6H AND 6HR IMPULSE COUNTERS
(J94006H AND J94006HR)
DESCRIPTION, OPERATION, AND MAINTENANCE

CONTENTS

1. GENERAL

1.01 This section covers the description, operation, and maintenance of the 6H and 6HR impulse counters (J94006H and J94006HR).

1.02 The 6H set is portable, and the 6HR set is arranged for modular rack-mounting. These sets have similar electrical specifications; therefore, information contained in this section will pertain to both sets unless specified otherwise.

1.03 The 6H and 6HR sets replace the 6A and 6E impulse counters (J94006A and J94006E), respectively.

2. GENERAL DESCRIPTION AND OPERATION

A. Purpose of Instrument

2.01 The 6H and 6HR sets provide a means for counting impulse noise peaks that exceed a single adjustable threshold level in the frequency range of 20 Hz to 80 kHz.

2.02 A 735-ohm balanced, terminating input impedance is provided for making metallic impulse noise measurements normally made at 600 or 900 ohms.

B. General Operation

2.03 Dialing (6H set only) and holding are provided for setting up a connection preparatory to making measurements.

2.04 A timer provides a preset time interval for counting impulses. The timer is adjustable from 0 to 15 minutes. An adjustable stop on the timer provides for repeating a selected interval.

2.05 The 6H portable set (Fig. 1) is self-contained and operates from eight, AA-type, 1.5-volt alkaline flashlight batteries connected in series. In normal use (less than 250 counts per hour), the batteries should provide a minimum of 100 hours of operation. Pin jacks on the front panel are available for checking the condition of the batteries with an external voltmeter.

2.06 The 6HR set (Fig. 2) is arranged for modular rack-mounting and operates from the −48 volt office battery.

2.07 A weighting network selects the passband of frequencies to be measured. One network, having a ***C-notched*** filter on one side and a ***flat*** filter on the other, is supplied with each set. The ***C-notched*** filter has a characteristic similar to that of the ***C-message*** filter but includes a band rejection filter centered about 2750 Hz to permit measurements on compandored or mixed compandored-noncompandored circuits. The network is normally oriented for ***C-notched*** weighting. It plugs into a connector and is secured in place by a clamp. The network is accessible only by removing the set from its case.

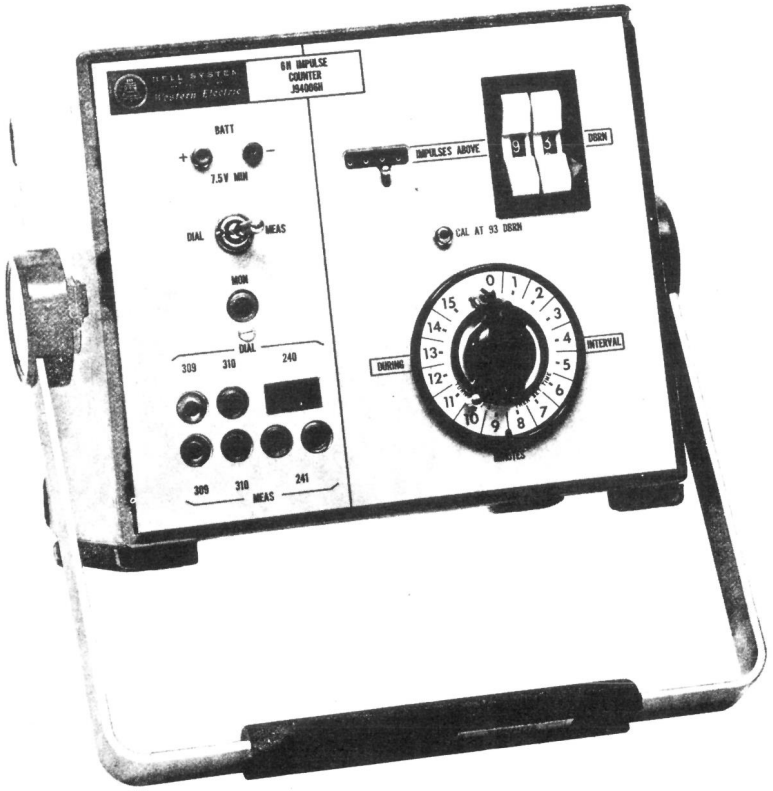

Fig. 1 – 6H Portable Set

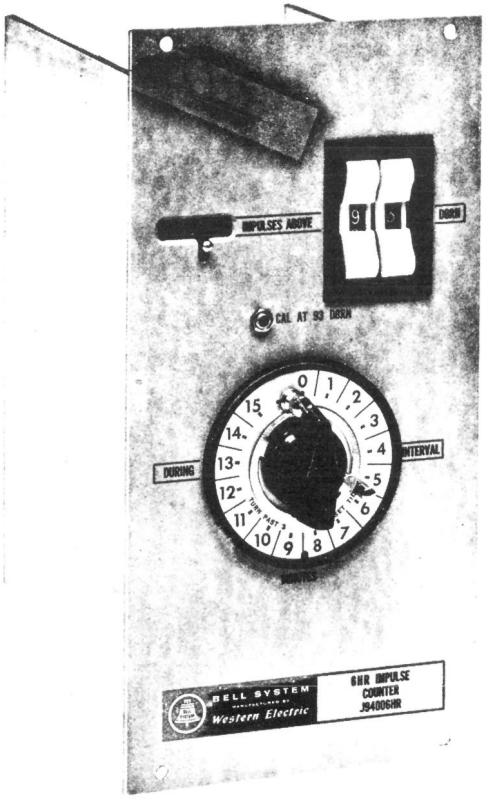

Fig. 2 – 6HR Rack-Mounted Set

2.08 An amplified output of the received noise is provided for monitoring purposes. A 723A receiver with a W2FS cord is supplied with each 6H set for listening to the measured noise. It can be plugged into a jack on the front panel of the 6H set. The monitor output appears at a jack at the rear of the 6HR set for wiring it to a separate jack field if desired.

C. Equipment Features

2.09 The 6H portable set weighs 13 pounds and measures 9 inches wide, 7-1/2 inches high, and 11-1/4 inches deep (including cover). The case is equipped with a sling-type handle which pivots about the left-right geometric axis. The handle automatically locks into any of 16 radial positions. This provides for carrying the set and for tilting it to a convenient operating angle. The 6H set cover contains simplified instructions for calibrating and operating the set. It also provides a space for storing the monitor receiver and cord when they are not in use.

2.10 The 6HR modular rack-mounted set weighs 11-1/2 pounds and measures 5 inches wide, 10 inches high, and 8-7/8 inches deep (including case, jack on rear of set, and 1-1/8 inch forward projections on front panel). With available brackets, ED-99987-( ), this set can be mounted in any size rack from 19 inches up. A plug and jack arrangement on the rear of the 6HR set provides for wiring the input, office battery, and monitor connections to the set and also provides for easy removal of the set from its case.

D. Electrical Specifications

2.11 Table A shows the electrical specifications for the 6H and 6HR sets.

TABLE A

ELECTRICAL SPECIFICATIONS

ITEM	SPECIFICATION
Sensitivity	40 to 99 dBrn, adjustable in 1-dB steps
Bandwidth	20 Hz to 80 kHz, normally modified by ***C-notched*** filter (see 2.12 and Fig. 4)
Input Impedance	735 ±15 ohms (20 Hz to 25 kHz) balanced for measurements normally made at 600 and 900 ohms
Holding	750 ohms dc resistance
Longitudinal Input Balance	(a) Greater than 80 dB at 1 kHz (b) Greater than 55 dB at 25 kHz
Maximum Counting Rate	7 counts per second
Maximum Counting Capacity	9999 counts, resettable to 0
DC Supply Voltage Range	(a) −7.5 to −12.5 volts for a 6H set (b) −44 to −52 volts for a 6HR set
Temperature Range	−10° to 150° F
Measurement Accuracy at 1000 Hz	(a) ±0.5 dB over temperature range of 32° to 122° F (see 2.13) (b) ±0.7 dB over temperature range of −10° to 150° F (see 2.13)

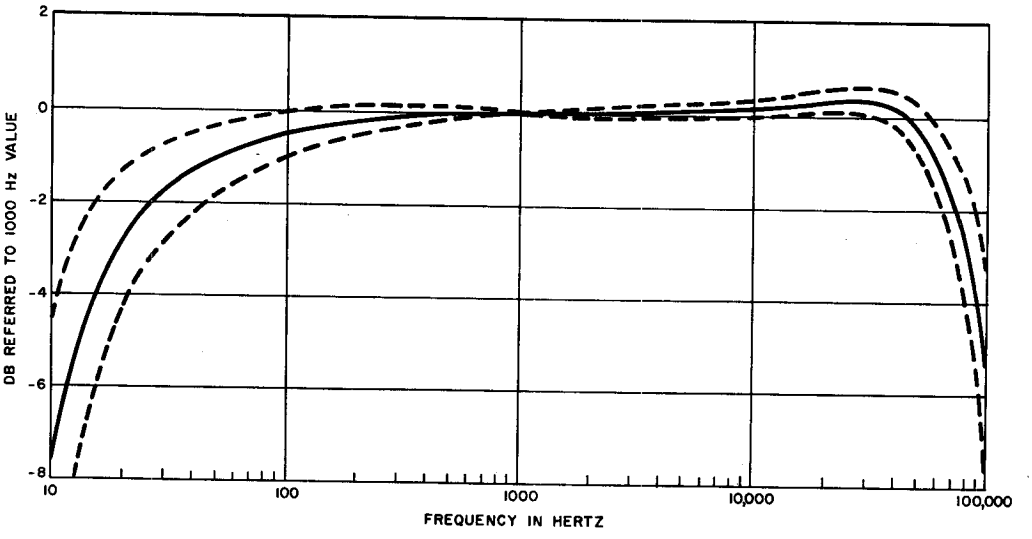

Fig. 3 – Frequency Characteristic With Flat Weighting

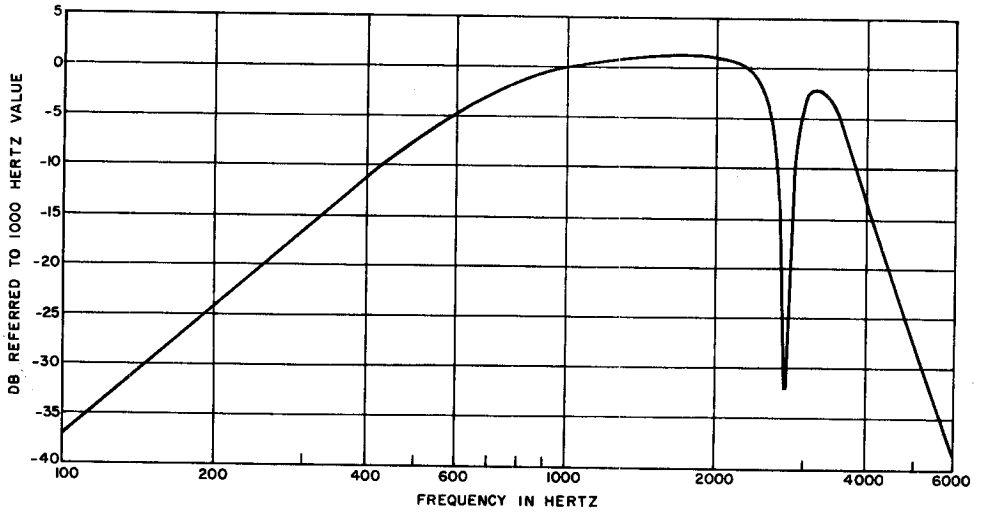

Fig. 4 – Typical Frequency Characteristic With C-Notched Weighting

2.12 Fig. 3 shows plots of the frequency characteristic for the 6H and 6HR sets with the weighting network oriented for ***flat*** weighting. The solid curve shows the typical response for these sets, and the dashed curves show the limits that result from component tolerances. The frequency characteristic is normally modified by means of the ***C-notched*** filter. Fig. 4 shows a typical plot of the resulting frequency characteristic with ***C-notched*** weighting. The characteristic is similar to that of the ***C-message*** filter but includes a band rejection filter centered about 2750 Hz to permit measurements on compandored circuits. In the band of 2736 to 2764 Hz, rejection greater than 30 dB is provided.

2.13 The measurement accuracy at the calibrating frequency (1000 Hz) for the 6H and 6HR sets will be ±0.5 dB in the temperature range of 32° to 122° F and ±0.7 dB in the temperature range of −10° to 150° F if the sets are properly calibrated (see 3.01). These accuracies apply for battery voltages of −7.5 to −12.5 volts for a 6H set and −44 to −52 volts for a 6HR set and for any DBRN dial setting.

3. OPERATING INSTRUCTIONS

A. Calibration of Set

3.01 To ensure good measurement accuracy, the set should be calibrated at least once every month, after changing batteries, or after changing the weighting network. When calibrating, the set should be in an environment of normal room temperatures (60° to 90° F). A 1000-Hz milliwatt generator, such as the 71-type generator (J94071), having either a 600- or 900-ohm source impedance and an accuracy of ±0.05 dB is required. The calibration procedure is as follows:

(1) For a 6H set, set the DIAL-MEAS control to MEAS.

(2) Set the DBRN control to 93.

(3) Connect the 1000-Hz generator, described above, to the input of the set.

(4) Turn the MINUTES control clockwise to the stop.

(5) For a 6H set, check the condition of the batteries by connecting a voltmeter to the BATT pin jacks. If this voltage is less than 7.5 volts, replace the batteries per 4.01, 4.02, and 4.03.

(6) Adjust the CAL control until the counter just counts. When this control is properly adjusted, the count will be erratic.

(7) This completes the calibration. Turn the MINUTES control fully counterclockwise and remove the milliwatt generator.

B. Operating Procedure

3.02 The 6H and 6HR sets are primarily intended for making metallic impulse noise measurements on voice-frequency circuits. In general, the receiving end of the circuit to be tested will be connected directly to the 6H or 6HR set (through a test pad when specified), and the far end will be terminated in a quiet termination equal to the office impedance. These sets provide a 735-ohm balanced input impedance for making measurements normally made at 600 or 900 ohms. This impedance is the geometrical mean of 600 and 900 ohms which makes the mismatch identical for 600- and 900-ohm measurements. The effect of this mismatch is corrected for when the set is calibrated (per 3.01). Multipled MEAS jacks on the front panel of the 6H set provide for connecting the circuit under test to the set with 309-, 310-, or 241-type plugs. Also, multipled DIAL jacks provide for connecting a telephone set or other dialing apparatus to the set with 309-, 310-, and 240-type plugs for establishing a connection on a circuit. A DIAL-MEAS switch on the 6H set connects the circuit under test to the DIAL jacks with this switch in the DIAL position and to the measuring circuitry with the switch in the MEAS position. The 6HR set has no input jacks on its front panel but has provision for wiring the input circuit to a separate jack field. A plug and jack arrangement at the rear of the 6HR set provides for making the input connection, the monitor output connection, and office battery connections; this arrangement also allows the set to be removed from its case without disconnecting any wiring.

3.03 The 6H and 6HR sets measure impulse noise by counting the impulses having ***peak*** values exceeding a single threshold level. The threshold level is adjustable by an attenuator having 1-dB steps and a range of from 40 to 99 dBrn.

3.04 The timer provides for presetting the time interval during which impulse counts are measured. The timer, having dial markings at 1/2-minute intervals, is adjustable from 0 to 15 minutes. An adjustable stop on the timer provides for repeating a selected interval. At the end of a preset interval, the timer will disable the counting circuit by removing dc power from all circuits of the 6H or 6HR set. The register relay will not be reset so that the total number of impulses received in the preset interval can be read from the register before resetting it for another test.

Note: To insure accurate timing in intervals of 3 minutes or less, first adjust the timer to at least 5 minutes and then return it to the desired value.

3.05 The trigger and register circuit response time is limited electrically such that impulses, separated by approximately 140 msec (about 7 counts per second) or more, will be recorded on the register relay. This insures that the register relay, after counting, will have sufficient time to reset properly before it accepts another count.

3.06 The MON output provides an amplified output of the received noise. By listening with a headset or other monitoring device or by oscilloscope presentation, the type of noise or the location of the source may be deduced. A 723A receiver with a W2FS cord is supplied with each 6H set. It can be connected to a single jack on the front panel of the set. A jack on the rear of the 6HR set provides means for wiring the monitor output to a separate jack field, if desired.

Note: Monitoring a circuit is usually required to determine, if possible, the type of impulse noise interference present and whether any trouble condition exists that would make the measurement meaningless. However, to avoid possible measurement errors due to noise pickup from a monitoring device, remove any monitoring device from the MON jack before making the actual impulse noise measurement. While investigating noise sources, it may be desirable to monitor the circuit during the measurement period. To determine whether noise is being picked up by a monitoring device, disconnect the test circuit from the input of the set, terminate the input of the set with a 600- or 900-ohm resistor, and observe the counter. This test should be performed with the set in both a grounded and an ungrounded condition.

3.07 The following is the operating procedure for a typical measurement:

(1) Connect the circuit to be measured to the input of the set.

(2) To set up a connection on a dialed-up basis, connect a telephone set or other dialing equipment to the DIAL jack field (6H set only).

Note: The 6HR set does not have the dialing feature. This feature must be supplied separately, if desired.

(3) Set the DIAL-MEAS control (6H set only) to DIAL and establish the connection.

(4) Set the DIAL-MEAS control to MEAS.

(5) Set the DBRN dial to the required level.

(6) If desired, connect a headset, oscilloscope, or other monitoring device to the MON jack; turn the MINUTES control clockwise and listen to or observe the measured noise as required (see Note in 3.06).

(7) Set the MINUTES control to the required time and measure the impulse noise counts. At the end of the preset time interval, the MINUTES switch will remove dc power from the set. The total number of impulses measured in this interval will be retained on the counter until it is reset for another test.

4. MAINTENANCE AND REPAIR

A. Battery Replacement

4.01 For a 6H set, the condition of the batteries should be checked periodically to insure that the dc supply voltage is within the normal operating range (−7.5 to −12.5 volts). This can be accomplished by connecting a voltmeter to the BATT pin jacks on the front panel. The MINUTES control must be turned clockwise before voltage appears at these jacks.

4.02 If the batteries require replacement, AA-type, 1.5 volt, ***alkaline batteries*** such as the RCA type VS-1334, or equivalent, should be used whenever possible. In normal use (less than 250 counts per hour), these batteries should provide a minimum of 100 hours of operation at ambient temperatures above 32° F. Below 32° F, the batteries will have a somewhat shorter life. If alkaline batteries are not available and if the ambient temperatures are above 32° F, type KS-14368 or equivalent carbon-zinc batteries can be used. These batteries, however, will provide only about one-half the life of the alkaline type. ***The carbon-zinc batteries will not provide satisfactory operation below 32° F.***

4.03 When replacing the batteries in a 6H set, care should be taken that the batteries are inserted properly in the holders. Designations near each holder show the correct polarities for each battery. To prevent possible overheating in the batteries and damage to the holders, batteries should be uniform, ie, they should be from the same manufacturer, should be of the same type, and should have about the same terminal voltage under load.

B. Trouble Indication and Repair

4.04 If any item of the set is malfunctioning or defective, the set should be sent to a repair and calibration center such as a Western Electric Distributing House.

4.05 Most trouble conditions will become apparent when calibrating the set. If a trouble condition is suspected, the calibration should be checked as described in 3.01. The calibration procedure is simple and can be accomplished with the use of a 0-dBm, 1000-Hz signal from a 600- or 900-ohm generator.

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4.12 ***Weighting Network:*** The weighting network provides a means for selecting the passband of frequencies to be measured. A 497E network, having a ***C-notched*** filter on one side (see 2.07) and a ***flat*** filter on the other side, is supplied with each set. The filters have a 600-ohm impedance and about 5 dB of flat loss. The set is calibrated through the weighting network and, therefore, any variation in flat loss between the filters is calibrated out.

NOTES