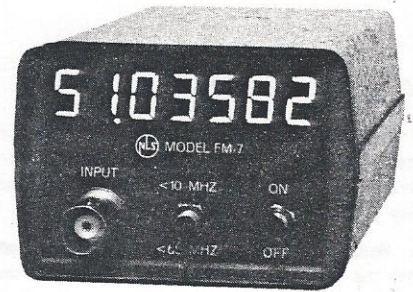




MODEL FM-7

Frequency Meter

INSTRUCTIONS



INTRODUCTION

The FM-7 Frequency Meter is the latest in electronic design. It uses integrated circuits assembled in a uniquely small package to provide a fully portable instrument for measuring frequency. Most important, it can measure frequency to an accuracy such that it can be used to verify radio transmission to the tolerances established by the FCC for transmission. Like NLS' LM Series of Digital Multimeters, the FM-7 is battery or line operated.

The FM-7 is a rugged, compact, low cost, wide range instrument of excellent accuracy, quality and long life. All use a crystal controlled time base for excellent stability and accuracy.

SPECIFICATIONS

FREQUENCY RANGES: Up to 10 MHz
Up to 60 MHz

INPUT CHARACTERISTIC:

Sensitivity:

30 mV to 500 mV (RMS sinewave) - 50 Hz to 30 MHz
100 mV to 500 mV (RMS sinewave) - 10 Hz to 50 Hz & 30 MHz to 60 MHz

Impedance:

1 MΩ, <50 pF up to 0.5 vrms input
1 MΩ, <120 pF above 0.5 vrms input

OVERLOAD PROTECTION (maximum input):

±100 vdc
250 vrms - 10 Hz to 500 kHz
 $1.25 \times 10^8 \text{ V} \times \text{Hz} \left(\text{vrms} = \frac{1.25 \times 10^8}{\text{Hz}} \right) -$
- 500 kHz to 25 MHz

5 vrms - 25 MHz to 60 MHz

RESOLUTION:

1 Hz on 10 MHz range
10 Hz on 60 MHz range

ACCURACY:

±1 count (±time base accuracy)

TIME BASE:

Frequency:

Internal Crystal - 2.097152 MHz

Stability:

Aging - <10 ppm/yr
Temperature - ±10 ppm, 0°C to +40°C
Battery Voltage - ±2 ppm, +4.5 to +6.5V

GENERAL:

Display:

7-digit LED. Time between displays:
1 second plus measurement time of 1 second.

Operating Temperature:

0°C to +40°C

SPECIFICATIONS (Cont)

Dimensions:

1.9" H x 2.7" W x 4.0" D (48.26 mm x 68.58 mm x 101.6 mm)

Weight:

9 oz (272 g)

Input Cable:

4 ft (122 cm) coaxial, terminated with miniature alligator clips.

Power:

Four type AA NiCad batteries (charger unit included).

Discharge Time - 2 hours

Charge Time - 14 hours

May be operated while batteries are being charged. Overcharge protection is built in.

OPERATING PRINCIPLES

The FM-7 is a direct counter. It actually counts the input pulses, one by one, after they have been amplified and conditioned. There are seven decades in use on the 10 MHz range (60 MHz maximum). A high quality 2.097152 MHz crystal is used to establish a precise one-second time base. During a one-second interval, the pulses are counted. For the next one-second interval, the count is displayed. This two-second sequence is then repeated.

The display is a multiplexed display of the data in the counters as they count. Multiplexing lowers the power requirements for display while still providing a bright, easily read display.

Two ranges are provided; a 10 MHz full scale range, which with the 7-digit display provides a one-hertz resolution and a 100 MHz full scale range, usable to 60 MHz, which has a 10-hertz resolution.

Because of the 7-digit display, the meter can be calibrated to 0.00001% for a given temperature and battery voltage.

PREPARATION FOR USE

Your frequency meter was shipped from the factory with a set of four type AA NiCad batteries installed within the case. The batteries are not fully charged. To bring them to a charged state, plug the charger unit cord into the meter and then plug the charger unit into a 115 vac power source. Allow 14 to 16 hours for the batteries to reach full charge with the meter not operating. Protection against overcharging the batteries has been designed into the instrument.

CAUTION

The instrument will also operate with non-rechargeable batteries and if this type is used, NEVER try to recharge them as they may explode and damage the meter. The charger unit is designed to recharge only NiCad batteries.

OPERATION

1. The meter will operate from the self-contained rechargeable batteries with or without the charger unit connected.
2. Connect the input cable to the BNC signal input connector on the front panel.
3. Rotate the front panel switch to the <60 MHz position. This turns the meter on and the display will light up.
4. Connect the input cable to the signal to be monitored. The meter will count the input pulses and display for one second the total received for the previous one-second gate time. If the meter is in the one-second gate time at the time it is first connected, the reading will be in error as not all pulses were received. The second sample period will provide the correct frequency.

CAUTION

Be sure that the input signal does not exceed the maximum input acceptable. (See specifications.)

5. If the observed frequency is less than 10 MHz, a zero will be observed as the left-most digit. If this occurs, change the front panel switch to the <10 MHz range.

NOTE

Always start with the <60 MHz range, since the maximum count rate on the <10 MHz range is 15 to 17 MHz.

6. When measuring a transmitter output frequency, several methods may be used. If the output is via a coaxial cable to the antenna, wrap a wire around the cable five or six times and connect the FM-7 input red clip to the wire. Leakage through the shield on the coaxial cable will provide sufficient signal to the FM-7. If the antenna is nearby, a simple wire about eight inches (203 mm) long or more can be used as a receiving antenna for the meter. Merely attach the clip to one end of the wire and hold it parallel to the antenna. The distance from the transmitting antenna is determined by the power radiated and the length of the receiving antenna.

BATTERY REPLACEMENT

If the batteries supplied with the meter ever need replacement or if non-rechargeable batteries are desired to be used, replacement may be effected as follows:

1. Snap off the rear cover of the instrument with the blade of a small screwdriver. Two small slots on each side have been provided for this purpose.
2. Remove the meter assembly from its case by gently pushing the switch-knob and the BNC connector on the front panel.
3. Remove batteries by pushing against the spring with the battery, and simultaneously lift the battery from the holder. Install the four replacement batteries in the cavity on the bottom side of the meter assembly.

NOTE

Ensure correct installation by observing polarity indications on the battery box.

CALIBRATION

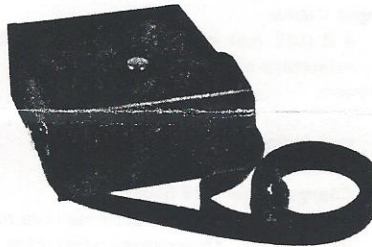
Connect the charger unit to the meter and plug charger unit into 115 vac power source. If the batteries are low, allow sufficient time for fully recharging. Calibration of the meter should always be performed with the batteries fully charged or with new non-rechargeable batteries.

To calibrate the instrument, first remove the rear cover from the instrument case as set forth in paragraph 1 above under Battery Replacement. Connect a calibrated frequency to the FM-7 input. The display should be accurate to one part in 10^7 (0.1 ppm) or better; if it is not, adjust the trimmer capacitor at the rear of the center board until the display reads the exact frequency as the known input frequency.

When the display reads the same, the meter will be calibrated to 0.00001%. This accuracy will vary by $\pm 0.0002\%$ with a change in battery voltage from 6.5 to 4.6 volts. Over the temperature range of 0°C to $+40^\circ\text{C}$, the change will be a maximum of $\pm 0.0001\%$.

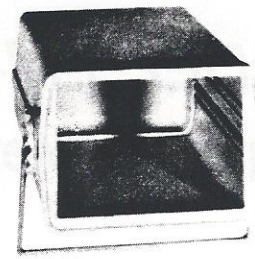
OPTIONAL ACCESSORIES

Leather Case. The leather case is designed to hold not only the meter but also the input cable and/or extra batteries. It can be mounted on the user's belt with convenient snaps, or it can be placed around the neck using the neck strap included. It cannot be accidentally pulled off the belt or the neck strap, as one-way snaps are used. The Part No. is 39-439.



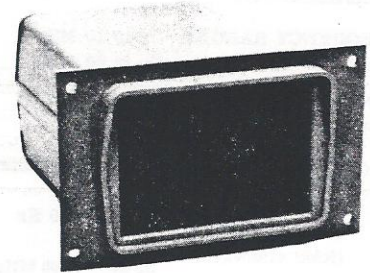
Leather Case

Tilt Stand. The meter can be obtained with a tilt stand which permits viewing the display easily when used on a bench. The base and detents are added to a standard case. The base is made of stainless steel and can be positioned in any of several positions for desk top use. This option is not a retrofit and therefore must be ordered with the meter. It may also be ordered separately as an extra case, providing a case for field use and one for desk top use. To order with meter, specify FM-7/LH; to order separately, specify Tilt Stand, Part No. 39-452-2.



Tilt Stand

Panel-Mount Flange. The meter can be obtained with a flange permanently attached to the case for panel-mounting. The horizontal distance between centers of mounting holes is 2-15/16 inches (74.6 mm) and the vertical distance is 1-15/16 inches (49.2 mm); hole diameter is 1/8 inch (3175 microns). This option is not a retrofit and therefore must be ordered with the meter. It may also be ordered separately as an extra case, providing a case for field use and one for panel mounting. To order with meter, specify FM-7/PH; to order separately, specify Panel-Mount Flange, Part No. 39-454-2.



Panel-Mount Flange

Prices and Specifications Subject to Change without Notice



Non-Linear Systems

Originator of the digital voltmeter.

4561-F Mission Gorge Place
San Diego, CA 92120

Phone: 619-521-2161
Fax: 619-521-2169
www.nonlinearsystems.com

This Document Provided Free

At

www.StevenJohnson.com

NOT FOR RESALE