



## Type 1490 DECADE INDUCTOR

### Type 940 DECADE-INDUCTOR UNIT

#### FEATURES:

- ◆ High values of storage factor  $Q$ , with maximum values above 200.
- ◆ Toroidal construction minimizes external magnetic fields, so that the coils can be stacked without errors from mutual inductance. The toroids are nearly astatic to external magnetic fields.
- ◆ Aluminum covers provide electrostatic shielding and mechanical protection.
- ◆ Wax dipping keeps out moisture.
- ◆ The switch is inherently reliable in extensive use and should not require bothersome cleaning or adjustment in service.

**USES:** These inductance decades are convenient elements for use in wave filters, equalizers, and tuned circuits throughout the range of audio and low radio frequencies. As components in oscillators, analyzers, and similar equipment, they are especially useful during the preliminary design period, when the ability to vary circuit elements over relatively wide ranges is necessary to determine optimum operating values. As moderately precise standards of inductance they have values of low-frequency storage factor,  $Q$ , which are much larger than those of air-cored coils.

**DESCRIPTION:** Each TYPE 940 Decade-Inductor Unit is an assembly of four TYPE 1481 Inductors (relative values,

1, 2, 2, 5) wound on molybdenum-permalloy dust cores, which are combined by switching to give the eleven successive values from 0 to 10. The decade switch has high-quality ceramic stator-and-rotor members and utilizes a well-defined ball-and-socket detent. All contacts are made of a silver alloy and have a positive wiping action.

The TYPE 1490 Decade Inductor is an assembly of three or four TYPE 940 Decade-Inductor Units in a single metal cabinet. The units have no electrical connection to the panel, but a separate ground terminal is provided which can be connected to the adjacent low terminal, which leads to the smallest decade.

#### SPECIFICATIONS

**Accuracy:** Each unit is adjusted so that its inductance at zero frequency and initial permeability will be the nominal value within the accuracy tolerance given in the following table:

Inductance per step	100 $\mu$ h	1 mh	10 mh	100 mh	1 h
Accuracy	$\pm 2\%$	$\pm 2\%$	$\pm 1\%$	$\pm 0.6\%$	$\pm 0.6\%$

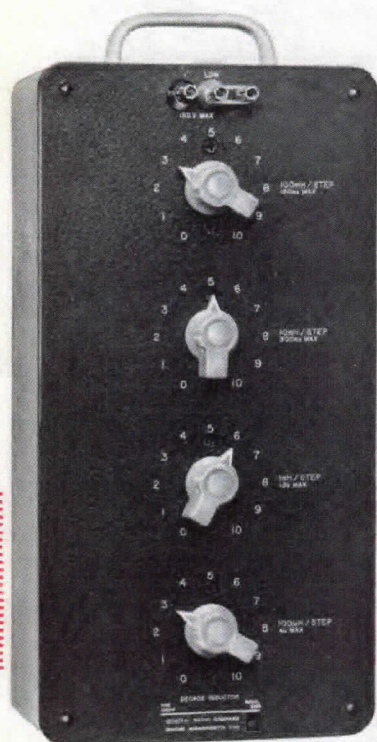
**Frequency Characteristics:** For any specific operating frequency, Figure 2 shows the percentage increase in effective series inductance (above the value when  $f = 0$ ) which is encountered with the extreme settings of each of the five decade-inductor units when the chassis is floating. Interpolation may be used for intermediate settings.

For the TYPE 1490 Decade Inductors, the percentage increase in effective series inductance (above the zero frequency value,  $L_0$ ) may be obtained by interpolation in Figure 3 for any setting of the highest-valued decade used, when the low terminal is grounded to the cabinet.

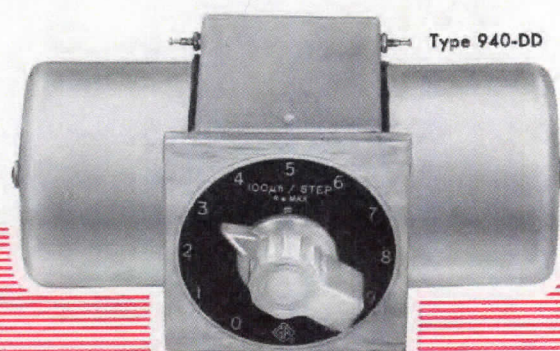
**Change in Inductance with Current:** Fractional change in initial inductance with ac current for each type of toroid is shown in the normal curves, Figure 1, in terms of the ratio of the operating current,  $I$ , to  $I_1$ , the current for 0.25% change, solid line (0.1%, broken line). For ratios below unity, inductance change is directly proportional to current. Values of  $I_1$ , listed below, are approximate and are based on the largest inductor in the circuit for each setting.

**Incremental Inductance:** DC bias current  $I_b$  will reduce the initial inductance as shown in the incremental curves, Figure 1.

Switch Setting	RMS $I_1$ (ma)				
	0.1% Increase	0.25% Increase			
	940-DD	940-E	940-F	940-G	940-H
1	141	24	7.6	2.4	0.76
2, 3, 4	100	17	5.4	1.7	0.54
5, 6, 7, 8, 9, 10	63	11	3.4	1.1	0.34



Type 1490-F



Type 940-DD



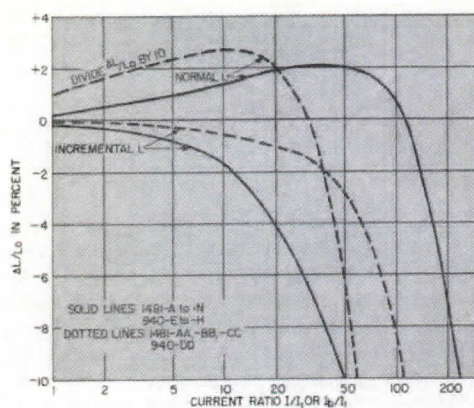


Figure 1. Percentage change in normal and incremental inductance with ac and bias current. Incremental curve is limited to an ac excitation less than  $I_1$ .

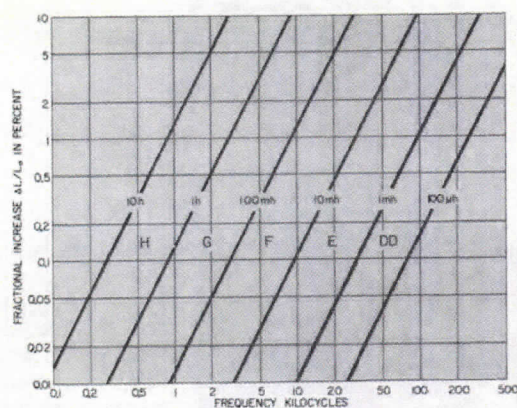


Figure 2. Change in effective inductance with frequency for the Type 940 Decade-Inductor Units.

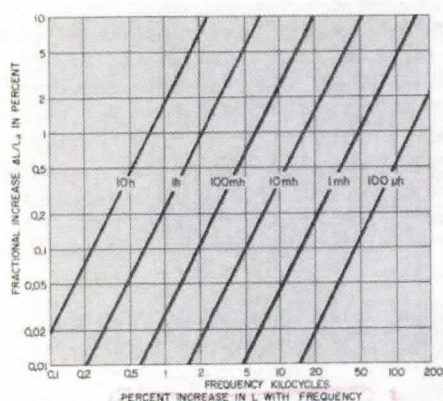


Figure 3. Variation of inductance with frequency, for the Type 1490 Decade Inductors.

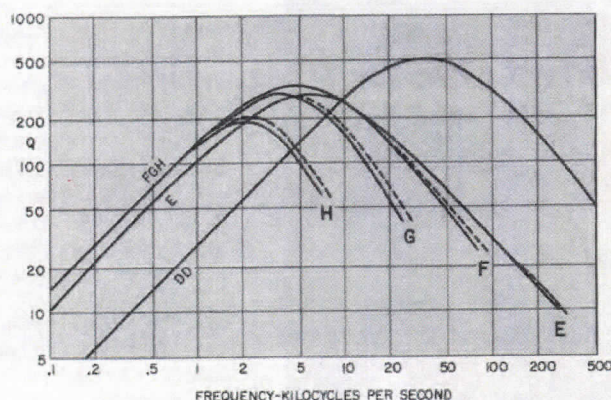


Figure 4. Variation of  $Q$  for the maximum inductance of each Type 940 Decade-Inductor Unit. Dashed curves correspond to use with chassis floating.

**Zero Inductance:** Approximately  $1 \mu\text{h}$  for the decade boxes.

**Storage Factor,  $Q$ :** See Figure 4.

**DC Resistance:** Approximately 45 ohms per henry.

**Temperature Coefficient:** Approximately  $-25$  ppm per degree C between 16 and 32 C.

**Maximum Voltage:** 500 volts, rms. The switch will break the circuit at 500 volts if turned rapidly to the new setting, but voltages above 150 may cause destructive arcing if the switch is set between detent positions.

**Maximum Safe Current:** 100 times the pertinent  $I_1$  value (30 times for the TYPE 940-DD).

**Terminals:** TYPE 1490, jack-top binding posts on standard  $\frac{3}{4}$ -inch

spacing; separate ground terminal provided. TYPE 940 Units have soldering lugs. Circuit insulated from chassis.

**Mounting:** TYPE 1490, lab bench cabinet (see page 210); TYPE 940, complete with dial plate, knob, and mounting screws.

**Dimensions:** TYPE 940 — width 8, height  $3\frac{1}{2}$ , depth  $4\frac{1}{4}$  inches (205 by 90 by 110 mm), over-all. TYPE 1490-C — width  $8\frac{1}{2}$ , height  $12\frac{3}{4}$ , depth  $5\frac{1}{2}$  inches (215 by 325 by 140 mm), over-all; TYPES 1490-D and -F — width  $8\frac{1}{2}$ , height  $16\frac{3}{4}$ , depth  $5\frac{1}{2}$  inches (215 by 425 by 140 mm), over-all.

**Net Weight:** TYPE 940 —  $3\frac{1}{2}$  pounds (1.6 kg); TYPE 1490-C —  $16\frac{3}{4}$  pounds (7.5 kg); TYPES 1490-D and -F —  $21\frac{3}{4}$  pounds (10 kg).

**Shipping Weight:** TYPE 940 — 6 pounds (2.8 kg); TYPE 1490-C — 24 pounds (11 kg); TYPES 1490-D and -F — 29 pounds (13.5 kg).

Type	Inductance	No. of Dials	Code Number	Price
940-DD	1 mh; in 100- $\mu\text{h}$ steps		0940-9810	\$120.00
940-E	0.01 h; in 0.001-h steps		0940-9705	120.00
940-F	0.1 h; in 0.01-h steps		0940-9706	110.00
940-G	1 h; in 0.1-h steps		0940-9707	120.00
940-H	10 h; in 1-h steps		0940-9708	130.00
1490-C	1.11 h, total; in steps of 0.001 h	3	1490-9703	370.00
1490-D	11.11 h, total; in steps of 0.001 h	4	1490-9704	470.00
1490-F	1.111 h, total; in steps of 100 $\mu\text{h}$	4	1490-9706	470.00