g, half sine of 9–13 ms duration in each direction along each of three mutually perpendicular axes. One of said axes is to be perpendicular to the mounting plane.

5.11 Design Detail Recommendations (Indicating Unit Only)

5.11.1 When analog displays are used, the display shall be accomplished by a pointer or other indicator traversing in a clockwise or left to right direction as applicable, to register increasing revolutions per minute over a suitable scale on the indicating unit dial.

5.11.2 Graduations shall be designed for the best practical legibility and accuracy of reading.

5.11.3 Unless otherwise specified: pointers and dial printing shall be white, dial background shall be low gloss black, and visible portions of the indicating unit should exhibit low reflectivity; the time or revolution indicator shall have white numerals on a low gloss black background except for the tenths indicator which shall have black numerals on a white background.

5.11.4 The indicating unit case shall be provided with studs for mounting by suitable U-clamps or similar means.

5.11.5 Typical envelope, mounting studs and terminal designations are displayed in Figs. 1–3.

5.12 Identification

5.12.1 INDICATING UNIT

5.12.1.1 To be legibly indicated on outside of case:

(a) Manufacturer's or user's part number.

(b) Manufacturer's or user's serial number and/or date of manufacture.

5.12.1.2 To be printed on dial and/or indicated on case:

Manufacturer's or user's name or trademark.

5.12.1.3 Electrical connections shall be clearly identified for proper wiring of instrument into circuit.

5.12.2 SENDER—Sender identification is to be used as agreed between manufacturer and user.

ELECTRIC HOURMETER SPECIFICATION—SAE J1378 MAR83

SAE Recommended Practice

Report of the Speedometer and Tachometer Committee, approved March 1983.

1. Scope—This SAE Recommended Practice establishes minimum requirements for electric hourmeters for general vehicular applications.

2. Electric Hourmeter Description—A typical electric hourmeter is a true operating time indicator which functions when electrically energized. The hourmeter is a DC operated device. There are three basic electromechanical types among which are: Stepper Solenoids, Stepper Motors, and Electrically Operated Clocks.

3. Calibration—The hourmeter indication shall be within ±2% of the elapsed time or ±0.1 h, whichever is greater, with nominal voltage applied at a temperature of 24 ± 3°C.

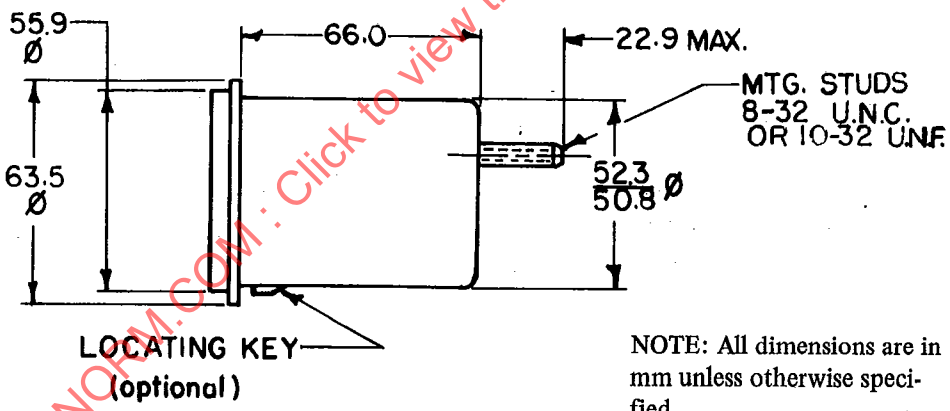
4. Effects of Environmental Conditions

4.1 Temperature

4.1.1 OPERATING—With nominal voltage applied, the time indication shall not vary more than ±1% of elapsed time in addition to the calibration error obtained in Section 3, while the unit is operating over the range of −7 to +54°C. No permanent damage shall result from operating the unit in a range of −40 to +82°C.

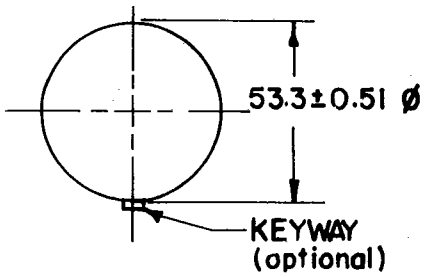
4.1.2 STORAGE—A 4 h exposure of the instrument to a temperature of −40 to +85°C shall result in no more than an additional ±1% of elapsed time permanent change from calibration error obtained in Section 3. The rate of temperature change during this test shall not exceed 2°C/min.

4.2 Voltage Variations—The time indication shall not change more than ±1% of elapsed time in addition to the calibration error obtained in Section 3 due to a voltage change of a nominal 12 V system from 12–16 VDC and a nominal 24 V system from 24–32 VDC. Twelve and



NOTE: All dimensions are in mm unless otherwise specified.

FIG. 1—(ENVELOPE) U-CLAMP MOUNT



NOTE: All dimensions are in mm unless otherwise specified.

FIG. 1A—PANEL CUTOUT

24 V hourmeters shall not change more than ±3% from the reading obtained in Section 3 at 11 and 22 V respectively.

4.3 Abnormal Voltage Conditions

4.3.1 TRANSIENT PROTECTION—The instrument shall be capable of withstanding supply voltage transients without permanent damage and shall remain within the calibration specification of Section 3 at the conclusion of this test. The instrument shall be connected and operated for a total of 1 h with a means provided to impress upon the nominal battery voltage a repetitive rectangular voltage pulse of plus and minus six times nominal battery voltage with a duration of 300 μs and 1% duty cycle with a current of no more than 1.0 amp. For some applications which may have transient voltages having a magnitude, duration, or duty cycle exceeding the above requirements, contact the instrument manufacturer for recommendations. Further information on transients may be found in SAE J1113.

4.3.2 OVERVOLTAGE AND REVERSE POLARITY—Provisions for protection against booster starts with double battery voltage and/or reversed polarity must be negotiated between the user and the maufacturer.

4.4 Humidity—Instrument shall not have its function impaired due to exposure to 95% relative humidity at 38°C for 48 h.

4.5 Vibration Test—The electric hourmeter shall be capable of withstanding without mechanical or electrical failure 6 h of vibration, 2 h along each of the three mutually perpendicular axes, one axis to be perpendicular to mounting plane. The vibration tests shall be run at a double amplitude of 1.52 mm with the frequency varying from 10–80–10 Hz (20 g max) at intervals of 1 min. After completion of test, the calibration shall remain within tolerances as specified in Section 3.

4.6 Shock Test—The instrument shall be capable of withstanding without mechanical or electrical failure, the following series of shocks and still maintain the calibration tolerances specified in Section 3.

The unit shall be subjected to 12 shocks in each direction along each of the three mutually perpendicular axes (72 total shocks), one axis to be perpendicular to the mounting plane. Each shock shall have an amplitude of 44–55 g, half sine of 9–13 μs duration.

5. Design Detail Recommendations

5.1 Unless otherwise specified by user, dial printing shall be white, dial background shall be low gloss black, and visible portions of the instrument should exhibit low reflectivity; the indicating wheels or drums shall have white numerals on a low gloss black background, except for the tenths indicator, which shall have black numerals on a white background.

5.2 All exposed surfaces shall be corrosion resistant for limited exposure. (NOTE: If instruments are required for installations in extreme environments, contact manufacturer for recommendations.)

5.3 Instruments shall be moisture and dust resistant. (See NOTE—paragraph 5.2.)

5.4 The hourmeter case may be provided with studs for mounting by suitable U-clamps or similar means. Some hourmeters may have a flange for mounting.

5.5 Typical envelope, mounting studs, mounting flange, panel cutout, and terminal designations are displayed in Figs. 1–4.

5.6 Identification (Unless Otherwise Specified)

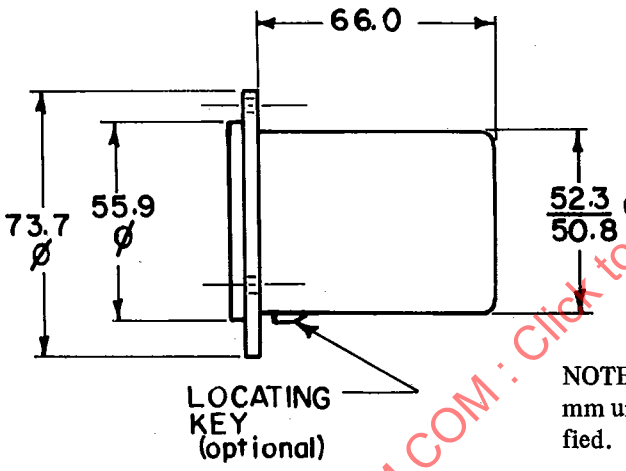
5.6.1 To be legibly indicated on outside of case:

a. manufacturer's or user's part number

b. manufacturer's or user's serial number and/or date of manufacture.

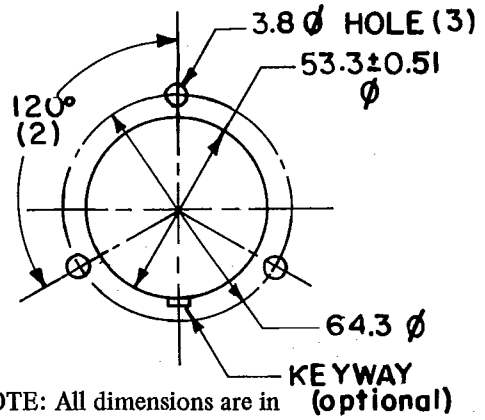
5.6.2 To be printed on dial and/or indicated on case: manufacturer's or user's name and/or trademark.

5.6.3 Electrical connections shall be clearly identified for proper wiring of instrument into circuit.



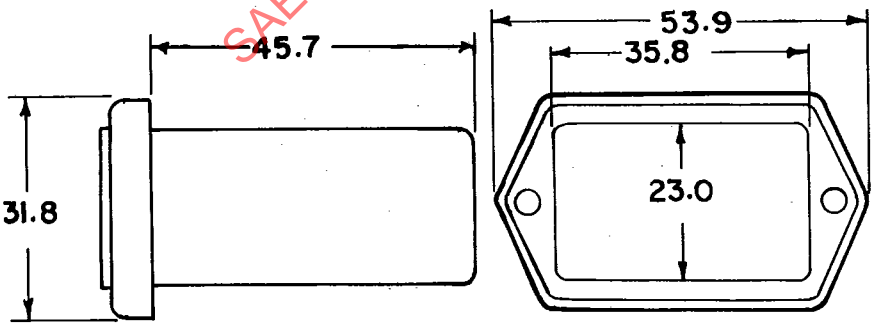
NOTE: All dimensions are in mm unless otherwise specified.

FIG. 2—(ENVELOPE) FLANGE MOUNT



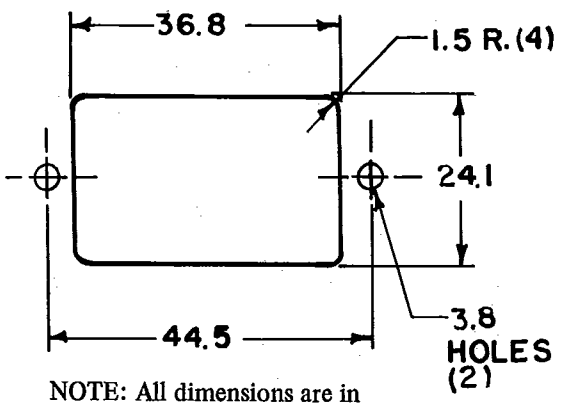
NOTE: All dimensions are in mm unless otherwise specified.

FIG. 2A—PANEL CUTOUT



NOTE: All dimensions are in mm unless otherwise specified.

FIG. 3—(ENVELOPE) FLANGE MOUNT



NOTE: All dimensions are in mm unless otherwise specified.

FIG. 3A—PANEL CUTOUT