ELEVATOR PERFORMANCE METER

SafeTach ™

	SPEED fpm	TIME sec		g's
Hi	144	3.7	Start	.01
Lv	8	2.0	Accel	.02
			Decel	.01
Run ⏱ 13.8		Jerk 2.0	Stop	.06
Flr ⏱				

RESET	Flr ⏱		SAVE/RCL

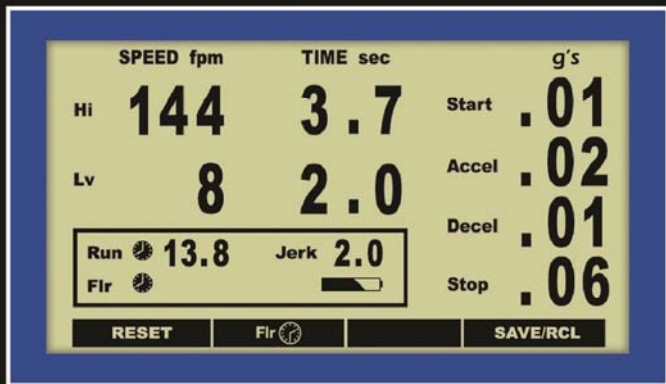maxton MFG

Operating Instructions - Revision 4.1 January 2016

Before operating this unit please read this manual. Retain this manual for future reference.

Introduction: SafeTach keeps personnel out of the hoistway.

SafeTach is used to facilitate elevator installation setup, maintenance and evaluation.

SafeTach is a simple tool for measuring speed and forces of hydraulic and traction elevators felt during elevator movement, providing real-time performance information, including g-forces for answering code requirements.

SafeTach **eliminates** the need for two people when measuring the speed of an elevator. It is no longer necessary to take measurements riding the top of the elevator cab and is not necessary to place the elevator out of service to obtain readings. **Simply placing SafeTach on the elevator floor and running the elevator will acquire speed and rate information.**

SafeTach may be placed unattended inside the elevator to automatically record measurements for speed in load tests, plus as an aid in checking and setting governors and overspeed valves.

OWNER'S RECORD

Model Type and serial number are located on a label on the underside of the unit.

The Software Version is seen on the warm up screen.

Refer to the serial number if you call Maxton regarding this product.

Record the Software Version and serial number:

Software Version   V _____

Serial Number   _____

RJ11 PORT

The RJ11 port is provided for a wired remote device (optional).

WARNING: Instrument damage will result if this port is connected to a phone jack.

PRINCIPLE OF OPERATION:

SafeTach uses a sensitive electronic circuit to measure acceleration and deceleration forces along a vertical axis. A digital computer integrates the acceleration over time to obtain and display force and velocity.

A short warm-up period on a stable surface is required to allow the unit to sense and stabilize for effects of local gravity.

BATTERY POWER:
NOTE: SafeTach will automatically turn-off after 10 minutes of inactivity.

Installing and changing the batteries:

- The 4, AA alkaline batteries are accessed via a door on bottom of the unit.

NOTE: The positive side of the batteries all face the same direction. (See Picture on right)

Battery life:

- The battery life display shows remaining battery charge.

- Replace batteries when low battery is indicated.

USING THE SafeTach

Keep the unit in its case:

- The soft case is designed to provide protection for the unit and a stable environment for SafeTach measurements.
- Minor imperfections on the measuring surface are tolerated by using the unit in its case. The case also acts to keep the SafeTach from rocking or slipping which would affect the readings obtained.

Turn on the unit:

- Press the power button until the SafeTach turns on.
- Select a unit of measurement for speed by pressing the left arrow button. (Standard or Metric)
- Select a unit of measurement for force by pressing the right arrow button. (g's or milli-g's)
- Place the SafeTach flat on the elevator floor before warm-up is completed.
- The moving bar shows the status.
- Position the unit so that it is readable and within reach of the car operating panel.

Take a reading:

- When the warm-up is complete **"PLACE CALL"** will appear on the screen.
- Do not disturb or move the SafeTach unit.
- Press an elevator floor button to put the elevator in motion. When the elevator starts to move the SafeTach is automatically triggered.
- The SafeTach will display the information collected on the data screen.

Take another reading:

- Keep the SafeTach in place on the elevator floor.
- With the elevator stopped & steady, press the Reset button.
- **"PLACE CALL"** will appear. The SafeTach is ready for another reading.

Turn off the unit:

Press the power button until the SafeTach turns off.
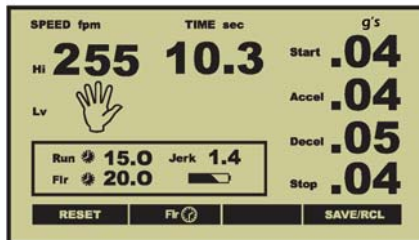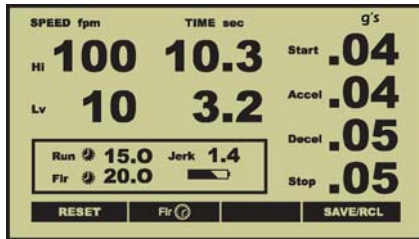
DISPLAY INFORMATION

High Speed (Hi) fpm
High speed readings are provided during the run.

Leveling Speed (Lv) fpm
A flashing o.k. hand ✍ indicates that leveling is occurring and speed is being captured. Leveling speed readings are indicated at completion of run. Optimal hydraulic leveling speed is 7-13 fpm. At 14 fpm and higher, a **HIGH** level speed alert is generated. Below 6 fpm a **SLOW** leveling speed alert is generated. For elevators operating above 225 fpm a stop hand indicates that the elevator has come to a stop.

Time sec:
Duration of motion is provided for high speed, leveling, and run time for reference and help in adjusting. Leveling time of 1-4 seconds is the expected range for the hydraulic elevator. For floor-to-floor time measurement by the SafeTach, **Flr** ⏱ selection will trigger a separate clock and operate like a stopwatch.

Force g's

SafeTach provides indication of several elevator rates of motion. **Start, Accel, Decel** and **Stop** are displayed as they occur. These rate readings provide useful information that can be used to improve elevator performance. Understanding what a reading represents is essential to making good use of the information. **Optimal Start, Accel, and Decel rate is 0.03g to 0.09g for a hydraulic elevator.** (0.01g of acceleration or deceleration, applied for one second, results in a speed change of 19.3 feet per minute).

Start

The elevator acceleration is measured at the beginning of car motion. It is an indication of the force necessary to overcome packing, guide shoe, or other mechanical friction. An **alert** is generated if the **Start** exceeds a certain percentage of the **Accel.**

An alert in this function indicates that either the acceleration is too abrupt or that excessive mechanical friction exists.

Accel

A measure of the acceleration immediately after the Start measurement. For the hydraulic elevator the **Accel** is controlled by the setting of the up acceleration or down acceleration on the control valve.

Decel

Measure of the rate of transition from high speed to leveling speed or stop, adjusted by setting the up transition and down transition adjusters on the control valve for the hydraulic elevator.

Stop

Measure of the stopping rate to the floor level. The **stop** is controlled by the braking action of the motor on a traction elevator; on hydraulic elevators it is affected by the settings of the up stop and down stop adjusters on the control valve. It is affected to some extent by hoistway friction issues. In the up direction, **stop** is also affected by the rate at which the hydraulic pump is brought to a stop and by the delay (or lack of it) between the de-energizing of the up leveling coil and the pump stop/time.

Jerk

A term used to describe a change in acceleration. When we ride in an automobile and feel a jerk, we are experiencing a change in acceleration of the vehicle in one or more directions.

In mathematical terms one jerk is equal to a change in acceleration of one foot per second per second, in one second of time. One jerk equals a rate change of 0.03108 g's in one second. The jerk force displayed is the highest that occurs over the entire run. Optimal jerk is a value of 15.0 or less.
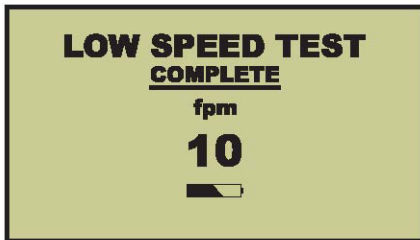
Low Speed Test

The SafeTach automatically shifts to low speed test mode if elevator speed remains below 20 fpm. This feature is used for verifying or setting the leveling speed, and for analyzing and setting up slow speed of elevator systems.

To utilize the Low Speed Test function:

Place SafeTach flat on the elevator floor. Run the elevator on inspection or slow speed until "low speed test complete" is displayed.

The SafeTach will automatically recognize this test and will display the low speed.

LOW SPEED TEST
COMPLETE
fpm
10

Save / RCL function

The SafeTach has the ability to save and recall two different runs from active memory. **Warning:** Active memory is volatile so any saved runs are lost when SafeTach device is turned off.
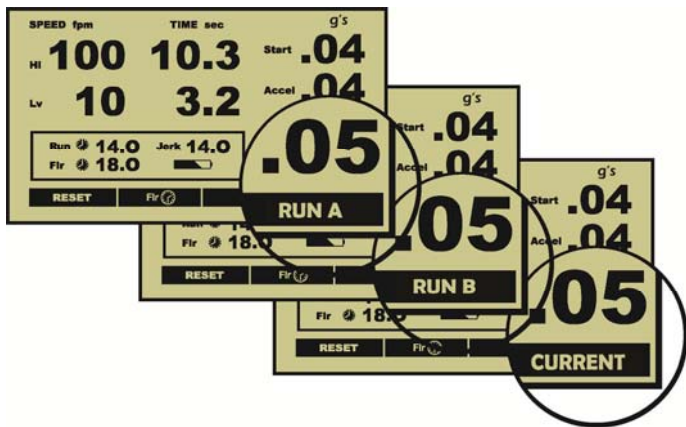
To save a run:
Press the SAVE/ RCL button.

"SAVE AS" and "RUN A" will appear.
 • Press "RUN A" again to select "RUN B".
 • Press "RUN B" to select "CURRENT".
 • Press "SAVE AS" button to save the
   current run to the selected "Run A"
   or "Run B".

All previously saved information in the selected run will be overwritten with current run information. "SAVE AS" is not available in "CURRENT".

By saving then cycling through the run data in this manner you can compare the information for up to three runs (Run A, Run B, and Current).

USING THE SafeTach TO MAKE ADJUSTMENTS

The following information is primarily applicable to hydraulic elevators. Use manufacturer recommendations in making controller adjustments.

Precaution

Rates should be measured and adjustments performed at low oil temperatures and with the car in an unloaded (or one rider) condition.

As oil temperature increases the control valve responds more quickly. Control valve adjustment must be performed with the oil temperature above 80 degrees F, but not above the low end of the operating temperature range.

As load is added to a car the acceleration rates will tend to increase. Control valve rate adjustments should not be changed with the elevator in a loaded condition, even if an alert is generated on the SafeTach.

ALERTS: **WARM UP SCREEN**

PLACE FLAT ON FLOOR............. Ready for placement
(Flashing)

.... Warm-up bar

.... Battery level indicator
(All Screens)

ALERTS: READY SCREEN

PLACE CALL (Flashing) . . . . Ready to run elevator

Flr ⏱
(Flashing)   . . . . Floor timer is activated

ALERTS: DATA SCREEN

FAST   (Flashing) .... Rate, Jerk VERY fast

SLOW   (Flashing) .... Rate, VERY slow

    .... Stop confirmation

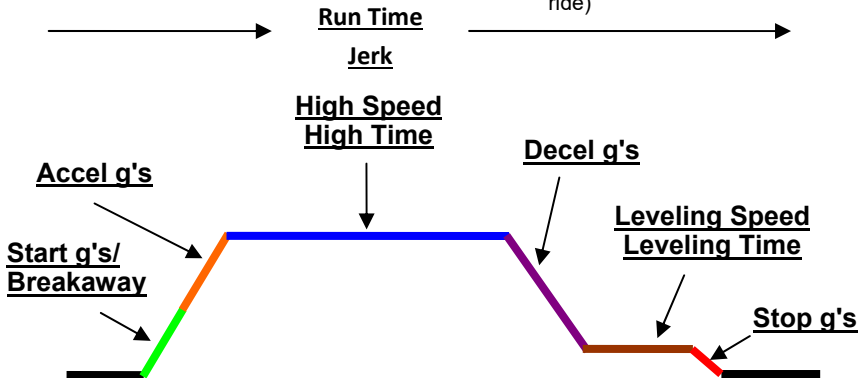   (Flashing) .... Leveling confirmation

  Limit (Flashing) .... Leveling time limit (15 sec)

The SafeTach is a performance metering device and will generate an alert for any measurement that falls outside the optimal range for that reading.

Rate alerts are displayed as a flashing FAST or SLOW imposed on the label of the item generating the alert condition.

It is possible to get multiple **alerts** generated in a single run. Each successive SafeTach measurement is dependent on previous measurements during that run. The following is the sequence of the measurements displayed by the SafeTach during a run:

- ■ START g's
- ■ ACCEL g's
- ■ HIGH SPEED
- ■ DECEL g's
- ■ LEVELING TIME
- ■ STOP g's / LEVELING SPEED
  (display simultaneously)
- • JERK (generated by the event of maximum jerk for the entire ride)

Run Time
Jerk

High Speed
High Time

Accel g's

Start g's/
Breakaway

Decel g's

Leveling Speed
Leveling Time

Stop g's

Example Elevator Speed / Rate / Time / Jerk Profile

**When a poor ride generates multiple alerts,
the alert conditions should be corrected
in the order in which they occurred:**

Example:

An elevator stop condition with a decel rate exceeding 0.10 g's / second will generate a **FAST** alert message for **decel** rate, and a **FAST** alert message for **jerk** (jerk alert). In this case correcting the condition which causes the abrupt decel will also correct the jerk alert.
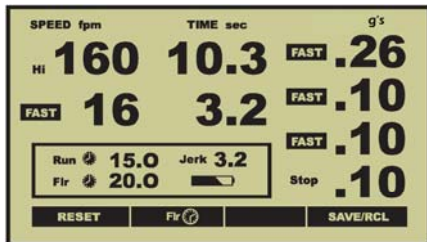
Example:

If the leveling time exceeds 15.0 seconds, or if the SafeTach does not sense an elevator stop, a " ⏱ **Limit** " (time limit) alert message is generated. There are several electrical control and physical conditions, which could result in long leveling time. These need to be evaluated before control valve level adjustment changes are made.

The experienced hydraulic elevator technician will find that all alert generating conditions are within his ability to control and modify.

The following pages give examples of alert conditions, and the items to check to resolve these conditions, for hydraulic elevators in general (generic), and for elevators with Maxton hydraulic control valves installed.
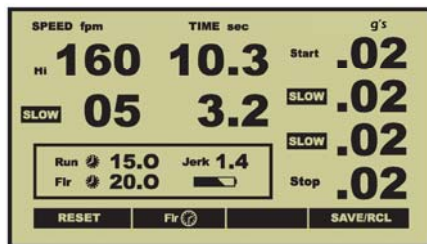
Generic Hydraulic Controller

Fast Alert - items to check:

Start	- bypass sizing
	- packing tight
	- guide shoes tight
Accel	- acceleration adjustment
Level	- leveling speed adjustment
Decel	- transition adjustment
	- slowdown distance
Jerk	- any motion change that exceeds 15.0 in Jerk force

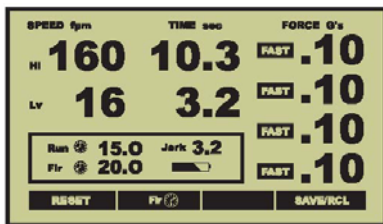
Slow Alert - items to check:

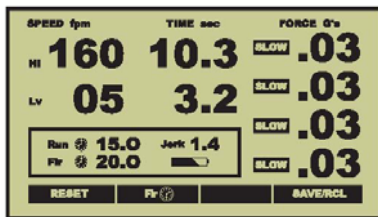|	
Accel	- acceleration adjustment
	- pilot fluid restriction
	- relief not set (up only)
Level	- leveling speed low
Decel	- transition adjustment
	- slowdown distance

Maxton Hydraulic Controller

Fast Alert - items to check:

Start	- reset BPS per procedure
	- packing tight
	- guide shoes tight
Accel	- turn IN on UA (up), or DA (down)
Level	- turn IN on UL (up) or DL (down)
	to slow car to less than 12'/minute
Decel	- turn IN on UT (up) or DT (down)
	to slow transition
	- check slowdown distance
	(2" for each 10'/min car speed)
Jerk	- any motion change that
	exceeds 15.0 in Jerk force

Slow Alert - items to check:

Accel	- turn OUT on UA (up), or DA (down)
	- check up-strainer for clog
	- relief (R) not set (up only)
Level	- turn OUT on UL (up) or DL (down)
Decel	- turn OUT on UT (up) or DT (down)
	- check slowdown distance
	(2" for every 10'/min. car speed)

CONDITION / DISPLAY

CAUSE

Elevator stopped,
Hi Time not displayed

Stable **Hi Speed** was not achieved.

Elevator stopped,
Leveling Speed not displayed,
Leveling Time increasing.
(Hydro Elevator)

Stable **Leveling Speed** was not achieved.

Elevator stopped,
Leveling Speed displayed,
Leveling Time stopped,
Run time increasing.
(Hydro Elevator)

Up stop or down stop is set too soft.

Elevator stopped,
Leveling Time increasing.
(Traction Elevator)

Hi Speed was less than the traction elevator
threshold, and stable **Leveling Speed**
was not achieved.

TROUBLESHOOTING

CONDITION / DISPLAY	CAUSE
Elevator stopped, **no Leveling Time**, no **Leveling Speed**, with **Stop Hand** indication. (Traction Elevator)	**Leveling Speed** and **Time** are not reported when the SafeTach senses a traction elevator. (normal condition)
Elevator moving, ◷ **Limit** displayed, **No Stop g** reported.	Excessive **Leveling time** (over 15 sec). Leveling speed too slow or slowdown distance is too long.
Information "Runs Away" before a call is placed.	SafeTach not "Placed Flat" within 60 seconds of power on - **false trigger**. (Car movement, or the car was moving when the SafeTach was reset, or the SafeTach was moved during the reset).
Start g > .01 and **Accel g = .00,** or **Fast** alert on **Start g**.	Breakaway problem, or **Hi Speed** was achieved in 3/4 second or less.
Any **Fast** or **Slow** alert.	Reading is not in the optimal range.
	See **Using the SafeTach to make Adjustments** for more details... pages 7-12

CAUTIONS & WARNINGS

Be careful not to get the unit wet:
Do not expose to rain or moisture. Do not immerse the unit in liquid.

Do not drop, shake nor strike the unit:
Malfunctions and inability to obtain readings may result from damage to the electronic circuits and components.

Keep unit away from magnetic fields: A strong magnet may erase or disturb the memory of the unit, causing malfunction, or failure of the unit to function.

Keep the unit out of a hot environment:
Never expose the batteries or instrument case to temperatures above 150ºF (66ºC). Do not expose to direct sunlight, or store inside a closed vehicle parked in the sun. If a surface is too hot to touch, it is too hot for the SafeTach.

The RJ11 port on the face of the SafeTach is for a wired remote device. Connecting a phone jack to this port may damage the equipment. Equipment modifications are not approved, and may damage the equipment.

SPECIFICATIONS

Operating temperature: 40ºF to 120ºF
Operating voltage: +3vdc
(4 x AA alkaline batteries)
Dimensions: 7" x 7" x 2.75",
with soft case
Weight: 1.0 lbs.

Measurement	Accuracy
Speed	+ / - 1 fpm
	+ / - .005 M/S
Force	+ / - 0.01g's
	+ / - 1 milli-g's

This equipment has been tested and found to be compliant with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

CALIBRATION

The SafeTach is factory calibrated for the life of the unit. Each time the SafeTach is energized or reset it checks and adjusts to local gravity. This ensures that acceleration rates are sensed to a very high degree of accuracy. Barring physical damage to the unit, state-of-the-art electronic circuitry ensures the SafeTach never needs re-calibration.

CLEANING INSTRUCTIONS

To clean the SafeTach and its case use only a soft cloth dampened with a mild household dish washing liquid, or similar cleaner known to be safe for use on ABS and Mylar plastics.

Do not use paper towels, solvents, acetone, paint thinners, or other petroleum products to clean the SafeTach; damage may result.

LIMITED WARRANTY

Maxton warrants that the SafeTach is free from defects in materials and workmanship for a period of one (1) year from the date of purchase. Any SafeTach unit that is determined by Maxton to be defective in material or workmanship, and returned to Maxton, shipping costs prepaid, as exclusive remedy within the warranty period, will be repaired or replaced, at Maxton's option.

Physical damage or damage resulting from using incorrect cleaning products is not covered by warranty.

The warranty is void when service or repair is performed by a non-authorized individual or service company.

Maxton makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall Maxton be liable for indirect, special or consequential damages.

For service contact Maxton for material return authorization.

NOTES

NOTES

www.MaxtonValve.com

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