

# Honeywell



## Model NK

### Portable Indicator User's Guide

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Sensotec Sensors

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## **Honeywell**

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### ***Model NK Portable Indicator User's Guide***

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SPAN



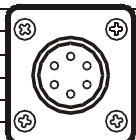
ZERO



SHUNT  CAL

LOW  BAT

OFF  ON



PEAK



TRACK



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# 1 Introduction

The Model NK Portable Indicator is a battery-powered signal conditioner and readout device. The Model NK provides precise electrical drive to a transducer and translates transducer output into a digital display of engineering units.

The signal conditioner supports transducer outputs between 1 and 4 millivolts/volt (mV/V); a high input option supports outputs up to 40 mV/V. The excitation supply drives transducers with impedances as low as 250 Ohm at 4 volts. The readout device is a 4-½ digit, liquid-crystal display.

Enclosed in a rugged, weatherproof aluminum case, the Model NK is specially designed for remote field operations. Quick field setup allows the Model NK to be used for a variety of applications, from checking the load on an oil well drilling bit to determining natural gas line pressure.

**Coarse zero** and **coarse span** controls allow broad adjustment for a wide variety of transducer outputs. To prevent accidental misadjustment, these controls are located on the edge of the circuit board inside the unit, easily accessible when the panel is removed from the case. **Fine zero** and **fine span** controls on the front panel allow precise adjustment for offsets and gain variations up to +/-15 percent of full scale.

An optional peak detector toggles between **peak** mode and **track** mode via a front-panel switch. In both modes, the unit monitors the input signal. In **peak** mode, the Model NK stores, digitizes, and displays the highest signal level.

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## 2 Setup and Use

### 2.1 Your Model NK

The Model NK can be purchased in one of two ways:

- As a stand-alone unit with a mating connector for the input connector
- As a set with a transducer and a mating connector for the input connector

Some transducers are equipped with integral cables that connect the transducer to the Model NK. Separate cables are available for transducers without integral cables.

If you purchased the Model NK with a transducer as a set, the unit is already calibrated to that transducer. Follow the setup procedures in this section before using the unit for the first time.

If you purchased the Model NK as a stand-alone unit or if you replaced the original transducer, follow the setup *and* calibration procedures (page 14) before using the unit for the first time.

## 2.2 Additional Tools

Use the following tools to set up and calibrate your Model NK:

- Approximately 50 mm [2 in] of 0.50 mm<sup>2</sup> (or 20 AWG) wire (if needed)
- Needle-nose pliers
- Small, standard screwdriver
- Calculator
- Solder and soldering iron (if needed)

## 2.3 Setup Overview

1. Connect the transducer to the unit (page 5).
2. Turn on the unit (page 8).
3. Set the decimal point location (page 8).
4. Verify the calibration (page 11).
5. Fine tune (page 12).



## **2.4 Connect the Transducer**

### **2.4.1 Cable Type**

Determine the distance between the transducer's installed location and the Model NK. If the distance is less than 10 m [30 ft], use a four-wire hookup. If it is greater than 10 m [30 ft], use a six-wire hookup and the "sense" feature.

Transducers with integral cables generally have four wires, designated:

- (+)Excitation**
- (-)Excitation**
- (+)Signal (or (+)Output)**
- (-)Signal (or (-)Output)**

For long six-wire cables, the additional two wires are used for the "sense" feature and are designated:

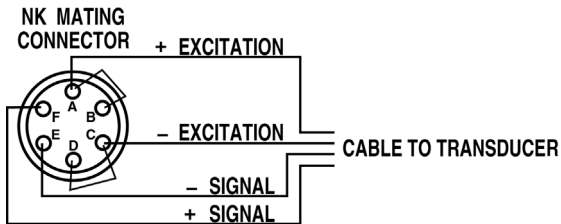
- (+)Sense**
- (-)Sense**

The "sense" feature reduces the effect of signal voltage loss over a long cable, increasing display accuracy. The "sense" feature is only needed for cables longer than 10 m [30 ft].

## 2.4.2 Connection

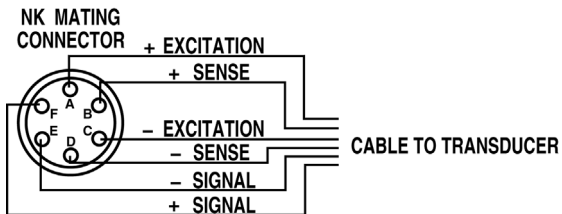
Connect the transducer to the Model NK via the Model NK's six-pin input connector. Use the transducer's integral cable if available. If the transducer is not equipped with an integral cable, wire your own cable as follows:

- **Four-wire hookup** —Disable the “sense” feature by soldering two small wires inside the mating connector to jumper:
  - (+)Excitation (pin A) to (+)Sense (pin B)
  - (-)Excitation (pin C) to (-) Sense (pin D)



**FIGURE 1: FOUR-WIRE TRANSDUCER HOOKUP (WITHOUT SENSING)**

- **Six-wire hookup** — Jumpers are not needed in this configuration.



**FIGURE 2: SIX-WIRE TRANSDUCER HOOKUP (WITH SENSING)**

## 2.5 Turn On the Unit

Flip the **on/off** toggle switch on the front panel to **on** and allow the Model NK to stabilize for a few seconds.

1. Make sure that no load is applied to the transducer, then press and hold the **shunt cal** button.
2. If the number on the display drifts, the unit is not yet stable.
3. Release the **shunt cal** button and try again in a few seconds.

## 2.6 Set the Decimal Point Location

The Model NK is factory set to the correct decimal point location for its original transducer. As a stand-alone product, it is factory set to xxx.xx. You can easily change the decimal point location to match your load and desired display.

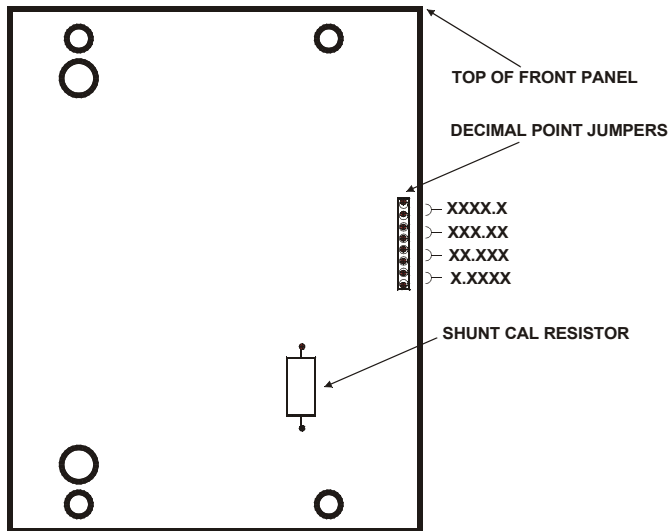
Each decimal point has two terminals that must be connected. For example, to set the decimal point to xxxx.x for a 1000 psig load, jumper the first and second terminals (from the front of the board).

For smaller loads (such as 200 psig), setting the decimal point to xxx.xx may provide higher resolution, but may also result in an unstable last digit. For a stable

last digit, set the decimal point to xxxx.x.

To set the decimal point location:

1. Remove the unit from the case by loosening all four captive fasteners on the front panel and lifting the panel out of the case.
2. Find the decimal point jumper locations (Figure 3: on page 10).
3. Use needle-nose pliers to remove the existing jumper and place it in the desired terminals.



**FIGURE 3: DECIMAL POINT JUMPER LOCATIONS**

## 2.7 Verify Calibration

For best results, verify the calibration daily.

*Note: When not using the original transducer, calibrate the Model NK before use (page 14).*

1. Obtain the following values from the transducer calibration data sheet:
  - Shunt-cal output (or “shunt-cal factor”) in mV/V
  - Calibration factor (or “full-scale output”) in mV/V
  - Full-scale engineering units (or “capacity”) in psig, lbs, etc.
2. Perform this calculation and record the value.

$$\frac{\text{shunt-cal output}}{\text{calibration factor}} \times \text{full-scale engineering units} = \text{shunt-cal engineering units}$$

*Note: Place a decimal point in the full-scale engineering units value in the equation in the same place as set in the display.*

3. With no load on the transducer, press and hold the **shunt cal** button. Compare the displayed value with the result of step 2. If the values are not equal, adjust the **fine span** potentiometer according to the procedure below.

## 2.8 Fine Tune

Fine tune the Model NK (the controls for both **zero** and **span** are on the front panel):

1. **Fine zero**—With no load on the transducer, use a small screwdriver to turn the **zero** potentiometer until the display reads **0000**.
2. **Fine span**—With the known load on the transducer, use a small screwdriver to adjust the **span** potentiometer until the display matches your known load.

**OR**

With no load on the transducer, press and hold the **shunt cal** button. Use a small screwdriver to adjust the **span** potentiometer until the display matches the value calculated on page 11.

*Note: Turn the potentiometer clockwise to increase the displayed value. Turn it counterclockwise to decrease the displayed value.*



## **2.9 Using the Model NK**

Verify the calibration daily for best results. To use the Model NK, simply apply the load on the device to be measured and read the display. Recalibrate the Model NK each time you use it with a different transducer. For details about using the peak detector and other options, see page 25.

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## 3 Calibration

### 3.1 When to Calibrate

Calibrate the Model NK if you are not using the original transducer and each time you change transducers.

### 3.2 Methods of Calibration

Two methods of calibration are available: *standard* and *shunt*. Use standard calibration when you can place a known load on the transducer. Use shunt calibration to simulate the load when you cannot apply a known load or for quick field setup.

### **3.3 Calibration Overview**

Remove the unit from the case by loosening all four captive fasteners on the front panel and lifting the panel out of the case, then do the following:

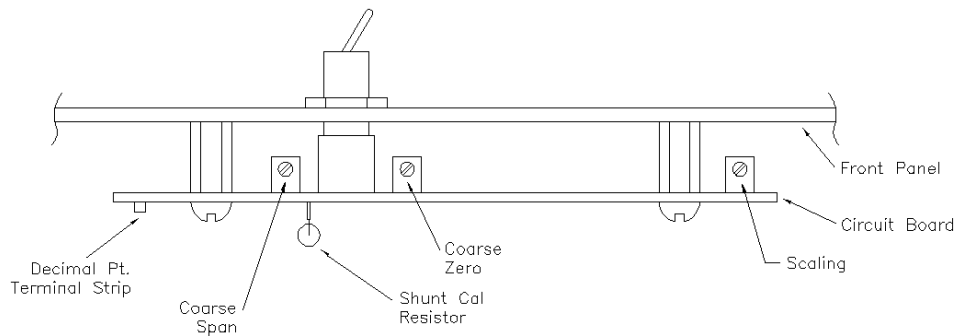
1. Center the fine tuning (page 16).
2. Turn off the scaling (page 16).
3. Adjust for no load (page 18).
4. Adjust for a known or calculated load (page 19—standard calibration; page 21—shunt calibration).
5. Adjust the scaling (page 19—standard calibration; page 21—shunt calibration).

### **3.4 Center the Fine Tuning**

Center the **zero** and **span** fine-tuning potentiometers to allow precise adjustment in either direction. Use a small screwdriver to turn each potentiometer up to 15 turns clockwise until it clicks. Then, turn it back halfway, 7-½ turns counterclockwise (see Figure 4: on page 17).

### **3.5 Disable Scaling**

Scaling is the ratio of the output voltage to the displayed reading. Disable scaling so it does not interfere with calibration. Use a small screwdriver to turn the **scaling** potentiometer up to 15 turns clockwise until it clicks (see Figure 4: on page 17).



**FIGURE 4: POTENTIOMETER LOCATIONS**

### 3.6 Adjust for No Load

1. Remove any load from the transducer.
2. **Coarse zero**—This control zeroes the display when the **fine zero** is out of range or the transducer has a preload, offset, or tare.  
Use a small screwdriver to turn the **coarse zero** potentiometer until the display reads approximately *0000* (Figure 4 on page 17).
3. **Fine zero**—Use a small screwdriver to turn the **fine zero** potentiometer on the front panel until the display reads exactly *0000*.

*Note: Turn the potentiometer clockwise to increase the displayed value. Turn it counterclockwise to decrease the displayed value.*

### 3.7 Adjust for a Known Load

If you can apply a known load to the transducer, use the standard calibration method. If you cannot apply a known load, use the shunt calibration method (page 21).

#### 3.7.1 Standard Calibration

1. **Coarse span**—This control adjusts the span for each different transducer.
  - a. Apply a known load (near full scale) to the transducer.
  - b. Use a small screwdriver to turn the **coarse span** potentiometer counterclockwise until the display reads approximately **19999**.
  - c. If the known load is not full scale, scale down this value proportionately. For example, if you apply an 80-lb load to a 100-lb transducer, scale down **19999** to **15999** as shown:

$$\frac{80}{100} \times 19999 = 15999$$

2. **Fine span**—With the known load applied, use a small screwdriver to turn the **fine span** potentiometer until the display reads exactly **19999** (or the scaled-down value).
3. **Scaling**—This control scales the display to the desired units. With the known load applied, use a small screwdriver to turn the **scaling** potentiometer until the display reads the desired full-scale engineering units (found on the transducer's calibration sheet or the result of step 1c).

After scaling, return the panel to the case and tighten the four captive fasteners. If the display does not read **0000**, fine tune the unit again according to the procedure on page 12.



### 3.7.2 Shunt Calibration

Use shunt calibration when you cannot apply a known load to the transducer. When the **shunt cal** button is pressed (with no load on the transducer), a precise resistor of known value is shunted across one leg of the transducer. This resistor simulates a known load or pressure.

The internal **shunt cal** resistor is installed on two pin jacks on the bottom of the circuit board (see Figure 4: on page 17).

*Note: The internal **shunt cal** resistor is normally 59 kOhm. To install a different calibration resistor, remove the present resistor from the jack and plug in a new one. See the information sheet supplied with the transducer for the recommended value for the **shunt cal** resistor and other relevant information.*

1. From the transducer calibration data sheet, obtain the following values:
  - Shunt-cal output (or “shunt-cal factor”) in mV/V
  - Calibration factor (or “full-scale output”) in mV/V
  - Full-scale engineering units (or “capacity”) in psig, lbs, etc.
2. **Coarse span**—This control alters the gain of the amplifier or readjusts the span when calibrating to a different transducer. Determine the unscaled shunt-cal display value using the following formula:

$$\frac{\text{shunt-cal output}}{\text{calibration factor}} \times 19999 = \text{unscaled shunt-cal display}$$

With no load on the transducer, press and hold the **shunt cal** button. Use a small screwdriver to adjust the **coarse span** potentiometer until the display reads approximately the unscaled shunt-cal display value.

3. **Fine span**—With no load on the transducer, press and hold the **shunt cal** button. Use a small screwdriver to adjust the **fine span** potentiometer on the front panel until the display reads the exact unscaled shunt-cal display value from step 2.

4. **Scaling**—This control scales the display to the desired units. Determine the scaled shunt-cal value using the following formula:

$$\frac{\text{shunt-cal output}}{\text{calibration factor}} \times \text{full-scale units} = \text{scaled shunt-cal engineering units}$$

With no load on the transducer, press and hold the **shunt cal** button. Use a small screwdriver to adjust the **scaling** potentiometer until the display reads the scaled shunt-cal engineering units.

After scaling, return the panel to the case and tighten the four captive fasteners. If the display does not read **0000**, fine tune the unit again according to the procedure on page 12.

## Shunt Calibration Example:

The following values are taken from a typical transducer calibration data sheet:

- shunt-cal output = 1.4683 mV/V
- calibration factor = 2.9999 mV/V
- full-scale units = 25 psig

To calculate the unscaled shunt-cal display value (as in step 2 on page 22):

$$\text{unscaled shunt-cal display} = \frac{\text{shunt-cal output}}{\text{calibration factor}} \times 19999 = \frac{1.4683 \text{ mv/v}}{2.9999 \text{ mv/v}} \times 19999 = 9788$$

To calculate the scaled shunt-cal value (as in step 4 on page 23):

$$\text{scaled shunt-cal value} = \frac{\text{shunt-cal output}}{\text{calibration factor}} \times \text{full-scale units} = \frac{1.4683 \text{ mv/v}}{2.9999 \text{ mv/v}} \times 25 \text{ psig} = 12.236 \text{ psig}$$

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## 4 Options

The Model NK has three options:

- Peak detector
- Analog voltage output
- High input

See below for brief descriptions of the Model NK options. For more information about the options, contact our Sales Department.

### 4.1 Peak Detector

The peak detector operates in two modes: **peak** and **track**. In both modes, the unit monitors the input signal. Use the toggle switch on the front panel to select the desired mode. The peak detector always operates in either **peak** or **track** mode.

In **peak** mode, the Model NK detects and displays the highest positive peak signal level. After two conversions of the analog-to-digital converter (at 1.5 conversions

per second), the unit stores the highest value. If the Model NK identifies a higher peak, the peak detector reactivates to record and display the new value. To cancel a displayed peak value, flip the **peak/track** switch to **track**.

In **track** mode, the peak detector continuously follows the input signal but does not store the highest value.

## **4.2 Analog Voltage Output**

An optional 0-1 volt analog output is available (for example, to connect to a chart recorder). For this option, a double banana-plug jack (positive red terminal) is mounted on the front panel. Loading current must not exceed 2 mA.

### **4.3 High Input**

A “low-gain” version of the Model NK is available which supports transducer outputs between 10 and 40 mV/V. The Model NK can also be field-converted for high input. For more information, contact our Service department.

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## 5 Maintenance and Repair

### 5.1 Cleaning

Clean the exterior and front panel of the Model NK with a damp (not wet) soft cloth.

### 5.2 Troubleshooting

#### 5.2.1 Low Battery

The red **low battery** light on the front panel indicates that the battery voltage is below 4.6 volts or that a battery is installed incorrectly. Although the unit can be operated with weak batteries, it may produce inaccurate readings.

*Note: We recommend alkaline batteries. To safeguard the circuitry, remove the batteries when not using the unit for a long period of time.*

Replace the batteries according to the following procedure:

1. Flip the **on/off** toggle switch on the front panel to **off**.
2. Loosen all four captive fasteners and remove the panel from the case.



3. Replace all four “D” batteries, matching polarities to the indications on the battery holder.
4. Replace the front panel and tighten the fasteners.

### 5.2.2 Overrange indications

*Note: The Model NK indicates an overrange condition by a flashing left arrow on the display.*

An overrange indication often results from faulty “sense” pin wiring (such as a missing or broken wire). Determine the source of the problem using the following procedure:

1. Check all electrical connections for continuity.
2. Check the wiring code for pin layout.
3. Verify that the unit was set up according to the instructions in this manual.
4. Determine if the problem is with the transducer or the Model NK:
  - a. Remove the transducer from the Model NK.
  - b. Jumper (-)Output (pin E) and (+)Output (pin F).
  - c. If the display reads close to **0000**, the transducer may be faulty. Try using another transducer with the Model NK, calibrating first.

5. If an overrange indication is still present, the problem may be with the Model NK. Contact our Service Department.

### **5.2.3 Erratic readings**

Erratic readings could indicate that the batteries are weak.

1. Check the batteries for low voltage or mismatched polarities. Replace weak batteries.
2. If the batteries are strong and installed properly but erratic readings are still present, contact our Service Department.

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## 6 Specifications

### 6.1 Physical Characteristics

Size	178 mm x 127 mm x 127 mm [7.0 in x 5.0 in x 5.0 in]
Number of channels	1
Material	deep-drawn, weatherproof aluminum case
Weight (including batteries)	1.6 kg [3.5 lb]

## 6.2 Environmental

Temperature, storage	-28 °C to 65 °C [-20 °F to 150 °F]
Temperature, operating	0 °C to 55 °C [32 °F to 130 °F]

## 6.3 Power Supply

Battery type	4 D cells (alkaline recommended)
Battery life	250 hours (for alkaline)

*Note: To safeguard the circuitry, remove the batteries when not using the unit for a long period of time.*

## 6.4 Transducer Interface

Transducer excitation	4 Vdc (constant voltage)
Transducer output range	1 to 4 mV/V 10 to 40 mV/V (high input option)
Transducer bridge range	250 Ohm minimum
Electrical connector type	Bendix/Amphenol PT02A-10-6S
Mating connector type (included)	Bendix/Amphenol PT06A-10-6P(SR); (part number 023-0086-00)
Zero balance	+/-15% full scale (minimum)
Noise and Ripple	30 $\mu$ V

## 6.5 Amplifier

Full-scale output (optional)	0-1V (output impedance < 1 Ohm)
Non-linearity (% F.S.) (max.)	+/-0.02%
Drift (max. zero and span)	+/-5 mV
Zero stability (% F.S./yr.)	0.1%
Span stability (% F.S./yr.)	0.1%
Fine span adj. (% range)	+/-15%
Coarse span adj. (% range)	100%
Fine zero adj. (% range)	+/-15%
Coarse zero adj. (% range)	100%

## 6.6 Digital Display

Type	liquid-crystal display (LCD)
Number of Display Characters	4-½ digits
Character size	12 mm [0.5 in]
Conversion rate	1.5 / second
Scaling	0-19999
Scaling method	potentiometer
Maximum display count	19999
Polarity indications?	yes
Programmable decimal points?	yes
Overrange indicator	flashing left arrow
Resolution	1/20000
Maximum sensitivity	0.1 $\mu$ V/count



## 6.7 Options

High Input	0-40 mV/V
Analog Voltage Output	0-1 Vdc (2 mA maximum)
Peak/hold detector	bleed rate of 0.01%/second or less



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## **7 Warranty**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is the Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide applications assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.



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