Logitech Electronics Limited

2000 MKII SERIES™

Tachometers

Model 2000V

User Guide

Addendum to 2000 SERIES Tachometer User's Guide

The 2000V is a variation on the standard 2000T tachometer. It measures the time between pulses generated by an object passing between two sensors and from this calculates the velocity of the object.

The two pulses are usually applied to input A (I/P_a) and input B (I/P_b) - terminals 10 and 12 on the rear of the instrument, although it is possible to combine the two signals and apply them to input A only.

The unit will calculate $1/t$ and multiply this by the scaling factor. In order to display velocity in the chosen units, it is necessary to enter an appropriate scaling factor:

e.g. distance between start and stop pulse is 2.5m, velocity required in m/s.
$v = d/t$ so scaling factor is simply 2.5

To give a display to one decimal place:
Enter **25** for scaling factor and set the decimal place in the display by entering **0.0** as offset.

The scaling factor is initially factory set to zero, which forces the user to enter a valid number before the instrument can be used. When power is first applied the display will show **GATE .... SET .... RESET** (**....** signifies a one second delay before the display changes).

If the unit is required to reset automatically then the number of seconds delay is entered as the RESET value.

If the display should hold the measured value until a manual reset pulse is given, then this value should be set to zero.

As the **FUNC** button is pressed the display will show **SCALE** allowing the scaling factor to be entered.

When the **FUNC** button is pressed again the display will show **OFFSET**. Usually, this feature will only be used to set the position of the decimal point as required in the display of the measured value (see page 9).

Further operations of the **FUNC** button allow a low and a high alarm value to be set (if required).

Contents

Specification

Display	6 decade and sign 7-segment red LED, 10mm high
Decimal point	Programmable from front panel
Scaling	Programmable via front panel, retained in non-volatile memory.
Signal inputs (A and B)	
Standard	
Standard sensitivity	180mV to 10V — protected to 100V
Frequency	30kHz maximum with single input, or 15kHz maximum with dual inputs
Impedance	15kΩ minimum
Accuracy	0.05% with square wave at 1V peak
Optional	
High sensitivity version	12mV to 1V — protected to 100V
Analogue input module	(specified as 0–1V, 0–5V, 0–10V, 0–20mA, 4–20mA)
Control inputs	Opto-isolated — requires sink to 0V of 220W maximum. Mode change (frequency A, frequency B, ratio A/B, ratio B/A Reset (if optional latching alarm has been specified)
Outputs	
Standard	
Transducer supply	10V DC nominal unregulated @ 80mA max
High and Low Alarms	Open collector 200mA @ 60V max
Optional	Analogue 0–1V, 0–5V, 0–10V, 0–20mA, 4–20mA Dual Relay module — can switch 8A @ 240V AC Serial Interface Higher transducer supply voltage 24V DC @ 50mA max
Connections	Screw terminals on rear panel.
Power requirement	
AC	Factory set to 115V or 230V a.c. 50/60 Hz, loading 3VA.
DC	Mains Tachometers can also be powered by providing 10V to 15V DC @ 300mA max via the 10V terminal (refer to **WARNING** on page 13) Alternatively, if specified at time of order, they can be configured to operate from 24V DC only.
Temperature range	
Operating	0°C to +50°C
Storage	-20°C to +80°C
Dimensions	96 x 48 x 113mm (panel cut-out 92 x 43mm).
Weight	500g (standard mains supply version)

General Description

The 2000T MKII SERIES™ Tachometers are 6-decade seven segment high brightness red LED display instruments based on the industry standard 8051 series architecture microprocessor.

They are built into half DIN (96 mm x 48 mm) panel mounting housings and can be supplied to operate on 115V or 230V AC or 24V DC power supplies (see Transformer Connections on page 6).

Two signal inputs are available, Input A (I/Pa) and Input B (I/Pb). The two inputs can be scaled independently but they share a common Sensitivity Control. If using only a single input signal then this should be connected to Input A (I/Pa).

2000T MKII SERIES™ Tachometers are available with several factory fitted options which must be specified when ordering – see Specification on page 4 for details.

Additionally, **Logitech** will customise the programmed operating modes of these Tachometers to suit specialised applications.

Many variations on the standard software have been developed — please contact the Sales Office if this service is required for your installation.

Note:
Two versions of 2000T MKII SERIES™ instruments are available - either with a **full** switch set accessible externally on the front panel, or with only a **single** function switch (**FUNC**) accessible unless the bezel and front panel are temporarily removed. The following setting-up instructions assume the front panel has been removed if using a **single** switch version.

Safety Information for EU Users

WARNING This instrument must be earthed when powered from a mains supply (see also Mains Earth on page 9). Refer to the rating label for the pre-set voltage and ensure that the instrument voltage corresponds to the intended supply voltage.

Important: The wires in the power lead fitted to mains instruments are coloured in accordance with the following code:

Green and Yellow . . . . . Earth
Blue . . . . . Neutral
Brown . . . . . Live

As the colours of the supply lead fitted to mains supply instruments may not correspond with the coloured markings identifying the terminals in your plug, connections should be made as follows:

- Connect the green and yellow wire to the terminal marked with the letter E or identified with the ⏚ (earth) symbol.
- Connect the blue wire to the terminal marked with the letter N or coloured black.
- Connect the brown wire to the terminal marked with the letter L or coloured red.

The mains supply to this instrument must be protected with a 1 Amp fuse.

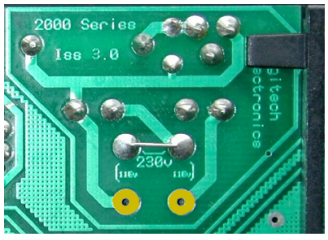
Transformer Connections

2000 MKII SERIES™ instruments for use on mains power can operate on either a 230V or 115V 50/60Hz AC supply.

Instruments are factory pre-set to operate from the mains voltage specified at time of ordering.

If, for any reason, the user needs to change the mains operating voltage the following procedure must be adhered to:

1. Disconnect the Mains Supply.
2. Gently prise off the front panel bezel surround and allow the front panel to fall forward and out.
3. Remove the two nuts at the rear of the case, then push the instrument out through the case front.
4. Pads which select the operating voltage are located on the under side of the printed circuit board. The existing link(s) should be removed and new link(s) should be soldered across the appropriate pads, and the instrument reassembled (one link is used for 230V AC, two links are needed for 115V AC).



Switches and Connections

RUN/SET Switch

This switch is located in the top right hand corner of the front panel.

RUN mode. When the instrument is in this mode the Tachometer will display the measured signal.

Pressing this switch changes the Tachometer to the **SET** mode and activates the **DP**, the **0–9** and the **±** (polarity) switches (see Setting a Scaling Factor on page 10).

FUNCTION (FUNC) Switch

This is located directly below the **RUN/SET** switch and is used when it is required to observe or set the programmable parameters (see Setting a Scaling Factor on page 10).

Pressing the **FUNC** switch steps through the parameters in the following sequence:

SCALE ….	Scaling Factor
…. OFFSET	
ALA L	Alarm Low
ALA H	Alarm High

If the **RUN/SET** switch is in the **RUN** mode, and the instrument is displaying a measured value, a single depression of the **FUNC** switch will step the display automatically through all the programmed parameters at a pre-determined rate of approximately one per second.

On completion of this cycle the display will return to the measured value.

DP (Decimal Point) Switch

This is located under the **FUNC** switch and is used to set the position of the decimal point as required.

A single depression of the switch will move the decimal point one decade.

Holding the switch depressed will cause the point to move in decade steps from right to left at a pre-determined rate.

This switch is only active when setting either the Scaling Factor or the Offset (the DP position in the normal display)

0–9 Switch

Located under each decade, these switches are used to set the value of all programmable parameters. Each depression increments the display one digit. Holding the switch depressed steps the display through **0** to **9** at a pre-determined rate.

+/- Switch

Located at the lower left hand corner of the front panel, this switch selects negative values when required by displaying a negative sign. No sign is displayed for + (positive) values.

Rear Panel Terminals

A_L	LOW alarm (Open Collector 200mA 60V max.)
A_H	HIGH alarm (Open Collector 200mA 60V max.)
0V	Common
⏚	Mains Earth
10V	+10V DC (unregulated) @ 80mA
RST	Reset Alarm (If Latching Alarm option is specified)
M0	Mode 0
M1	Mode 1
0V	Common
I/P_a	Signal A
0V	Common
I/P_b	Signal B

Mode Switches

Mode 1	Mode 0	Function
Open	Open	Frequency A
Ground	Open	Frequency B
Open	Ground	Ratio $^{A}/_{B}$
Ground	Ground	Ratio $^{B}/_{A}$

The user must connect an external switch between Mode 0 (terminal 7) and/or Mode 1 (terminal 8) to 0V (terminal 9 Common) to obtain the required function as shown in the table below:

Sensitivity Control

This is located to the right of the terminal block on the rear panel and is factory preset. However, should it be necessary during on-site installation, adjustment is accessible through a hole in the rear panel itself.

Maximum sensitivity is obtained when the control is turned fully clockwise.

It is recommended that the sensitivity level is increased only as far as necessary to obtain a steady signal. This minimises the risk of detecting spurious signals.

Alarm Outputs

The **HIGH** alarm will be activated when the value shown on the display is equal to, or greater than, the value programmed into memory.

The **LOW** alarm operates on a value equal to, or below, the programmed value.

The alarm outputs automatically reset when the value shown on the display returns to a “no alarm” value.

If specified at time of ordering, a 2000T can be supplied with a latching facility for the alarm outputs. Resetting the outputs is then performed by grounding terminal 6 (RST) on the rear panel.

Mains Earth

2000 MKII SERIES™ Tachometers are supplied with a three core mains cable. The earth lead from this cable is connected to terminal 4 on the rear panel terminal block.

For most applications this Earth terminal should be linked to common terminal 3 (0V) — see also Safety information for EU users on page 6 and Electromagnetic Precautions on page 18.

Exceptions to this are if the Common is connected to Earth elsewhere in the system (care must be taken to avoid Earth loops); or it is found that the mains earth is of poor quality; or when it is essential that the signal input or the analogue output of the instrument is floating.

Programming the Instrument

Calculating a Scaling Factor

The displayed value is calculated as **D = Sr** where **S** is the scaling factor and **r** is the measured rate of input signal in pulses per second (pps) or Hertz (Hz).

The scaling factor is most easily calculated by considering the maximum input frequency expected and by deciding what the display should read at this frequency.

If a decimal point is required in the final display it should be ignored at this stage — see Increasing the discrimination of the display on page 11.

The scaling factor is then calculated as: **displayed value divided by input frequency**

The scaling factor range is 0.00001 to 999999 and it may be necessary to round off the calculated value to fit within this range.

Setting a Scaling Factor

On an instrument that has not been previously programmed

Unless requested otherwise, instruments are normally supplied from the factory with all settings programmed to zero.

On power up for the first time the display will show **freq A .... SET .... SCALE .... 0** (**....** signifies a one second delay before the display changes) and will be in the set mode awaiting programming as required.

If the **RATIO** functions are needed, then a link(s) must be fitted on the terminal block as appropriate — see MODE Switches on page 8.

To enter the scaling factor, simply use the **0–9** switches under the appropriate decade until the correct figure is displayed. The decimal point should then be positioned as required by use of the **DP** switch.

If other parameters need to be programmed (see the following sections), step to each one in turn by pressing the **FUNC** switch to display the parameter that is to be programmed and enter the values using the **0–9** switches for each decade as required.

When all parameters have been programmed to the required values return to the **RUN** mode by pressing the **RUN/SET** switch.

On an Instrument that has been previously programmed

If an instrument has been supplied with factory programmed settings as requested, or once the user has programmed the settings and returned the instrument to the **RUN** mode, on power up the display will show the programmed mode for one second:

FREQ A or **FREQ B** or **RAT A / B** or **RAT B / A**
followed by **0** if there is no input signal present when in **FREQUENCY** mode
or **no sig** when in **RATIO** mode.

If it is necessary to change the scaling factor, simply press the **RUN/SET** switch once to change from the **RUN** mode to the **SET** mode, and then use the **0–9** switches under the appropriate decade until the correct figure is displayed. The decimal point should then be positioned as required by use of the **DP** switch.

If other parameters need to be altered (see the following sections), step to each one in turn by pressing the **FUNC** switch to display the parameter that is to be altered and change the previously set values using the **0–9** switches for each decade as required.

When all parameters have been programmed to the required values return to the **RUN** mode by pressing the **RUN/SET** switch.

Increasing the discrimination of the display

In some applications it may be an advantage to increase the discrimination of the displayed value **D**. This can be achieved by moving the decimal point when setting the scaling factor **S**, as shown in the example below:

Assume an input frequency of 1000 Hz and a calculated scaling factor of 1.52, then **D** = **1520**

By moving the decimal point in the scaling factor by one place to the right an extra decade of discrimination can be achieved.

Thus if we make **S** = 15.2 then **D** will read **15200**.

It is now necessary to position the decimal point. To do this, switch the Tachometer into the **SET** mode and select the **OFFSET** function. The **DP** switch should now be used to obtain a display showing **0.0** Switching back to the **RUN** mode will give a reading of **1520.0** The Tachometer is now set to give an extra decade of discrimination.

If two decades of discrimination are required, simply move the decimal point two places to the right in the calculated scaling factor, and position the DP accordingly in the **OFFSET** mode. The only limit when increasing the discrimination is if the display goes beyond **999999**, in which case it will read **HIGH** and it is then necessary to reduce either the scaling factor or the input frequency.

Setting an Offset

The Tachometer has an **OFFSET** facility that can be either positive or negative. It is a very useful addition to the scaling factor and can be used to display percentage difference between **A** and **B**, or show the deviation from a nominal value. For example:

> If the nominal frequency on Input **A** is 1000 Hz, by setting the scaling factor to **1** and the OFFSET to **-1000**, the display will show the deviation from 1000 Hz.

Another use of the **OFFSET** is in the display of percentage difference between signal **A** and signal **B**. One of the signals is chosen as the reference (say signal **A**).

The percentage difference is given by $\frac{B-A}{A} \times 100$ which simplifies to:

$$(B/A \times 100) - 100$$

Thus by setting the mode to read ratio B/A with a scaling factor of **100** and an Offset of **–100** the percentage difference between **A** and **B** will be displayed.

If a decimal point is required this should be inserted when setting the offset.

Output Options: DC Analogue

0–1V, 0–5V, 0–20mA, or 4–20mA outputs

When Tachometers are fitted with any of these options the output is available via a red (+ve) and a black (-ve) socket on the rear panel.

Note: Outputs are proportional to the display reading, not the input signal.

With the Tachometer in the **SET** mode, each depression of the **FUNC** switch will step through the parameters in the following sequence:

SCALE	
OFFSET	
ALA L	Alarm Low
ALA H	Alarm High
REF	(0V) or (0V) or (0V) or (0mA) or (4mA)
F.S.	(1V) or (5V) or (10V) or (20mA) or (20mA)

When using the outputs, values should be set in parameters 5 and 6 as appropriate.

The **REF** will probably be zero but it can be set to the lowest value normally expected. The Full Scale (FS) value will depend on the Analogue Output Module specified when the instrument is ordered, the application and the range of display readings expected.

Note: The outputs are not affected when the Tachometer is operating in the **RUN** mode and the operator uses the Function (**FUNC**) switch to check the parameters that have been set in 1 to 6 above.

WARNING

2000 SERIES mains powered instruments cannot normally be operated on an external 10V to 15V DC supply when an optional Analogue Output is specified.

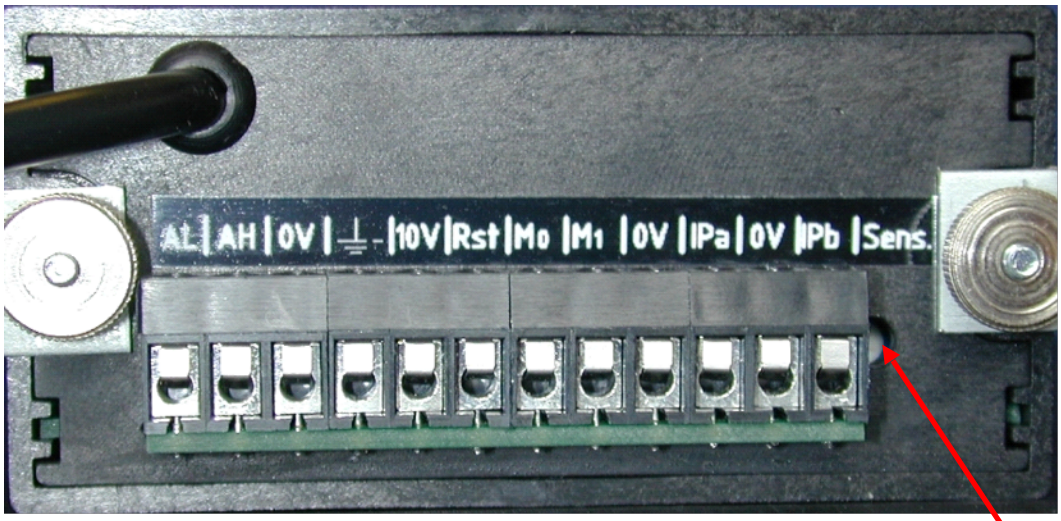
If it is necessary that an external DC supply is used, then the facility to do so should be requested when discussing the specification of the instrument with our Sales Office and it **must** be specified on the purchase order.

Diagrams

Front Panel Layout

Note: On instruments with the SINGLE switch set option
only the FUNC switch is accessible unless the bezel and front panel are removed

Rear panel layout

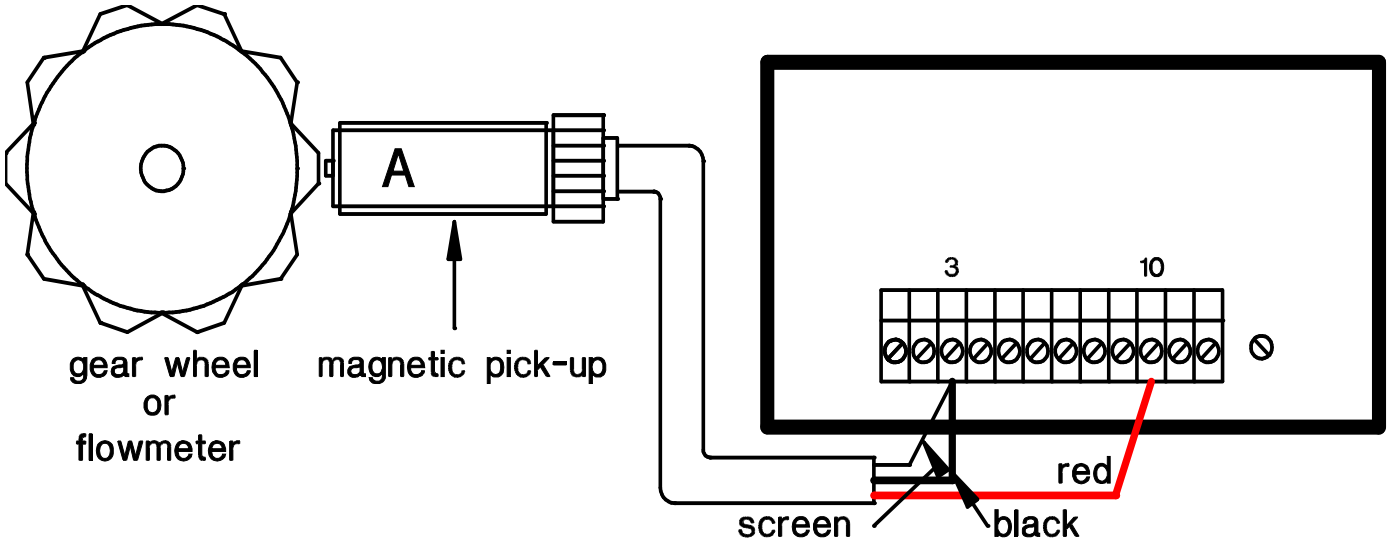


Sensitivity Control

Connection diagrams – typical applications

Variable reluctance Magnetic Pick-ups

Single-input operation



Dual-input operation

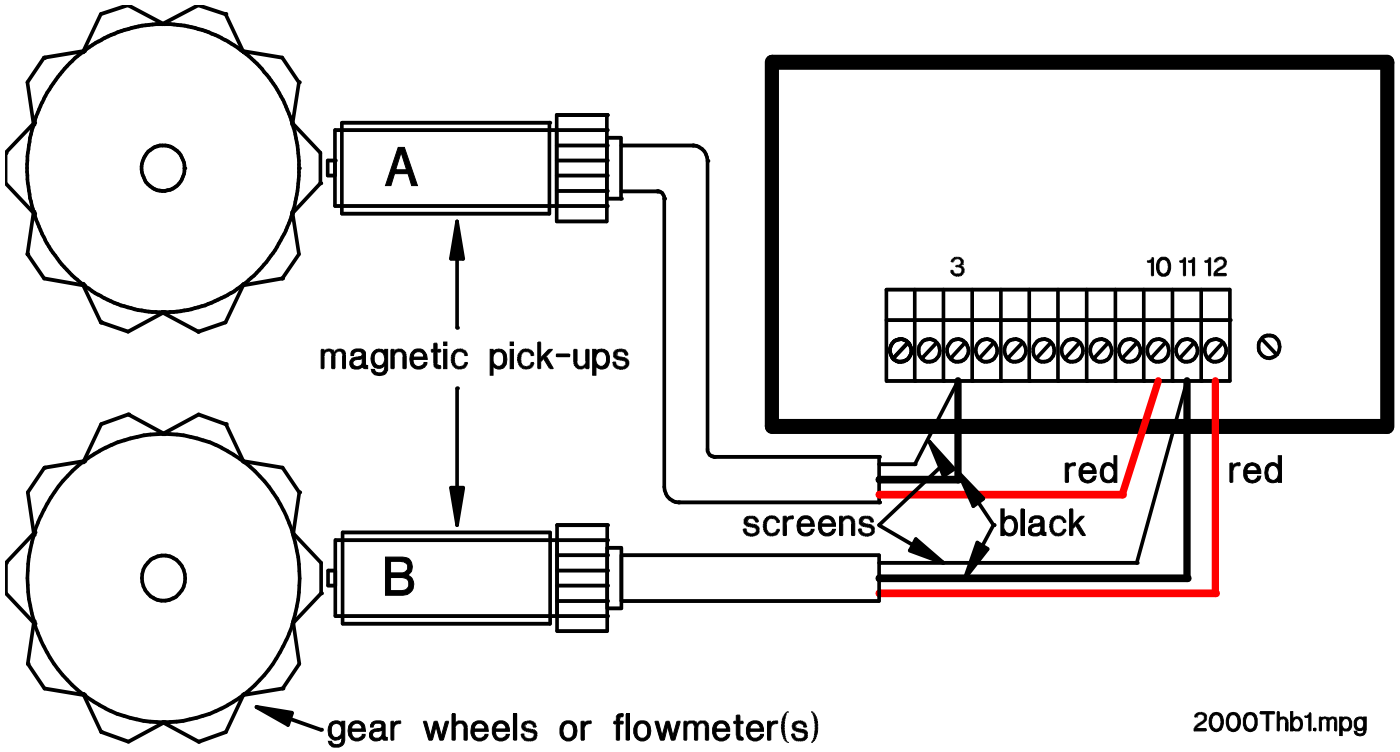
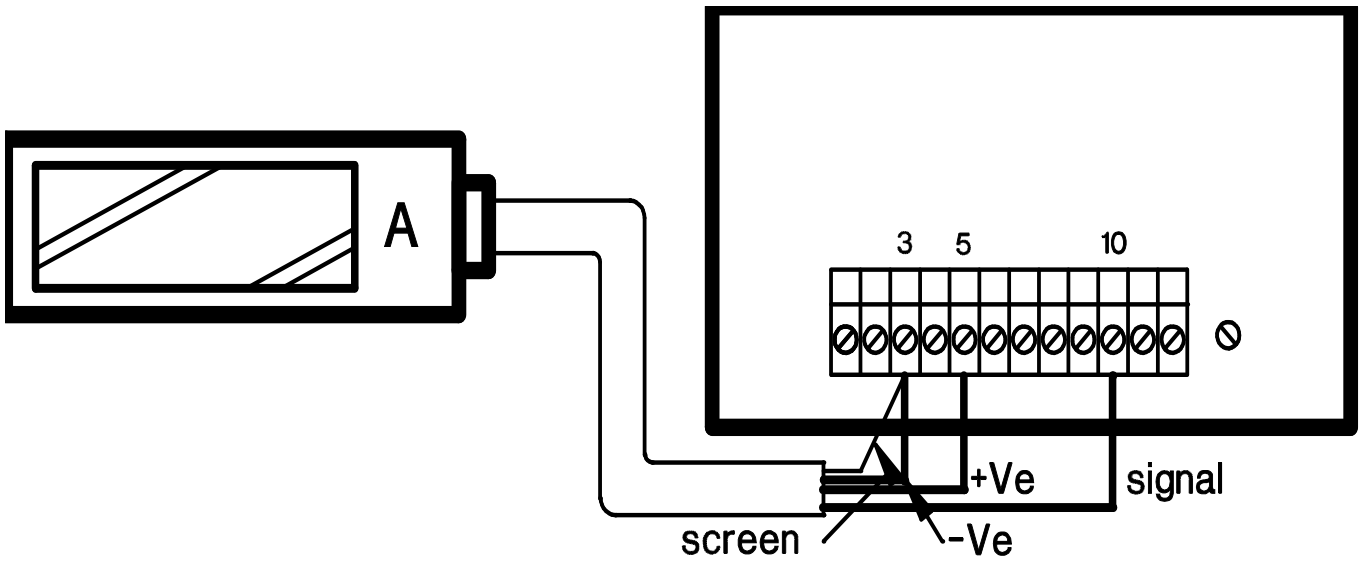
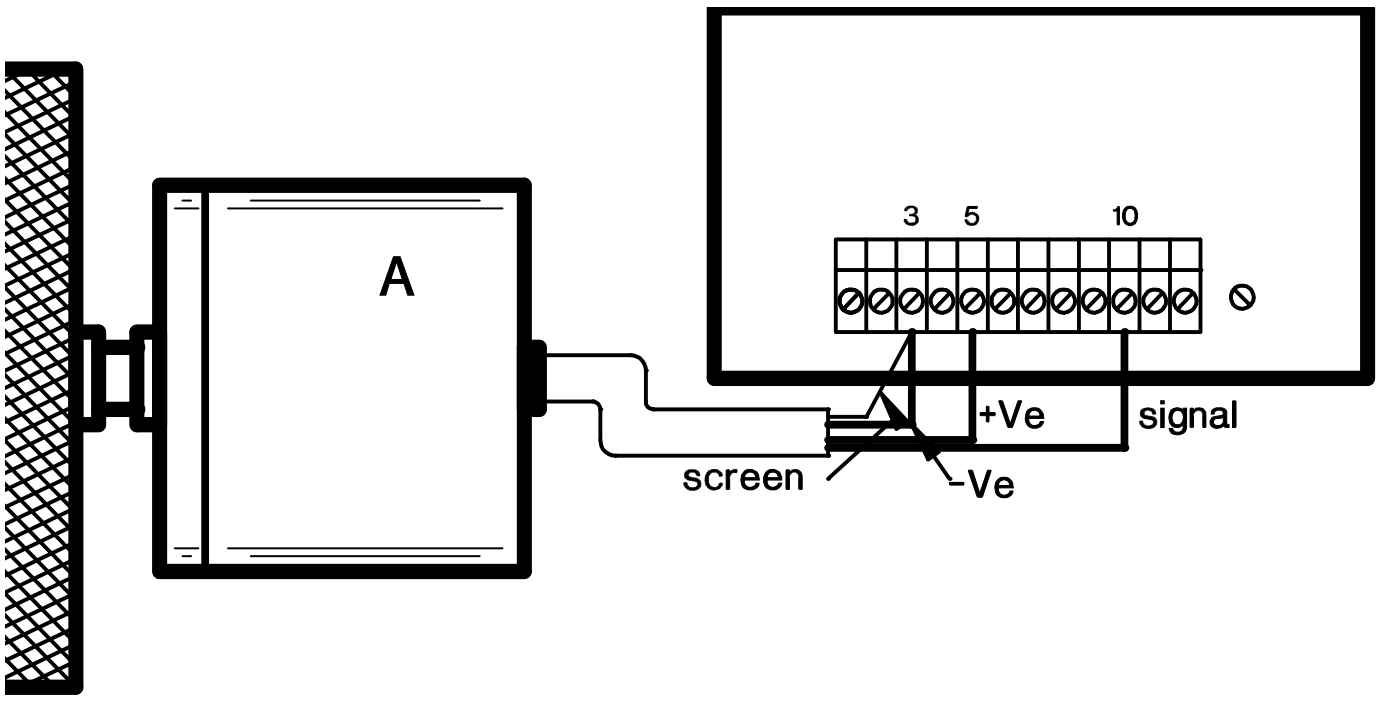


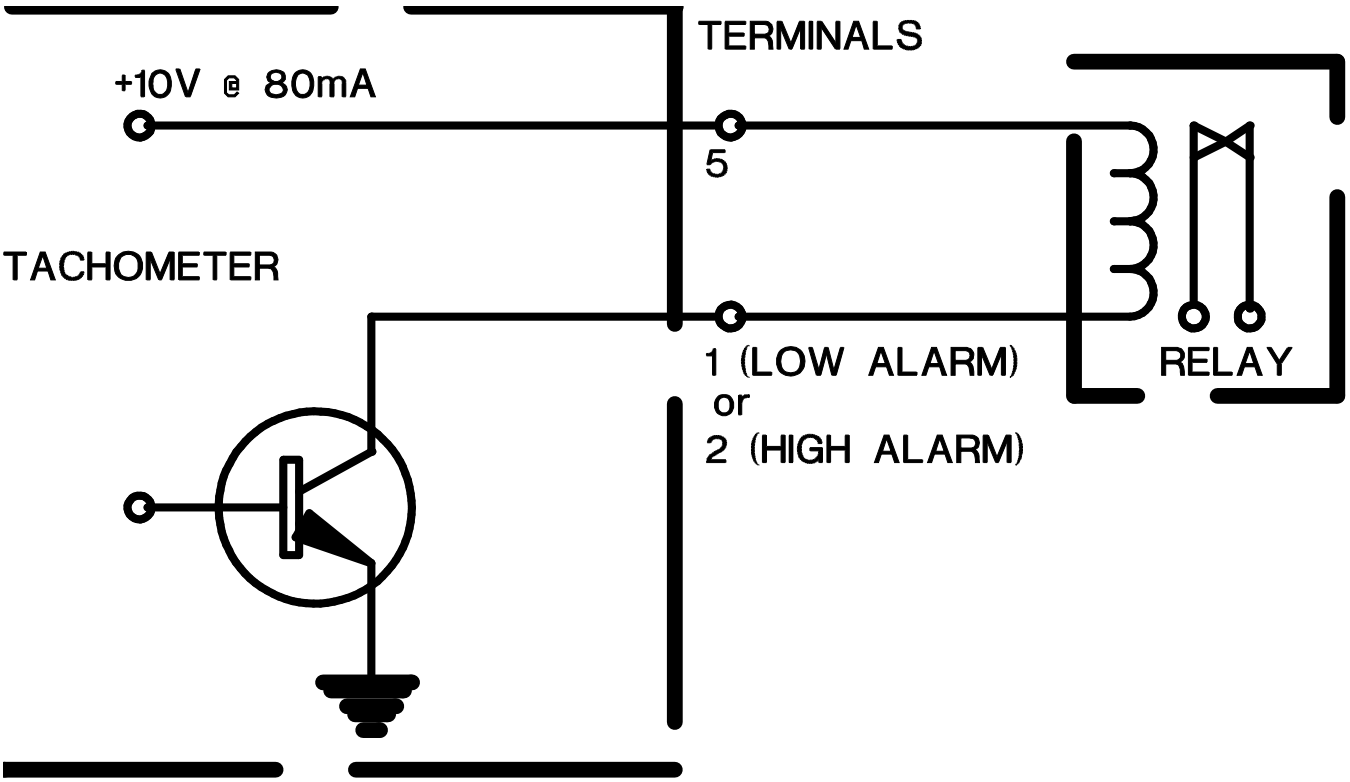
Photo-electric sensor or Proximity probe



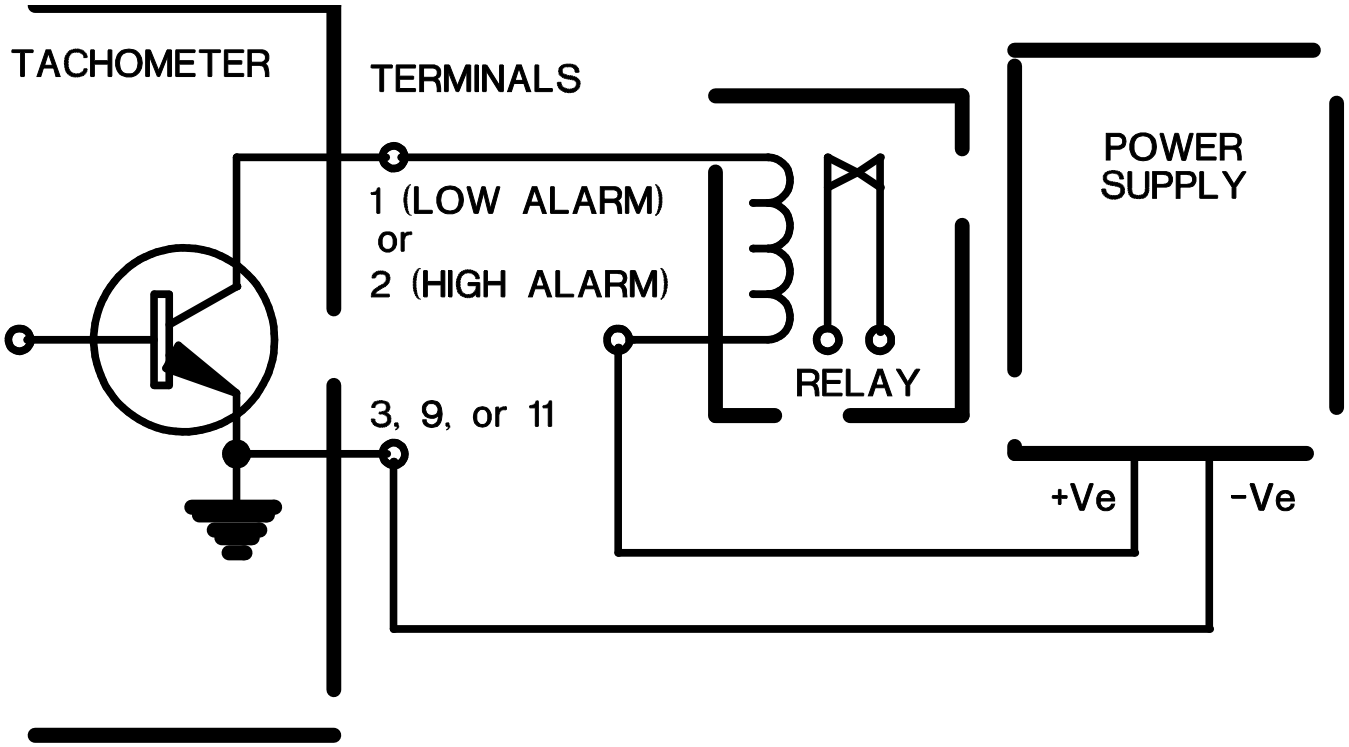
Digitising encoder (shown with optional Measuring Wheel)



Alarm Output Connections



Alarm connections with external power supply



Additional Information

Electromagnetic Precautions

Logitech have designed in a great deal of noise immunity into the product in accordance with EN5001-2 and EN5002-2 (radiated emissions, conducted emissions, ESD, radiated susceptibility and fast burst transient testing)

However it is still vital to use good EMC (Electromagnetic Compatibility) techniques on installation of both this and other associated electronic equipment and sensors in order to ensure reliable operation.

It is important to note that if used with systems that radiate high levels of harmonic noise such as DC Drives, AC Inverters and Servo Drives then the levels of imposed interference can greatly exceed that of the European Standards.

In such cases it is important to ensure that mains leads are routed as far as possible from all cables carrying power to such equipment and that the supply should, if viable, be taken from a clean source.

Where this is not possible, it is advisable to use a good quality mains filter mounted as close to the instrument as possible, ensuring that the cable between the filter and the instrument is kept separate from any cables carrying high levels of current or any fast switching transients.

All signal connections to the instrument should be made using screened lead with the screen connected to mains earth at one end only.

Wherever possible, it is advisable to connect the 0V terminal to mains earth, unless it is found that the mains earth is of poor quality or when it is essential that the signal input is floating — see Mains Earth on page 9.

Low Voltage Directive

It is essential that the mains supply to the instrument is fused externally to no more than 1A and that the cabling supplying power to the instrument is rated for at least 3A.

Low voltage signal cables should not be run in the same conduit or twisted or tied to cables carrying voltages in excess of 50V (AC or DC).

If the instrument is not installed fully in accordance with the instructions in this User Guide it may not comply with the requirements of the Low Voltage Directive.

Warranty

2000T MKII SERIES™ Tachometers carry a two year warranty that is only valid where there is no damage caused by accident, negligence, misapplication, or repairs/modifications attempted by unauthorised personnel. The warranty only extends to the original user.

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MADE IN THE UK

Reliability, Guaranteed

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Design and Manufacture of Electronic Systems and Instrumentation. Supply of Sensors and Transducers

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