



Logitech Electronics Limited

2000 MKII SERIES™

Counter/
Tachometer

Model 2000CT

User Guide

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Specification

Display	7-segment red LED, 10mm high RATE — 6 Decade TOTAL — 7 Decade
Decimal point	Programmable from front panel
Rate	
Accuracy	0.05% with a square wave at 1V peak
Signal Inputs	Signal A
Normal Sensitivity	180mV—10V (protected to 100V)
High Sensitivity Option	12mV—1V (protected to 100V)
Frequency	30 kHz max
Impedance	15k Ω min
Control Inputs	Factor protection
Outputs	High Alarm, Low Alarm (Open Collector 200mA @ 60V max)
Total	
Signal Inputs	Signal B — count up
Control Inputs	Factor protection, external Reset
Control inputs	Opto-isolated - requires sink to 0V of 220W maximum.
Outputs	DC Voltage (10V nominal unregulated @ 80mA max)
Scaling	Programmable via front panel (non-volatile memory)
Connections	Screw terminals on rear panel.
Power requirement	
AC	Factory set to 115V or 230V AC 50/60 Hz, loading 3VA.
DC	Mains Tachometers can also be powered by providing 10V to 15V DC @ 300mA max via the 10V terminal.
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

General Description

The [2000CT Combined Counter/Tachometers*](#) are 6-decade seven segment LED display instruments based on the industry standard Intel 80C51 series 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 5).

The [2000CT](#) is designed to accept a pulsed signal from either one or two sources and the display can be switched to show the rate of the input signal or the total count as and when required. Both options are continuously monitored and either may be instantaneously selected by pressing a button on the front panel. A high and low alarm can be set for the rate value and the appropriate output will be activated when the value falls outside either limit.

The displayed values are scaled so that one unit on the display can represent a pre-set number of input pulses. In addition to this scaling there is the facility for individual scaling of the total display and the rate display so that rate may be displayed as units per second, units per minute, units per hour, milli-units per second etc., and total can be displayed as units, milli-units, kilo-units etc. An option is available for output of the rate value in a fully scalable analogue form, either current or voltage.

[2000 Series](#) instruments are available with several factory fitted options which must be specified when ordering — see [Specification](#) on page 3 for details. Additionally, **Logitech** will customise the programmed operating modes of these instruments to suit specialised applications. Many variations on the standard software have been developed — please contact our Sales Office if this service is required.

Note: Two versions of [2000 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.

* In some industries these type of instruments may be described as “Totaliser/Ratemeters”
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Safety Information for EU Users

WARNING This instrument must be earthed when powered from a mains supply (see also [Mains Earth](#) on page 7 and [Electromagnetic Precautions](#) on page 16). 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 \equiv (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.

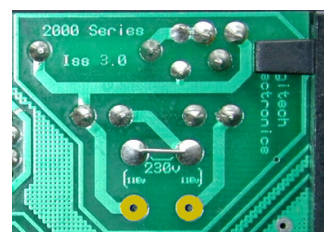
Transformer Connections

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.

When the instrument is in the **RUN** mode, it will display the measured signal, the value of which will depend whether the instrument is set to display **RATE** or **COUNT**. Momentarily pressing this switch once puts the instrument into the **SET** mode and activates the DP, 0–9 ; and the \pm (polarity) switches. To return to the **RUN** mode, simply momentarily press this switch once again.

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. When in the **SET** mode, momentarily pressing the **FUNC** switch steps through the parameters in the following sequence see [Programming the Instrument](#) on page 8:

Factor	Universal Scaling Factor
Total....Scale	Multiplying factor for displayed value for TOTAL
Disp. DP	Decimal point position in displayed value for TOTAL
Rate....Scale	Multiplying factor for displayed value for RATE
Disp. DP	Decimal point position in displayed value for RATE
ALA L	“Low Alarm” set point
ALA H	“High Alarm” set point

If the instrument is in the **RUN** mode, a single depression of the **FUNC** switch will toggle the display between showing the accumulated **TOTAL** value, or the current **RATE** value (unless there is no input signal when displaying **RATE**, in which case the display will show **NO SIG**).

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 **Factor**, the **Total: Scaling Value** or the **Rate: Scaling Value** parameters.


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 has no function on [2000CT](#) models.

Rear Panel Terminals

AL	Low Alarm
AH	High Alarm
0V	Signal Common
	Connected directly to earth wire in mains cable
10V	10 to 13v @ 80mA (unregulated D.C. output for sensors)
Rst	Reset Input for TOTAL
M0	Protection input for Meter Factor
M1	Not used
0V	Common
IPa	Rate Signal input*
0V	Common
IPb	Count Signal input*

*Note regarding Rate signal input and Count signal input:

The 2000CT is designed to accept a rate signal input and/or a count signal input and these can be supplied by two different sensors or pulse sources. If only one signal source is to be used for both Rate and Count monitoring, then simply connect the signal source to IPa (terminal 10) and fit a link from IPa to IPb (terminal 12).

Sensitivity Control

This is located to the right of the terminal block on the rear panel and is factory pre-set. 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 Alarm Output facility is available in the **RATE** mode only. 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.

Mains Earth

[2000CT Counter/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  0V terminal 3 (COMMON) - see also [Safety Information for EU Users](#) on page 5 and [Electromagnetic Precautions](#) on page 16.

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 RATE and a TOTAL Factor

The value displayed for **RATE** is calculated as :

$$\text{RATE} = \frac{N \times \text{Scaling Value}}{T \times \text{FACTOR}}$$

N = number of pulses counted in time T

T = measurement time (usually 1 sec)

The value displayed for **TOTAL** is calculated as :

$$\text{TOTAL} = \frac{C \times \text{Scaling Value}}{\text{FACTOR}}$$

C = total count.

Programmable Parameters

The following values must be programmed into the unit in order to display the desired values:

i	Factor
ii	Total - scaling value
iii	Total - decimal point position
iv	Rate - scaling value
v	Rate - decimal point position

Other parameters that may need to be programmed are:

vi	Low Alarm limit
vii	High alarm limit

And if the analogue output option has been specified:

viii	Reference
ix	Full Scale

In order to program the parameters the instrument must be operating in the **SET** mode. Unless the appropriate parameters have been specified at the time of ordering, all values will be factory set to zero when the instrument is first powered up.

Since zero is an invalid number for Factor or Scaling values, the instrument must have a link connected between M0 (terminal 7) and 0V (terminal 9 Common), and will initially be forced into the setup routine and will display **SET FACTOR 0** (.... signifies a one second delay before the display changes).

If the display shows **RATE** or **TOTAL** when power is first applied to a not-yet-programmed instrument, it is because the link is missing (see also the section entitled [Alteration of Programmable Parameters](#) on page 12).

To change a decade value press the button located immediately below the digit. The value will increment from **0** to **9** and then return to **0**. If the button is held down the value will increment automatically every second. The button can be released when the required value shows.

To change the decimal point position press the button at the lower right hand side of the panel. The decimal point will step from the right to the left and return to the right. It is not possible to adjust the position of the decimal point when parameters **vi** to **ix** are accessed.

After the required value has been entered for the first parameter, press the **FUNC** button once to step to the next parameter to be entered (information about each parameter follows below) and repeat for each parameter in turn.

Once all the parameters have been stepped through in turn, one more press of the **FUNC** button will return the display to the first parameter again if you want to amend or check the values that have been programmed prior to returning the instrument to the **RUN** mode.

Otherwise, when the required values have been programmed, press the **RUN/SET** button once to switch the instrument to the **RUN** mode ready for use.

The values programmed into the instrument are stored in non-volatile memory and need setting only once for a particular application and will be retained in the event of a power loss.

i — FACTOR

The **FACTOR** parameter is protected and cannot be set unless a link is connected between M0 and 0V (on the rear terminal block).

The value entered as **FACTOR** is applied to both the **RATE** and **TOTAL** displayed values. The value entered should be the number of input pulses which correspond to one measurement unit, e.g. if the measurement device is a Flowmeter with 3500 pulses per litre then the value entered should be 3500.

Note: It is possible to enter a value other than an integer by pressing the bottom right hand button which moves the decimal point.

ii — TOTAL: Scaling Value (TOTAL SCALE)

After the total count has been divided by the **FACTOR**, the result is multiplied by the scaling value before being displayed. If a small value is expected then it may be appropriate to set the scaling factor to 100, 1000 or even more so that the full capabilities of the instrument may be utilised by displaying the total to several decimal places.

Alternatively, if a very large value is anticipated, it may be appropriate to set the scaling factor to 0.1, 0.01, etc. to ensure that the displayed value will not overflow the display.

iii — TOTAL: Decimal Point Position (DISP. DP)

When this parameter is first displayed, the display will show ----- with no decimal point showing. The decimal point will move one place to the left on each depression of the lower right hand button. The value appearing in the display for **TOTAL** will have a decimal point displayed in the chosen position.

iv — RATE: Scaling Value (RATE SCALE)

The measured number of pulses per second is divided by the **FACTOR** and then multiplied by this scaling value before being displayed (see **ii** above).

v — RATE: Decimal Point Position (DISP. DP)

When this parameter is first displayed, the display will show ----- with no decimal point showing. The decimal point will move one place to the left on each depression of the lower right hand button. This sets the position of the decimal point in the display when **RATE** is being displayed (see **iii** above).

vi — Low Alarm (ALA L)

When the calculated rate is equal to or is less than the value entered for Low Alarm the associated output will be activated. It is not possible to adjust the position of decimal point when programming the value. The decimal point position will be taken from that set in step **v** above.

vii — High Alarm (ALA H)

This is identical in operation to the Low Alarm feature described above but operates when the rate equals or is greater than the programmed value.

Analogue Output Settings

(optional extra, available only if specified at time of ordering)

viii — Reference (REF)

The setting for reference defines the rate value for which the analogue output is at zero. This “zero” will be 0V for 0–5V output, 0mA for 0–20mA output or 4mA for 4–20mA output. A calculated rate value between the reference value and the full scale value causes an output to be produced.

ix — Full Scale (FS)

The setting for Full Scale defines the rate value for which the analogue output will be at maximum (5V or 20mA depending on option originally ordered).

When all parameters have been programmed it is possible to step through all settings by repeatedly pressing the centre right hand button (**FUNC**). When all parameters are set to their required values then the unit can be switched to normal operating mode by pressing the top right hand button (**RUN/SET**).

Operating Mode

When the instrument is switched from **SET** mode to **RUN** mode or when power is applied after the programmable parameters have been previously set, the display will show **RATE** for a period of one second followed by the calculated value or **NO SIG** if the input signal does not change state during the one second gating period. If the calculated value is too large to be displayed then the display will read **HIGH**.

If the **FUNC** button is pressed the mode will change from rate display to total display. The unit will display **TOTAL** for one second followed by the current total count.

Note: **RATE** is displayed using a maximum of six digits.

TOTAL is displayed using up to the full seven digits.

The rate is continuously monitored and alarms will be set if appropriate. If the analogue output option has been specified then it will be updated in response to changing rates, irrespective of whether **RATE** or **TOTAL** is shown on the display.

Reset of Total Count

It is possible to reset the **TOTAL** count by either one of two methods.

1. By momentarily connecting **RESET** (terminal 6 on the Rear Panel) to 0V. This can be accomplished by a push button switch or by using a key switch which would provide security and avoid inadvertent or unauthorised operation.
2. Alternatively, the **FUNC** switch can be used to reset the count. To zero the **TOTAL** display using the **FUNC** switch, the button must be held down for approximately six seconds while the display shows **TOTAL RESET 3 21 0**

When the display shows **RESET 0** the switch button can be released and the **TOTAL** count value will now be displayed as **0**.

Alteration of Programmable Parameters

The programmable parameters can be accessed at any time by momentarily pressing the **RUN/SET** button once. This will cause the mode to change from the normal **RUN** mode to the **SET** mode. The unit will normally display **SET TOTAL SCALE** followed by the current value programmed for the total scaling value. The value set for **FACTOR** may be protected (see below).

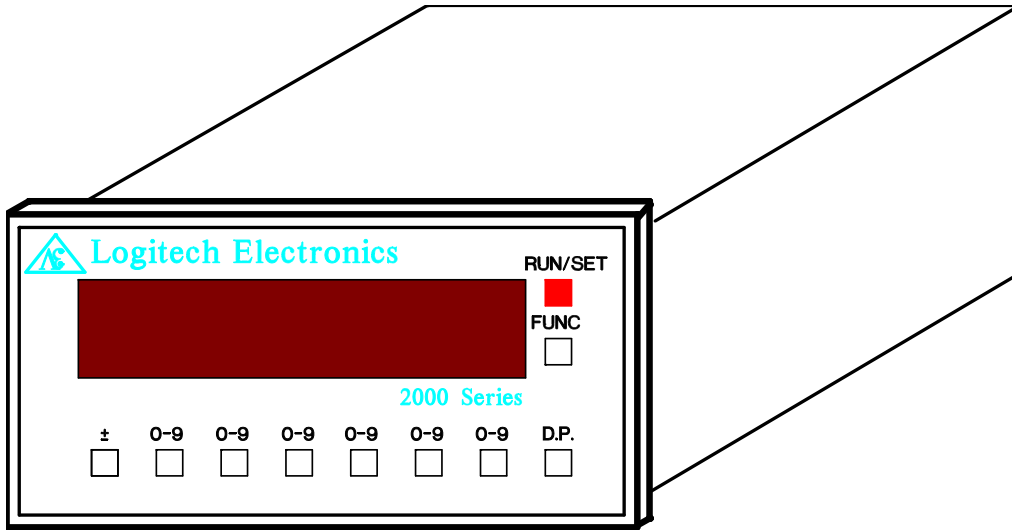
If the Factor or Scaling Value is changed after the instrument has been in use operationally, then **TOTAL** should be reset prior to using the instrument with the revised programming to avoid the possibility of an incorrectly displayed value which has been held in memory from use with the previous settings.

Protection of Factor Value

Remember that the value entered for **FACTOR** can only be accessed by connecting a link on the rear terminal block between M0 (terminal 7) and 0V. When the **RUN/SET** button is pressed while this link is in place the unit will display **SET FACTOR** followed by the current value programmed for **FACTOR**. This value can then be changed and all other programmable parameters are accessible, as before (see [Programming the Instrument](#) on page 8), by pressing the **FUNC** button.

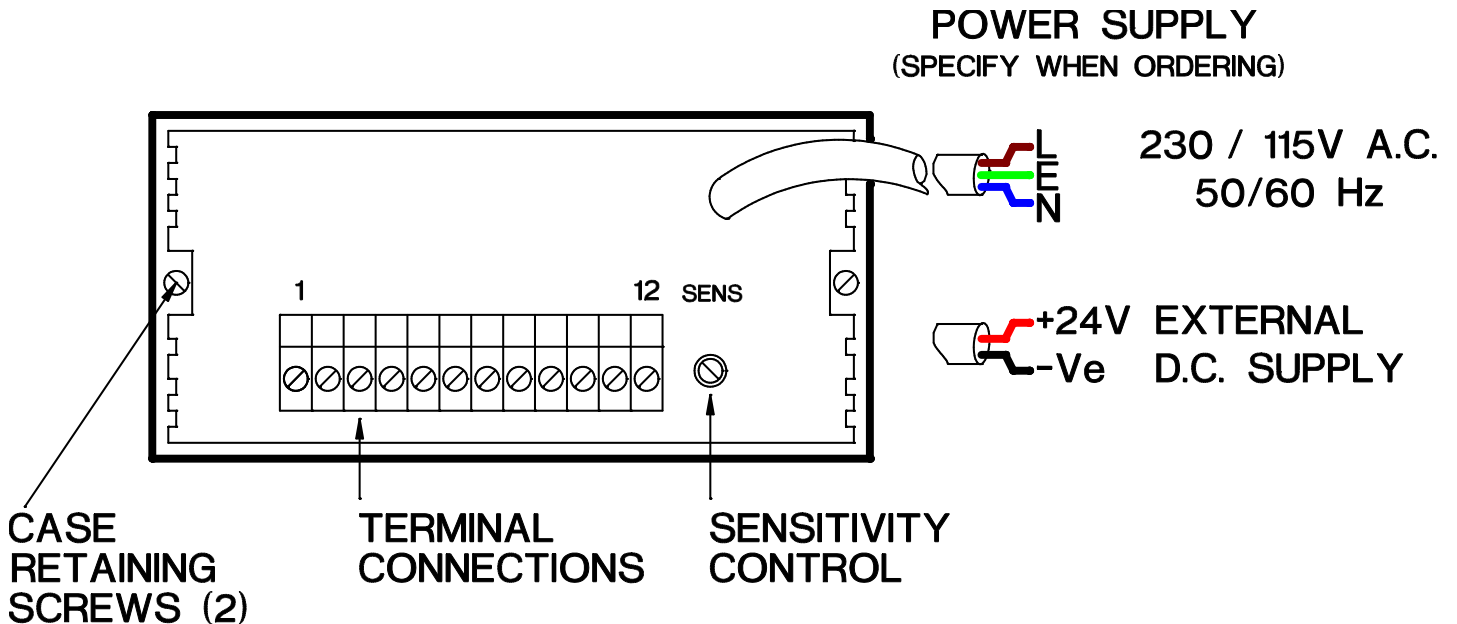
Diagrams

Front Panel Layout



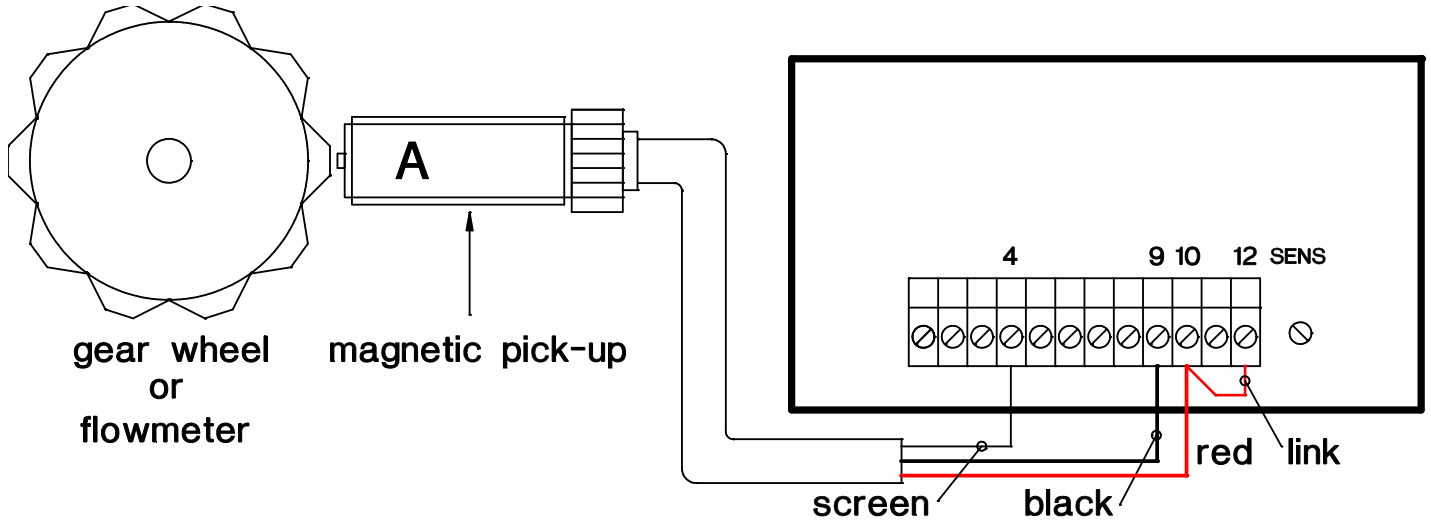
Note: On instruments with the SINGLE switch set option only the FUNC switch is accessible unless the bezel and front panel are removed

Rear panel layout



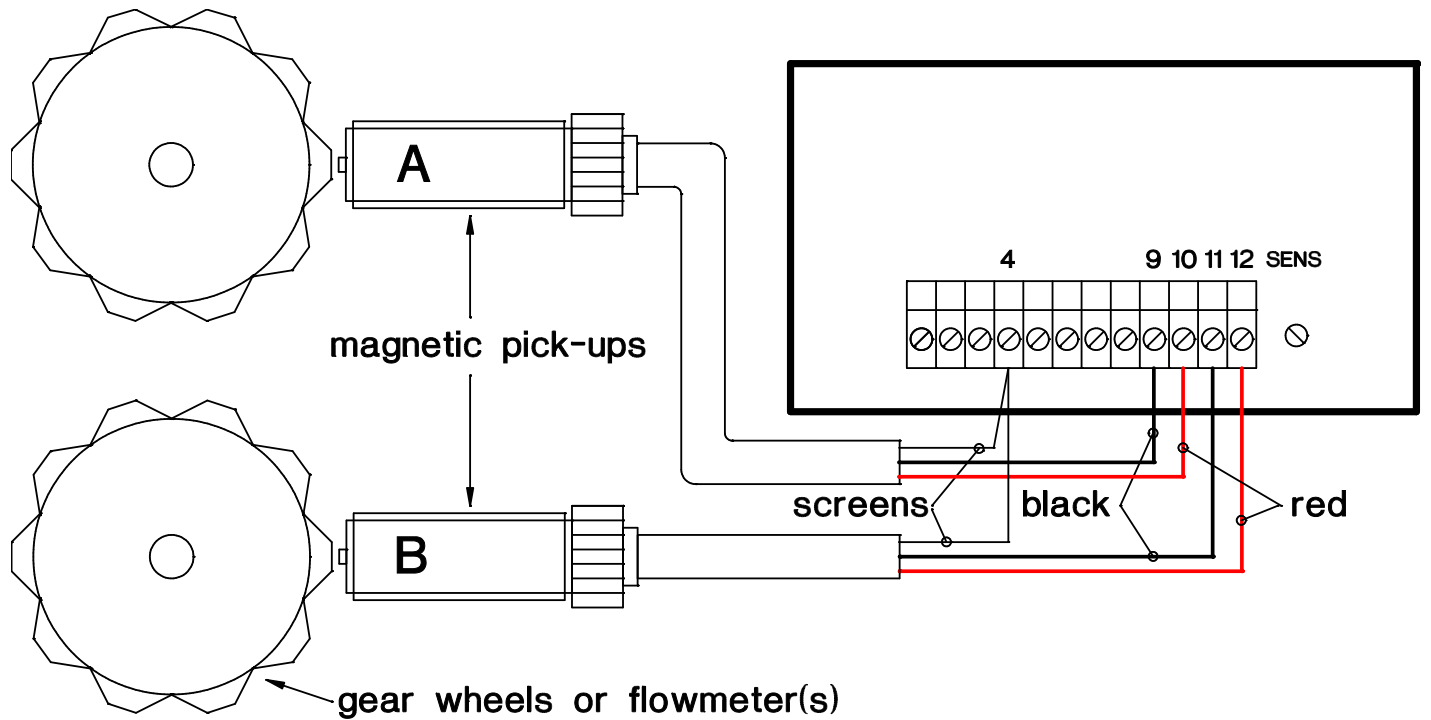
Connection Diagrams – Typical Applications

Variable reluctance Magnetic Pickups

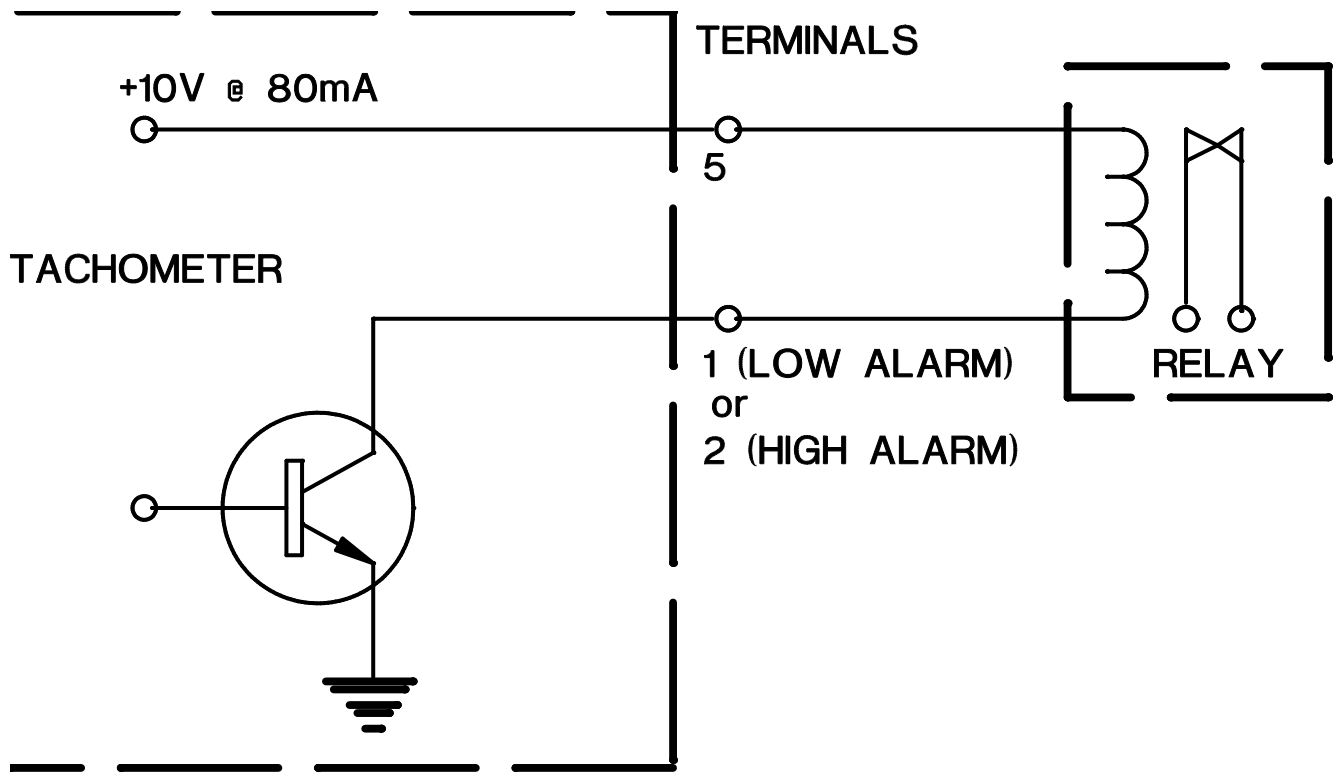


Single-input operation

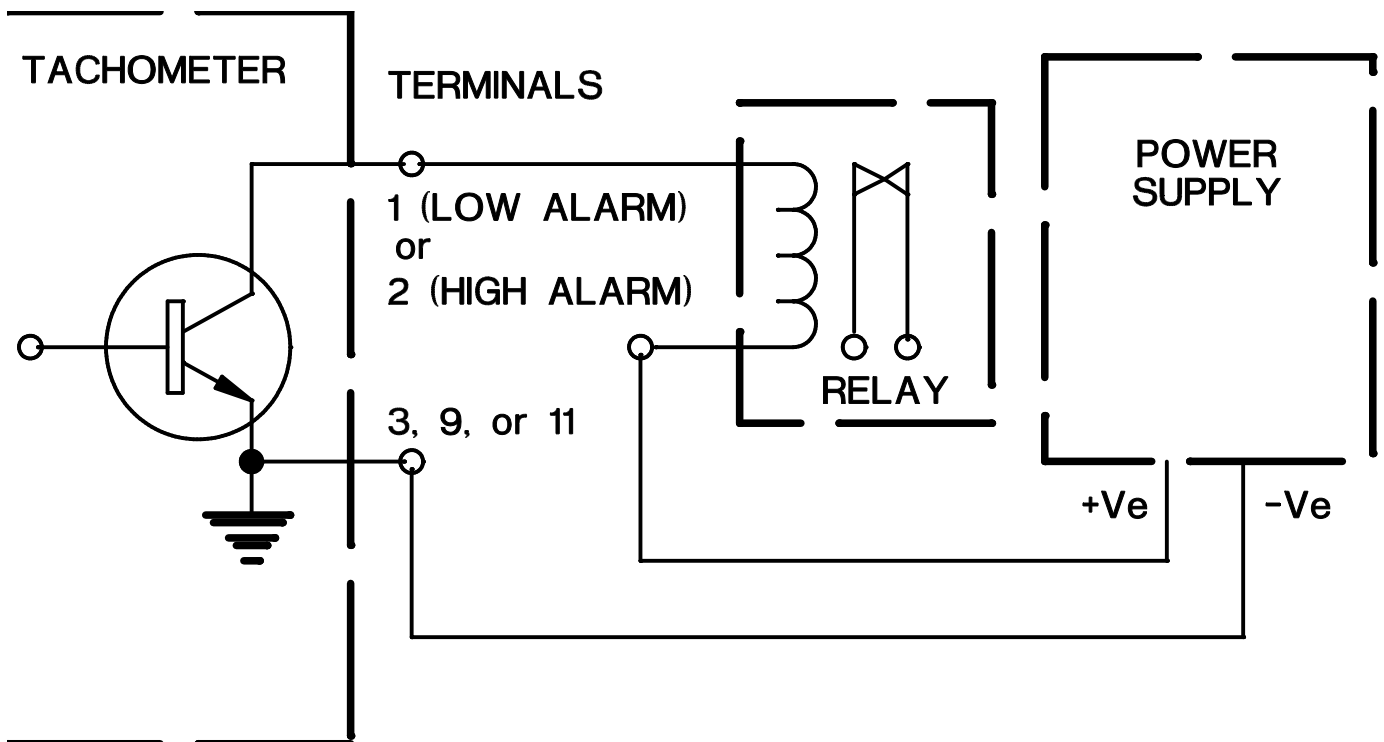
Dual-input operation



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 7.

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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Reliability, Guaranteed



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

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