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MULTI-RECALL DIGITAL TACHOMETER

TEL TAC

OVAL TRACK PRO

TEL TAC
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INSTALLATION WIRING PROGRAMMING MAINTENANCE

Description The TEL TAC OTP is an LCD digital readout tachometer with 'Multi-Recall' memory readings. It can be used with most engines and ignitions including magnetos and battery powered systems. The tach will turn on automatically when the engine is started and read RPM in hundreds while the engine is operating from 500 to over I2,000 RPM on V/8 engines and to I8,000 RPM on smaller engines. Examples of readings in hundreds: '08' is 800 RPM; '82' is 8,200 RPM; '137' is 13,700 RPM. See '**Operation**' sheet for details on readings. Tach is powered by a 9 volt alkaline battery which can last hundreds of hours.

Mounting The TEL TAC should be securely mounted in the cockpit but should not interfere with the driver, steering or other controls. Do not mount next to a coil or ignition box with a coil. Four 10-24 NC tapped holes are provided on the back of the unit to attach to a dash or to the mounting brackets. Mounting brackets for dzus button or hose clamp attachment are supplied. A template is provided to locate mounting holes. Cable receptacle requires a 1" hole to clear retaining nut. **Do not loosen the plastic nut or mount to it. Do not use the cover screws for mounting.**

Wiring The tach cable provided connects to the receptacle on the back of the tach and is retained by rotating the wingnut until it 'clicks'. The **white wire** picks up signal pulses from the primary of ignition coils and magnetos or from the tach signal output of electronic ignitions when available. The **isolator** attaches to the end of the white wire and **must be used with ALL magnetos**. The isolator must NOT be used with electronic ignitions with a tach output. The white wire can be shortened or extended if necessary.
The **black wire** should be securely bolted to the chassis. It should remain short, grounding near the tach mounting if possible and should not connect to the cutoff switch, coil, ignition unit or other ground wires. NEVER connect the black wire to a 12V power source. Be sure paint or coating is removed from all system grounding points. **See back page for wiring information on each application.**
Important All PRIMARY WIRING to tach, switch, magneto, coil, ignition system, trigger, car battery, etc. MUST BE SEPARATED FROM PLUG WIRES and HIGH VOLTAGE COIL WIRE. Be sure to ground ignition box or mag coil (–) terminal to engine or chassis. This reduces the electrical interference from the spark plugs that might affect tach operation and RPM readings.

Maintenance The TEL TAC is built to be waterproof if seals are intact, and unit is properly assembled. Avoid use of high pressure spray or solvent cleaners which may degrade front overlay adhesive. Front window and overlay are scratch resistant, but dirt should be cleaned with window or household type spray to avoid marring the finish. Cold temperature (like rinsing with cold water) may create a vacuum inside drawing moisture through any damaged seal. Removing the tach during car washing is always safest.
Important Tach should be opened and checked periodically for signs of moisture. If moisture or humidity gets inside tach it can't escape unless the cover is removed. Allowing moisture to remain inside the tach will fade and destroy the readout and may damage other components. If the window clouds or other signs of moisture are noticed, remove the cover and disconnect the battery. Dry tach thoroughly with dry air or a **mild** heat source. Check the battery and it's connector for corrosion. Clean dirt from the o-ring and it's mating surface. **ALWAYS CHECK O-RING PLACEMENT AND CONDITION BEFORE INSTALLING COVER**. O-ring is a standard –042 size. Be sure plastic nut on cable receptacle is snug. Be sure both cable connector and receptacle are dry before mating.

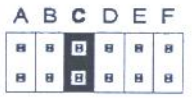
Battery The TEL TAC will show 'LO BAT' in upper left corner of the display when the battery is getting low. If the battery has not been damaged by vibration, impact or heat it can last hundreds of hours. The tach will read correctly for many hours after the 'LO BAT' warning first shows. The battery can be changed while maintaining the car, allowing for careful inspection and cleaning of the tach.
Duracell™ 9 volt alkaline batteries are highly recommended. Experience has proven they are superior for this application. Other brands may not withstand the stress of racing and could damage the tach. Avoid generic types ('heavy duty', non-alkaline, store brands, made in x---x, etc.) Although a battery can last more than one season, discarding it at the end of each season and installing a fresh **Duracell™** before racing is cheap insurance against a damaged battery leaking and causing damage to the tach.

Accuracy The TEL TAC uses digital calculation and a quartz timebase to determine RPM. Other than the jumper setting, there are no calibration adjustments. Loose connections, improper grounding or faulty ignition components (points, plugs, wires, etc.) can cause incorrect readings. Engine problems like weak valve springs, track conditions, and driving styles can all affect the RPM attained. Tach may read 2-300 RPM less than a rev limiter chip or setting due to timing scatter or not enough time at the limit RPM to get a reading.

Error Codes The tach may flash an error code after the engine is stopped along with the RPM reading (reading may not be correct).
E 1 This indicates the tach did not follow it's normal sequence and had to restart itself. This code may rarely appear if the engine is started at the exact instant the tach was shutting off (the reading would still be correct).
E 2 This indicates the memory was corrupted
Either of these codes could be caused by interference from plug wires, improper grounding, loose battery snaps or a defective battery. Relocate tach, ground connection and wiring away from ignition components. Check continuity and insulation on plug wires. Unplug tach and check continuity from outer receptacle pin on the back to a case screw with an ohmmeter (ground connection is made through left circuit board mounting screw). Be sure tach is dry inside. Test or replace battery and inspect connector snaps.
E 3 This indicates the programming jumper is not making contact or was removed while the tach was operating. Inspect jumper and pin alignment. Move jumper up and down on the pins to clean contacts and restore a good connection.
Error codes will continue to show until tach turns itself off or the battery is disconnected for a few seconds.

Programming The TEL TAC is adjustable to suit most all racing applications. See tables below for the correct jumper setting. To change the jumper setting, remove the four cover screws and the cover. If the tach is still operating, disconnect the battery temporarily to shut it off. At the top of the circuit board above the readout are a series of pins with a plastic jumper. The jumper is placed over the **vertical pair** of pins corresponding to the letters '**A**' through '**F**' printed to the left of the pins. To change the setting, pull out the jumper with needle-nose pliers and install on the correct pins. **Check o-ring placement**, and reinstall the cover.

SETTING	A	B	C	D	E	F
+PULSE/REV	4	3	2		1	



Magnetos use a different setting than battery powered ignitions. The +pulse/rev numbers printed under the letters show the number of positive (+) pulses counted per crankshaft revolution. As an example, a V/8 4-stroke engine will fire 4 times per crankshaft revolution. A battery powered ignition for this engine will produce 4 (+) pulses per revolution and use the '**A**' setting. A magneto primary on the same engine will produce 2 (+) pulses (and 2 (–) pulses which aren't counted) per revolution and use the '**C**' setting. The tach is normally supplied with the '**C**' setting for V/8 magnetos or 4 cylinder battery powered ignitions.

Magnetos

Engine (# of cylinders)	Jumper Setting
V/8	C
6 (inc. V/6 odd/even)	D
4	E

The isolator must be used with all magnetos. Since the tach needs only a minimal signal, the isolator (a special 100,000 ohm high voltage resistor) reduces the voltage and minimizes the current to protect the tach, the connector and the mag. It attaches to the end of the tach white wire and connects to the mag, coil or cutoff switch. Do not ground the tach black wire to the switch, coil or electronic points/coil box—it should ground to the chassis near the tach mounting if possible.

MSD magnetos Connect the tach white wire through the isolator to the cutoff switch lug with the orange wire. On '**44**' mags, connect to the (+) coil terminal. Check the wiring of the 2-pin switch harness plug to be sure the orange switch wire connects to the orange points box wire—some plugs may be wired backwards. Be sure the electronic points/coil box has a ground wire to a cylinder head.

Vertex and other **internal coil magnetos** including **Fairbanks**, **Bendix**, etc. Connect tach white wire through isolator to points terminal on mag or to cutoff switch lug that connects to mag. **V/4 engines** with Vertex internal coil magnetos require a special tach.

Mallory or **Vertex external coil magnetos** Connect tach white wire through the isolator to the (+) coil terminal (orange wire on Mallory) or to the cutoff switch lug that connects to this coil terminal. Be sure the (–) coil terminal has a ground wire to engine or chassis. Some early 4 cylinder Mallory magnetos are converted V/8 units and would use the '**C**' setting.

Battery Powered Ignitions

Engine (# of cylinders)	Jumper Setting
V/8	A
6 (inc. V/6 odd/even)	B
4	C
1	E (crank triggered) or F

Distributor ignitions with **points** or **trigger module** and **single coil** Connect tach white wire to the (–) coil terminal.
HEI distributors Connect tach white wire to the TACH terminal on the distributor.

Electronic ignitions with **tach signal output** (includes **MSD**, **Electromotive**, **Crane**, **Accel**, etc.) Connect tach white wire to the tach signal output of the ignition unit. Be sure ignition box is well grounded to chassis or engine.
MSD 6 or 7 series including MSD 6AL Connect the tach white wire to the round black receptacle with a recessed male tab.
MSD 6ALN or 6HVC Connect the tach white wire to the **brown** wire from the 6-pin connector.
Do not connect to the white wire from MSD boxes—it is NOT a tach signal output. Tach does not require a MSD tach adapter.
Systems with 2 MSD's using a MSD 8911 tach splitter or a changeover switch require a 10,000 ohm resistor connected from the tach white wire to ground (or tach black wire). A tach splitter with the resistor included is available. Some factory wired race cars have the splitter and resistor included in the car's wiring harness.
EFI [brand] ignitions (used on some midget, sprint, and champ cars) and **V/6 odd-fire** engines with **MSD** ignition require special tachs.

4 Cylinder Motorcycle Ignitions (May use '**C**' or '**E**' setting, see below)
Dyna 2000 (Also used on midget engines) Connect tach white wire to green wire ('**C**' setting—preferred) or yellow wire ('**E**' setting).
2 coil systems Connect white wire to (–) coil terminal on one of the coils (coil terminal that is not wired to other coil). Use '**E**' setting.
4 coil systems Connect tach white wire to the tach signal wire in factory harness ('**C**' or '**E**' setting—see '**Hint**' below).
Honda 600F–4 and others may require a resistor (1,000 to 100,000 ohms ok; ~22,000 ohms optimum) connected from the tach white wire to ground (or tach black wire). Magneto isolator included with harness will work if connected from tach white wire to ground.

1 Cylinder Engines Tach may not work with some stock flywheel magnetos, CDI's or 2-stroke ignitions.
Honda (4 stroke only) Connect tach white wire to kill switch wire, use '**E**' setting.
Deco/Continental (battery powered only) Connect white to (–) coil terminal. Use '**F**' setting with points, '**E**' setting if crank triggered.

Hint If you are unsure of the correct setting, try running the engine and watch the tach reading while the engine is idling smoothly. Most racing engines will idle in the 1000 to 2000 range. If idle reading appears half (tach reads around '07' while idling) move jumper two spaces to the right. If it reads double (around '30') move jumper two spaces left. Note that '**B**' and '**D**' are for 6 cylinder engines only and '**F**' is for 1 cylinder engines only. Be sure tach smoothly tracks engine speed when slowly accelerating through RPM range.

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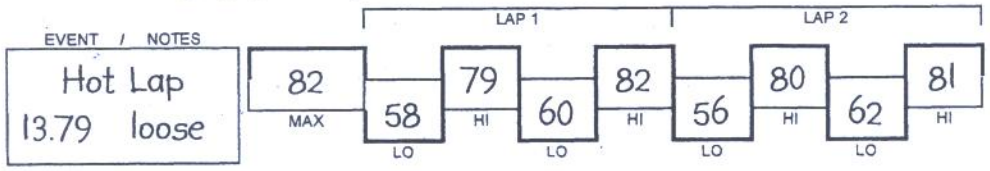
OPERATION

Operation The TEL TAC OTP 'Multi-Recall' tachometer provides nine selected RPM readings from each racing session. Readings are in hundreds of RPM. It provides the Maximum RPM, like other memory tachs, such as the TEL TAC II. It also selects two **consecutive** laps with the highest RPM's and provides the four lowest and the four highest RPM's attained during those laps. This provides a 'snapshot' of the car's typical performance.

Display When the motor is stopped after a session on the race track, the tach will display the nine readings, repeating them in sequence for 45 minutes or until the motor is restarted. The Maximum reading (highest RPM attained during the session) is shown for 5½ seconds. The eight other reading are then shown for about 1½ seconds each They are shown in the order they were recorded on the track starting with the lowest then the highest reading from each half lap.

Logbook To maximize the usefulness of your TEL TAC OTP, readings should be written down so they can be analyzed and compared to other readings. A logbook is provided to help organize your data. To record the readings after a session on the race track, wait until the 5 second Maximum reading, record it in the 'MAX' box, and write the the 8 readings that follow it in the 'LO' and 'HI' boxes. You now have a rough graph to help understand the numbers.



Laps Reference to 'laps' is used for easier explanation, but do not start and end at the start/finish line. OTP 'laps' begin in the slowest part of either turn, continue through the fastest part of the next straight, through the other turn, ending at the fastest part of the other straight. It may or may not be possible to determine which part of the track correlates to the data since the readings may start in either turn.

Lap Selection While on the race track, two **consecutive** laps with the four highest readings from each half lap are selected. For example, four high readings of 82, 81, 78 and 80 (average = 8025) would be selected instead of 78, 80, 84 and 76 (average = 7950). The first set had a higher average and would be selected even though the second set contained a higher reading, 84. For this reason, the Maximum RPM may not be included in the laps selected.

High Readings The four high readings give a more typical view of performance than the one Maximum RPM shown by regular telltale tachs. Readings are from both straightaways and can either back up or discredit the Maximum RPM, perhaps showing the Maximum might have come from wheelspin on a slick spot.

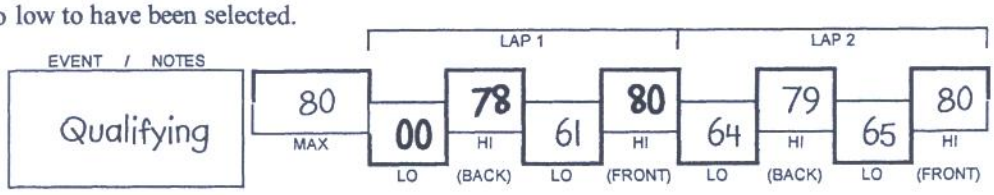
Low Readings The four low readings are those that came just before each of the four selected high readings. They show the range of engine operation, useful in engine development, and can be compared from one session to another to indicate changes in handling and turn speed. The most relevant data would come from pavement tracks and dirt tracks where the car is hooked up through the turns. Readings from smaller or slicker race tracks may reflect brake lockup.

Reset Tach is reset 1 minute after engine is stopped, after which the data will be replaced **if engine is restarted**.

Caution The TEL TAC OTP is intended for dirt or pavement **Oval Track use only**. It's special features are meant for typical oval tracks having 2 turns and 2 straights. It requires the car to speed up and slow down twice per lap and the average to change at least 600 RPM from turn to straight. It may not be as useful on irregular courses, very short or very round tracks or on cars with limited horsepower. Very erratic throttle usage may hinder it's ability to separate laps.

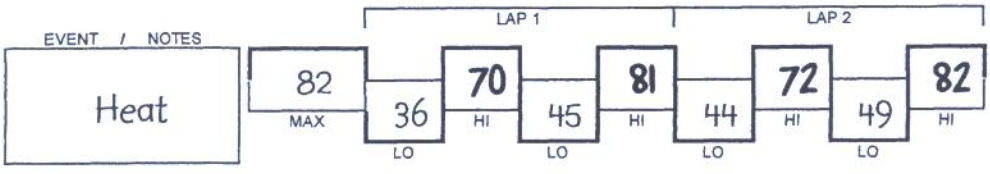
EXAMPLES

Qualifying On a two lap qualifying sequence with no warm-up lap, it is sometimes possible to correlate the data to the track by knowing where the car began its run. Since the car crosses start/finish three times (green, white, checkered) part of the run may not show in the data. If the driver backs off when getting the checkered, that half lap would not be selected because the high reading would be too low to have been selected.



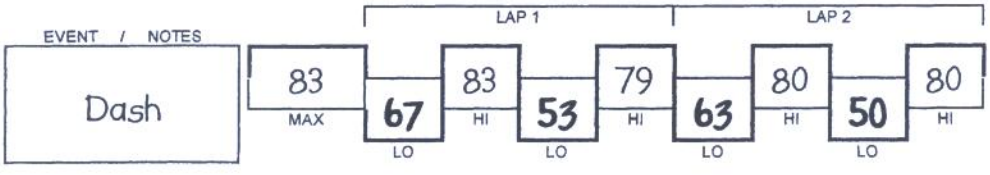
Note the 1st low reading is a '00', the result of the car being pushed off and accelerating to the next turn without slowing down to record a low reading. If the car is still accelerating through the next turn without slowing down, this turn may not be recorded in the data either (the car must slow at least 600 RPM to record a low number). In this instance the car was started in turn 4 and accelerated through 1 and 2. Therefore the 1st high reading had to have come from the backstretch.. The 2nd high reading would be on the frontstretch, and so on.

Slick Spot:



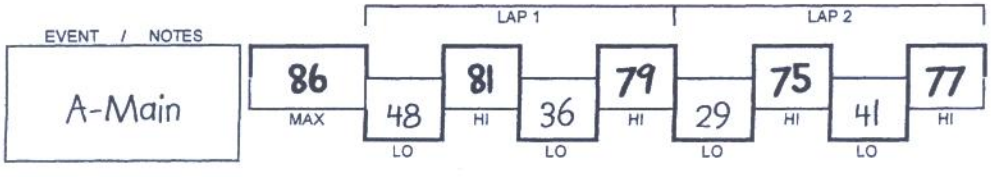
This particular track had a slick spot in the middle of the back straight where the transporters had crossed the track. The 2nd and 4th high readings are about 1000 more than the 1st and 3rd ones (every other high or low reading should come from the same straight or turn on the track). This demonstrates that the Maximum reading would not tell you what the motor was turning at the end of the straight, showing only what it turned at the slick spot.

Slow Turn If the car is having trouble with one turn, the readings could look like these:

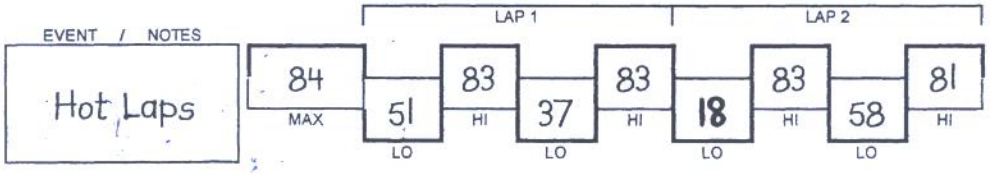


The 1st and 3rd low readings are over 1000 RPM higher than the 2nd and 4th. If improvements in handling were made a comparison to the low readings of a later session might show the difference.

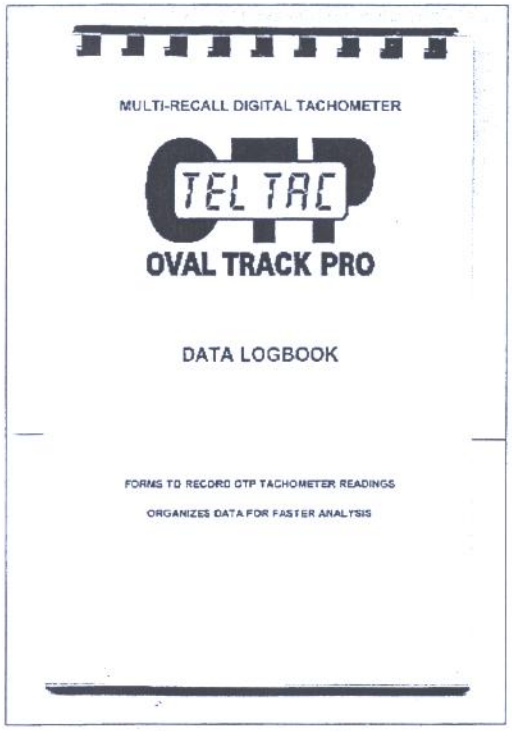
Maximum RPM Not Selected Here the Maximum reading is higher than the lap readings. If the engine was turning higher RPM more often, laps with higher readings would have been selected.

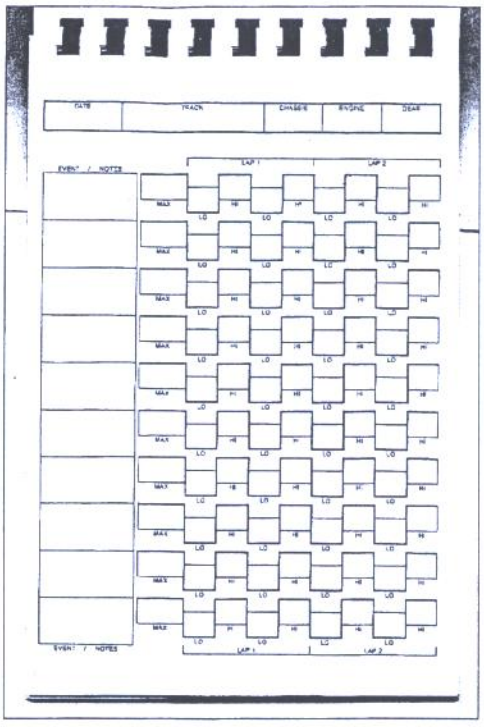


Brake Lock Here the 3rd Low reading is extremely low. The car was observed locking the wheels going into the turn.



TEL TAC OTP DATA LOGBOOK COUPON





The TEL TAC OTP Data Logbook is an efficient way to record and analyze the readings from your tach. You can obtain your first copy at no cost by simply writing your mailing address in the box on the label below.

You can **mail** this label to:

TEL TAC
PO Box 8915
Stockton CA 95208

Or **fax** this page to:

(209) 931-5059

Additional copies can be purchased from your authorized TEL TAC dealer.

TEL TAC
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