter, POWER ON indicator, COMMON RESET switch, optional HIGH READ/CHANNEL SELECT switch, calibration adjustments, and test points for KEY Ø (Keyphasor) and COM (common). Figure 1-1 illustrates the module front panel.

1-3 The LED panel meter consists of a meter housing, meter circuit board/ LED segment display assembly and scale. The meter circuit board receives power and signal voltages from the rack power supply and monitors, and performs analog-to-digital conversion and LED segment drive functions.

The LED panel meter indicates a measured value by illumination of one LED segment rather than by movement of a pointer. The meter has 53 LED segments; 51 segments indicate zero to full scale (or bottom full scale-to-zero-to-top full scale) one indicates upscale overrange, and one indicates downscale underrange. Segments illuminate individually in sequence to follow signal amplitude changes.

1-4 STANDARD OPTIONS

1-5 The standard options included in this module are shown in Table 1-1.

1-6 MODIFICATIONS

1-7 Modifications are changes to the module that are not covered by the standard options. These changes, if any, are described in the modification documents that immediately follow Section I of this manual. Modification document numbers are marked on the display module. These numbers should be used when ordering replacement modules.

1-8 OPERATIONAL DESCRIPTIONS

1-9 As shown in Figure 1-2, the monitor display drive inputs (0 to -10 volts) are applied through the METER CALIBRATION adjustment to the LED panel meter. The LED panel meter assembly contains the circuitry required for analog-to-digital conversion of the meter drive signal and drive of the appropriate LED segment at the meter scale. If the high read option is installed, the HIGH READ/CHANNEL SELECT switch must be in the CHANNEL SELECT position (shown) to allow the monitor signal and alarm levels to be selected for display. When the switch is in the HIGH READ position, only the highest monitor output is displayed, even if the monitor signal switches or alarm switches are actuated.

1-10 The input signals applied to the display module (except for the high read signal) are received from the monitor signal and alarm switches. These switches are normally used one at a time. However, no damage or false alarms will result from simultaneous use of more than one switch, but the meter indication should not be considered accurate.

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TABLE 1-1. LED ANALOG DISPLAY MODULE OPTION LIST

BNC CATALOG NUMBER

90380 - □□ —— □□

	HIGH READ		DISPLAY RANGE		DISPLAY RANGE
01	STANDARD WITHOUT HIGH READ	01	0-100°C	45	0-100%
		02	0-150°C	46	DUAL 0-100%/100-0-100%
02	WITH HIGH READ	03	0-200°C	51	0-5 MILS PEAK-TO-PEAK
		04	0-250°C	52	0-3 MILS PEAK-TO-PEAK
		05	0-500°C	53	0-10 MILS PEAK-TO-PEAK
		21	0-200°F	54	0-15 MILS PEAK-TO-PEAK
		22	0-300°F	65	0-125 MICROMETERS PEAK-TO-PEAK
		23	0-400°F	66	0-80 MICROMETERS PEAK-TO-PEAK
		24	0-500°F	67	0-250 MICROMETERS PEAK-TO-PEAK
		25	0-1000°F	68	0-400 MICROMETERS PEAK-TO-PEAK

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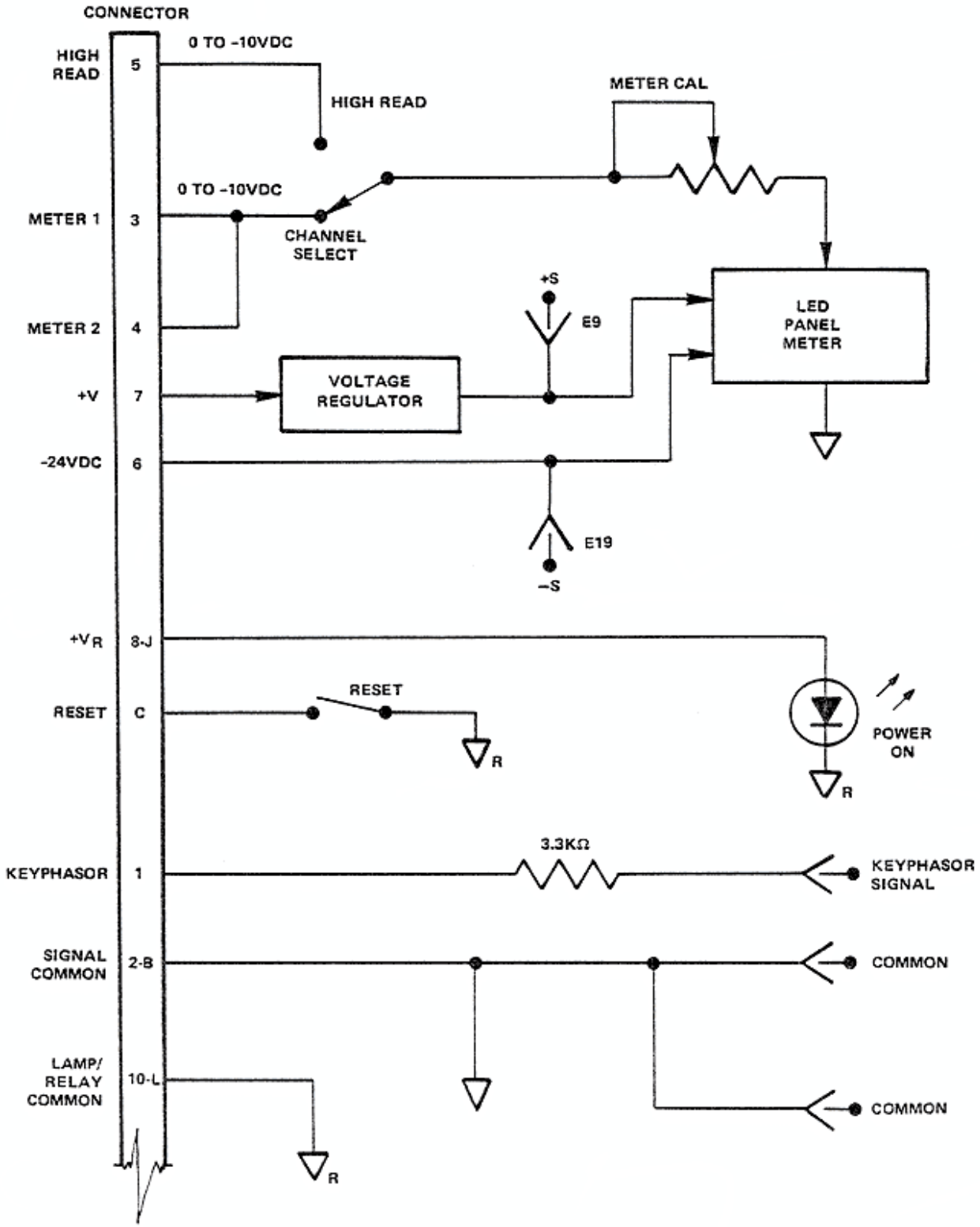


Figure 1-2. LED Analog Display Module Block Diagram

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SECTION II

MAINTENANCE

2-1 GENERAL

2-2 This section provides calibration and performance testing procedures for the LED analog display module. If trouble occurs, make certain that the power supply is operational and that all monitor inputs are within specifications before testing or replacing the module. Display module installation and removal procedures are given in the Rack Assembly Operation and Maintenance Manual, 8025700 or 8029270. Repair of the module is limited to replacement of the entire display module assembly. Failure to heed this recommendation could void the guarantee. If replacement of the module is required, use the specific catalog number given in Table 1-1 and include all option numbers and any modification numbers.

2-3 HANDLING AND STORING CONSIDERATIONS

2-4 The handling and storing of printed circuit boards during maintenance is extremely critical. Circuit boards contain devices which are susceptible to damage when exposed to high electrostatic charges. Damage caused by obvious mishandling of the board will void the guarantee. To avoid damage during maintenance of the instrument, observe the following precautions in the order given:

1) Remove all power to the instrument prior to servicing.

CAUTION

Machinery protection will be lost when power is removed. Activate alarm bypass on those installations that use energized (fail-safe) relays for alarm conditions as relays will change state with loss of power.

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2) Do not discharge static electricity onto the circuit board. Avoid tools or procedures that would subject the circuit board to static damage. Some of the possible causes include ungrounded soldering irons, nonconductive plastics and similar materials.

3) Maintenance personnel must be grounded with a suitable grounding strap (such as the 3M Velostat No. 2060) prior to handling or performing maintenance on a printed circuit board.

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4) Transport and store circuit boards in electrically conductive bags or foil.

5) Use extra caution during dry weather. Relative humidity less than 30% tends to multiply the accumulation of static charges on any surface.

2-5 PERFORMANCE TESTING AND CALIBRATION PROCEDURES

2-6 Successful completion of the following procedures will verify proper module operation. To ensure proper calibration, the procedures must be followed in the order given. The recommended maintenance equipment for performing these procedures is listed in Table 2-1.

TABLE 2-1. RECOMMENDED MAINTENANCE EQUIPMENT

RECOMMENDED EQUIPMENT	EQUIPMENT SPECIFICATIONS
Hewlett-Packard HP 3465 A/B Digital Multimeter (DMM)	4-1/2 digit display. Ranges: 0 to ± 1000 Vdc 0 to 500 Vac 0 to 2000 mA ac/dc 0 to 20 MΩ
DC Power Supply	Variable negative output voltage with a minimum range of 0 to -10 Vdc
Bently Nevada Corporation 9000 Series Extender Card Part Number 90038	Contains all required test points for performing test and calibration

2-7 DISPLAY MODULE CALIBRATION

2-8 If the following calibration procedure cannot be completed successfully, replace the entire analog display module.

a. With all monitor signal and alarm switches in the neutral position (not pressed for display), and if included, the optional HIGH READ/CHANNEL SELECT switch set to the CHANNEL SELECT position, the display module meter should indicate zero. If the meter does not indicate zero, unplug (and leave unplugged) monitors within the rack in an attempt to disconnect a possible erroneous signal. If the meter does not indicate zero with all monitors unplugged, replace the display module assembly. Reinstall monitors.

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b. Install the extender card in a vacant monitor position. Connect the dc power supply between the meter bus 1 (M1) and the signal common (SIG COM) on the extender card.

c. Turn on the dc power supply and set its output for a -10.00 volts indication on the DMM. The module meter should indicate full scale.

d. If the module meter does not indicate full scale in Step c, remove the adjustment control cover (Figure 1-1) and adjust the METER CALIBRATION potentiometer for full scale. Center the METER CALIBRATION potentiometer adjustment between the settings at which the overrange LED above, and the first LED below full scale illuminate.

NOTE

If a dc power supply is not available for this test and calibration, use one of the system monitors, with the output set to full scale (-10.00 Vdc). Monitor output may be set by using a simulated full scale signal input or temporary readjustment of an alarm setpoint (and actuation of appropriate monitor signal or alarm switch) to provide -10.00 Vdc at the meter bus 1 (M1) test point on the extender card.

2-9 LED PANEL METER TEST

2-10 Operation of the LED panel meter is tested as follows:

a. With the calibration signal source connected, vary the signal from zero to overrange checking that each LED segment illuminates in sequence. If meter operation is not correct, replace the display module assembly.

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