

Instruction Book
(Interim)

Model 4198 THRULINE
Directional RF Probe

Patent Notice

This device is manufactured under one or more of the following U.S. Patents: 2,966,645; 2,891,221; 2,852,741. Other patent rights reserved.

SECTION 1 GENERAL DESCRIPTION

1. PURPOSE AND APPLICATION

The Model 4198 THRULINE RF Probe is a directional device, which indicates the relative magnitude of the incident power into a load. It can also be used to indicate the relative magnitude of reflected power, if the unit is reversed in the line, i. e. , turned around end-for-end. It is intended for use in coaxial lines with a nominal characteristic impedance of 50 ohms. When used with the appropriate meter, potentiometer and calibrating resistors, it will indicate accurately full scale power levels of 40 milliwatts and 2 watts. Any full scale power level between these two values can be selected at will by the operator. The power levels selected, however, are arbitrary and are not calibrated. The primary purpose of the Model 4198 THRULINE RF Probe is for power level adjustments over a 50 to 1 range, with the secondary consideration the absolute value of the level selected. Normally this unit will be permanently mounted in original transmitter equipment. The meter (100 microampere dc full scale) is calibrated in microamperes and is not normally furnished with the instrument. The Model 4198 indicates average power, and is for use with CW, AM and FM but not for use with pulsed transmitters.

2. DESCRIPTION

The Model 4198 THRULINE RF Probe consists of a nominal 50-ohm line section with interchangeable RF connectors and a permanently attached directional coupler. The unit is normally furnished with "TNC" female connectors; however, type "N" male or female can be obtained upon request and installed in the field without disturbing the calibration or operation of the instrument. The directional coupler utilizes a silicon diode as a half-

wave rectifier which converts the sampled RF energy to dc. The arrow on the side of the unit indicates the direction of the power flow being sampled.

The external potentiometer (10 K ohms with logarithmic taper) controls the full scale sensitivity of the Model 4198 and permits the operator to select any full scale sensitivity between 40 milliwatts and 2 watts. These two power levels are accurately calibrated with two external resistors. The 2-watt level is selected by adjusting the potentiometer to its extreme counter-clockwise position; the 40 milliwatt level is selected by adjusting the potentiometer to its extreme clock-wise position. Any potentiometer position between these two extremes selects an arbitrary full-scale power level which is not calibrated. The external dc circuitry and calibrating resistor values are shown on Dwg. 419801.

The dc output of the directional coupler is brought out of the coupler housing by means of a glass insulated feed-thru. This feed-thru is the positive polarity of the dc circuit. The negative polarity is at ground potential and can be obtained by means of a solder lug under one of the RF connector screws. The series-parallel dc circuitry was selected to keep the rectified dc voltage below one volt at any potentiometer setting. This voltage limit prevents overloading and possible damage of the diode. This condition is satisfied as long as the meter is on scale, i. e. , 100 microamperes or less.

The Model 4198 RF Probe is not intended to be a calibrated wattmeter; however, a family of curves illustrating down scale power values for various full scale power levels is furnished. These curves are approximate, but are typical and serve a useful purpose. Since the meter is calibrated in microamperes, the curves are shown as watts vs microamperes. See Fig. 1.

The Model 4198 RF Probe frequency response is sufficiently constant over the operating frequency range so that no correction for frequency error is required. This is true of any power level or any combination of frequency and power level within the specified range.

3. SPECIFICATIONS (See Fig. 1 and Dwgs. 419800 and 419801)

Overall Dimensions:

3-3/4" x 1-23/32" x 1"

Fitted with two (2) Female "TNC" Connectors.

Weight:

7 ounces.

Frequency Range:

4.4 to 5.0 Kilo-Megacycles

Power Range:

40 Milliwatts to 2 Watts

Connectors:

RF - Two (2) Female "TNC" Quick-Change (QC) Type.

Directivity:

25 db minimum.

Accuracy:

+10% at two calibrated levels (40 MW and 2 W)

Insertion VSWR:

Less than 1.10 (With one (1) Male and one (1) Female "N".)

Impedance:

50 ohm nominal

Meter:

Furnished by Customer.

100 microamperes dc full scale, 1200 ohms.

Scale calibrated 0-100 microamperes.

4. CALIBRATION DATA - MODEL 4198

Serial No. _____

Frequency Response

<u>Frequency KMC</u>	<u>Incident Power MW</u>	<u>Model 4198 Reads</u>
4.40	200	100 Microamperes
4.47	199	100 Microamperes
4.55	200	100 Microamperes
4.65	200	100 Microamperes
4.75	198	100 Microamperes
4.90	199	100 Microamperes
5.00	200	100 Microamperes

Maximum Frequency Error 1%

Equipment Used:

Sperry Klystron Signal Source Model 444.

Sperry Klystron 2K43

Sperry Tuner Model 137

Bolometer Bridge HP 430B (Modified)

Thermistor Mount HP Model 477B

Attenuators (10 db 2 ea.) Weinschel Model 210-10

Frequency Meter PRD Model 504

Insertion VSWR

(One Female and One Male "N" Connector)

<u>Frequency KMC</u>	<u>VSWR of Load Used</u>	<u>VSWR of 4198 Plus Load</u>
4.40	Less than 1.02	1.05
4.50	Less than 1.02	1.065
4.60	Less than 1.02	1.060
4.70	Less than 1.02	1.065
4.80	Less than 1.02	1.05
4.90	Less than 1.02	1.03
5.00	Less than 1.02	1.025

Equipment Used:

Polarad Signal Generator Model MSG-34

Standing Wave Indicator H. P. Model 415B

Slotted Line P. R. D. Model 205A

Double Stub Tuner Weinschel Model DS109L

RF Load Bird Model 80M