

ELECTRIC TACHOMETERS

DESCRIPTION

The dial-type tachometer consists of a generator mounted on the governor drive connected by means of a pair of leads to an indicating instrument. When readings are desired in more than one location, several indicators may be used with one generator. The generator consists essentially of a permanent magnet and a wound armature with commutator and brushes. It is especially designed to maintain a stable output proportional to shaft speed. When connected by means of a pair of leads to a suitable DC indicator, speed will be accurately measured. The indicator is basically a voltmeter with a scale calibrated in revolutions per minute.

The digital tachometer replaces the tachometer generator and tachometer indicator system. The digital tachometer has no moving parts. It senses engine speed through the use of a magnetic pickup mounted on the starter motor bracket. Teeth of the flywheel ring gear create pulses at the magnetic pickup as they pass. The pulses are counted and processed by the tachometer, and engine RPM is displayed numerically, with a maximum indication of 999. If readings are desired in more than one location a second tachometer may be run off of the magnetic pickup. However, if a third tachometer is desired an additional magnetic pickup is required. The digital tachometer can be applied to all marine and industrial 645 engines equipped with a dual starter motor bracket.

INSTALLATION

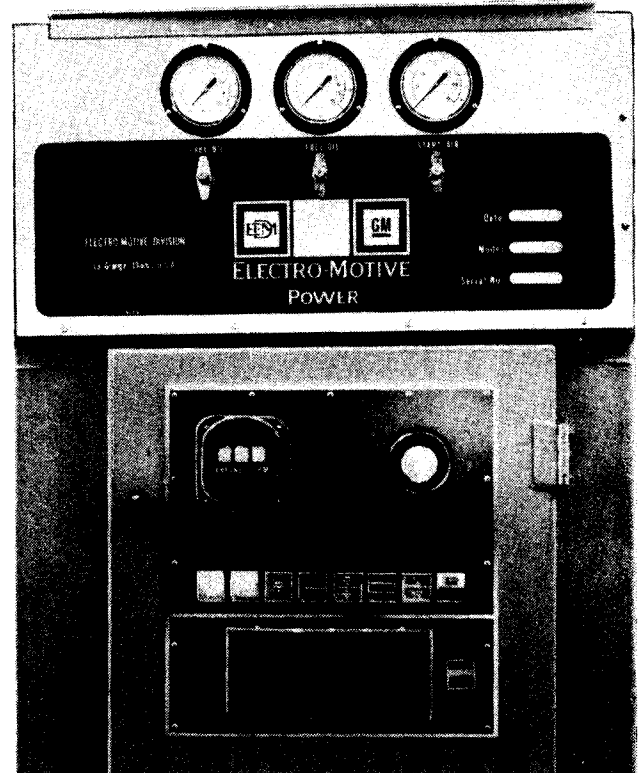
MOUNTING

The tachometer indicator should be mounted rigidly on a switchboard, instrument panel, or wall free from excessive vibration. It should, if possible, be kept out of locations where extremes of temper-

ature are encountered or where high humidity prevails, unless the instrument is equipped with a watertight case.

The tachometer generator is provided with a standard SAE screw-type couplings for direct drive. It is important that the hex mounting nut be tightened firmly to avoid loosening due to possible vibration.

The digital tachometer can be mounted in the existing opening from the tachometer indicator. For a typical application of the digital tachometer refer to Fig. 1.



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Fig. 1 - Typical Application Of Digital Tachometer

*This bulletin is revised and supersedes previous issues of this number.

CONNECTIONS

The preferred size of wire for connecting the generator to the indicator is No.14 AWG. All connections should be clean and tight.

CAUTION

Avoid shorting binding posts of generator while in position. If the wires run in conduit, the conduit should be grounded to avoid static charges which may affect the overall accuracy. For the same reason, ground the instrument and generator cases.

On the digital tachometer, care must be taken to maintain correct polarity at all wiring connections. The wiring between the magnetic pickup and the digital tachometer must be a shielded cable with a preferred size of No. 14 AWG. To check the tachometer circuit for correct wiring and polarity refer to Figs. 2 and 3.

RECOMMENDED PROTECTIVE FUSES FOR DIGITAL TACHOMETERS

When using a power supply, apply a 1.0 ampere fuse in the positive lead between the system supply voltage and the power supply.

When using a system supply voltage of 24 V DC, apply a 0.5 ampere fuse in the positive lead between the supply voltage and the tachometer.

For units with 120 V DC supply voltage using resistor assembly 9516252, connect a 2.0 ampere fuse in the positive lead between the system supply voltage and the resistor.

MAINTENANCE

TACHOMETER INDICATORS

The indicators require no servicing in the field other than an occasional check to see that the pointer rests on zero when the generator is not running or the connection is open. All indicators have an accessible zero adjusting screw which when turned right or left with a screwdriver, will bring the indicator pointer to its correct zero position. If the pointer cannot be brought to the zero position by turning the zero adjusting screw, the instrument should be returned to the factory for servicing.

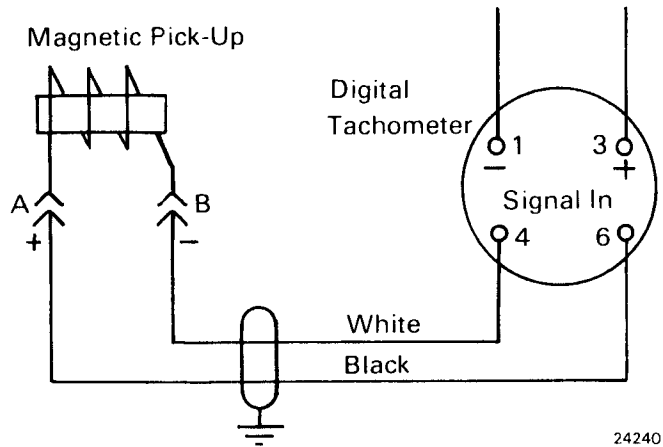


Fig.2 - Wiring Of Magnetic Pickup To Digital Tachometer

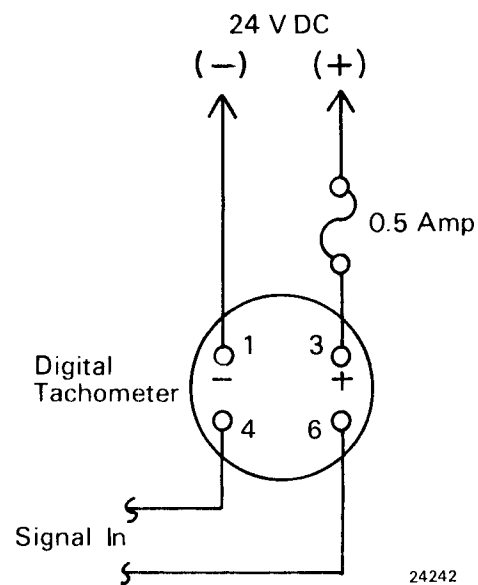


Fig.3 - Wiring Of Tachometer To 24 V DC Source

DIGITAL TACHOMETER ADJUSTMENT

The tachometer is preset at the factory and should not need adjustment at installation. However, in some cases it may be necessary to make adjustments. There are two methods available for adjusting the tachometer if required. Method A is the most accurate and should be used if equipment is available. Method B is not as accurate, but will provide an acceptable setting. Before any adjustment is made to the tachometer the magnetic pickup should be qualified as follows. The gap between the magnetic pickup and the flywheel should be 0.025 ± 0.005 ". Connect an AC voltmeter across the pickup leads. Output must be greater than 5 V AC with the engine running at idle.

If an acceptable setting cannot be obtained using either Method A or Method B the instrument should be returned to the factory for servicing.

METHOD A

1. Connect 24 V DC to power input terminals 3 (Pos.) and 1 (Neg.), Fig. 4.

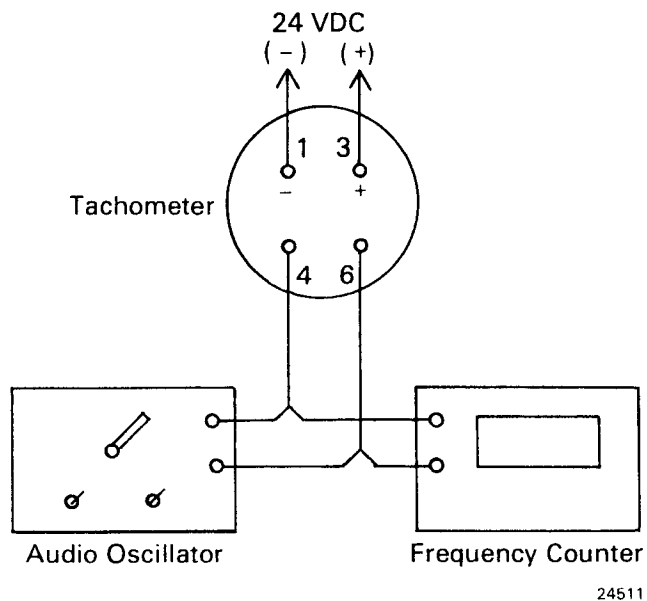


Fig.4 - Bench Setting Connections

2. Connect the audio oscillator and frequency counter to terminals 4 and 6. Adjust the oscillator for 3975 Hz, 5V PK-PK sine wave.
3. Adjust RH1 in the tachometer until the tachometer reads 900 ± 4 RPM.
4. Change the oscillator frequency to 1987 Hz and verify a tachometer reading of 450 ± 2 RPM.

METHOD B

1. Run engine at full speed (approximately 900 RPM). Measure engine speed with a hand tachometer.
2. Adjust RH1 in the tachometer until the tachometer reading is the same as the hand tachometer ± 4 RPM.
3. Bring engine speed to idle and check whether digital tachometer indication is within ± 2 RPM of hand tachometer indication.

NOTE

Tachometer case must be removed to adjust RH1.

TACHOMETER GENERATORS

The generators require very little servicing when properly mounted and connected. However, the coupling spider should be replaced at the intervals indicated in the applicable Scheduled Maintenance Program.

LUBRICATION

No lubrication is required in the field as all bearings are of the ball bearing type and are properly packed at time of manufacture. Do not dismantle these generators in an attempt to service internal parts other than cleaning the commutators and brushes. Servicing internal parts without proper facilities may result in incorrect speed indications.

The digital tachometer requires no lubrication as it has no moving parts.

BRUSHES AND COMMUTATORS

On occasion, it is possible that the instrument indications may become erratic or fluctuate. This is normally a sign that the generator commutator and brushes are dirty and require cleaning, or that the brushes have become worn. Remove the generator from its installation and thoroughly clean it externally before attempting to open it. To open the generator proceed as follows:

1. Remove small cover plate held by four screws and pull out small pin immediately under cover.

CAUTION

Do not lose small pin.

2. Disconnect the two connector strips from the brush holder. Remove the screw holding the brush holder assembly and lift out of its position. Note the position of assembly and mark one side, to insure reassembly in the same relative position. Be careful not to bend the brushes. If necessary, leads can be disconnected from brush holder after being removed from the generator housing.
3. Clean brushes and commutator with a clean dry cloth free from lint.

CAUTION

Avoid the use of benzine or any other cleaning fluid as it will destroy the treated surface of the brush and commutator.

When cleaning the brushes place them on a clean flat surface to avoid bending and wipe

carefully. Any foreign matter between the tongues of the brushes, should be removed carefully with a sharp wood stick.

To clean the commutator use a clean cloth and with the aid of a sharp wood stick, force the cloth into the commutator slots to clean out any foreign matter. Wipe the commutator until further wiping no longer soils cloth.

4. To assure proper brush tension on the commutator, the brushes must be perfectly flat when removed from the brush holder. To check this, place the brushes and damping springs on a clean flat surface such as plate glass. The brushes and damping springs should be smooth, clean and straight except for the slight bend at the tip which aids in guiding the brushes on the commutator.

Replace the brushes on the brush holder and mount the brush holder assembly in the generator. See Step 2. Do not oil or lubricate the brushes. Worn or badly bent brushes should be replaced.

It is recommended that a complete spare brush holder assembly be kept on hand for emergency

use. As the treatment of the brushes and their mounting is an important factor in the operation of the generator, the brushes are not sold separately. The brush tension has been carefully adjusted and no attempt should be made to alter the factory adjustment. The brush holder assembly and mounting screw should be carefully removed from its package and the instructions carefully read before installation. The mounting screw, having a Class 3 fit, should thread into the casting freely but without too much play. Excessive play will result in vibration and will greatly reduce the life of the brushes.

After installing the brush assembly, make sure that the brush holder is free to rock slightly when the mounting screw is properly seated. The rocking motion should only be sufficient to enable the brush holder to maintain a neutral position so that the tension and pressure of the two brushes will be properly equalized on the commutator.

5. The connecting wires leading to the brush holder should be bent so that there is no tension on the strips, thereby causing the brushes to shift with an upward or side thrust.