

# 2020 HANDHELD WIDE RANGE VOLTAGE & CURRENT CALIBRATOR

## OPERATION MANUAL

2020 HANDHELD WIDE RANGE  
VOLTAGE & CURRENT CALIBRATOR

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Transmille Instruments are subject to continuous development and in consequence, the instrument may contain minor detail differences from the information contained within this manual.

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**Operation Manual  
Part Number 2020TM**

**Version 1.00**

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# INTRODUCTION

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The 2020 sets new standards in both range and accuracy from a hand held calibrators combining the advantages of digital accuracy with the precision and ease of use of analogue controls. The large high accuracy 4200 count display allows precise setting of output voltages from 100uV to 40V in 6 ranges and current from 100nA to 40mA in 6 ranges. An indicator is provided to warn the user of incorrect connection or overload conditions.

For 4 to 20mA transducer applications the 2020 is ideal offering zero to 22mA in one range and can act as either a current source (for calibrating indicators) or a current load (simulating a transducer). An adjustable set point can be used for either a 4mA zero or another frequently used value.

For thermocouple simulation a high accuracy external adaptor\* is available allowing simulation of types J, K up to 750°C with 0.1°C resolution, with automatic cold junction compensation. Temperature mode selection is indicated automatically by an LED when the adaptor is connected. Built in a rugged ABS case and powered by two 9V batteries or a mains adaptor allows the 2020 to be used anywhere a precision voltage or current is needed.

# SPECIFICATIONS

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**Voltage Ranges** 200mV • 400mV • 2V • 4V • 20V • 40V  
Accuracy 0.05% ± 2 Digits  
Resolution 100uV @ 200mV/400mV Ranges •  
1mV @ 2V/4V Ranges • 10mV @ 20V/40V Ranges  
Output Current 2mA @ 20V/40V Ranges • 20mA All Other Ranges

**Current Ranges** 200uA • 400uA • 2mA • 4mA • 20mA • 40mA  
Accuracy 0.05% ± 2 Digits  
Resolution 100nA @ 200uA/400uA Ranges  
1mA @ 2mA/4mA Ranges  
10mA @ 20mA/40mA Ranges  
Drive Voltage 15V

**Temperature\*** Type J • K -50°C to 750°C  
Accuracy 0.3°C ± 2 Digits  
Resolution 0.1°C  
CJC Automatic

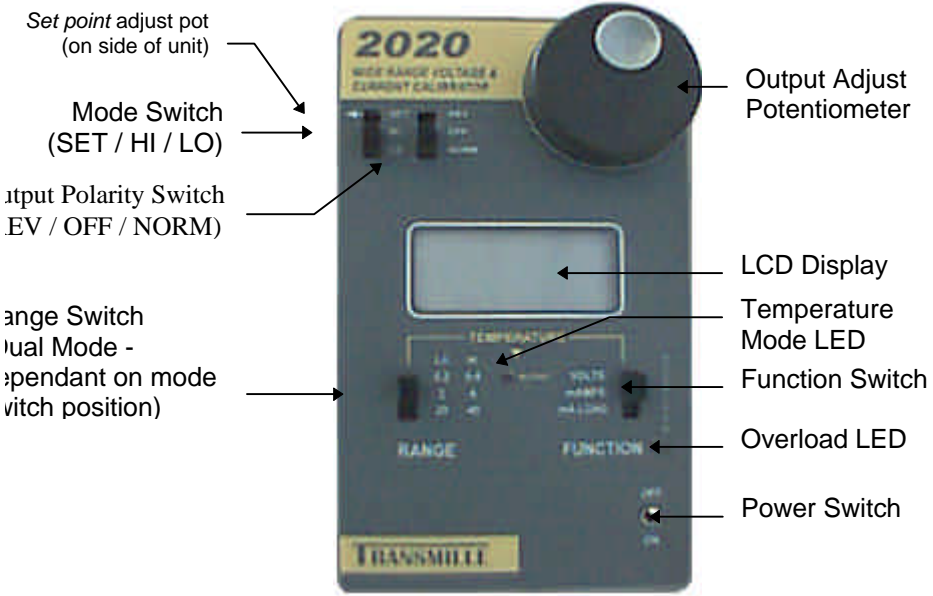
**Connections** Connections are made by 4mm banana type connectors.

**Dimensions** 142 x 80 x 45mm  
**Weight** 350g (Including 2x PP3 9 Volt Batteries)

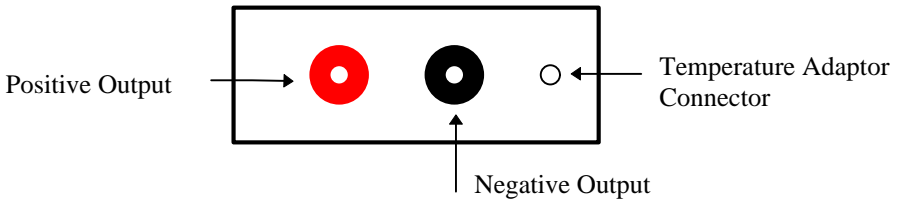
\* Option

# 2020 OPERATION

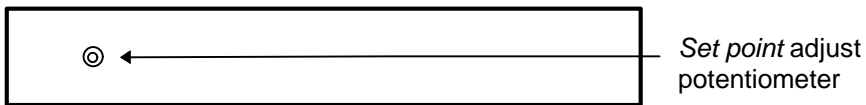
## CONTROLS



All operator controls are located on the front panel, with calibration adjustments located inside the unit along with the input / output protection fuse.



**TOP VIEW**



**LEFT HAND SIDE VIEW**

# 2020 OPERATION

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## INITIAL SETUP

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Operation of the 2020 is categorised into four different modes :

- Voltage Source
- Current Source
- Current Load
- Thermocouple Simulation of types J, K

For correct operation ensure the battery low indicator is not displayed in the top left hand part of the LCD display. The applied output will be displayed in source mode, so if the value alters when the unit under test is connected, the loading specifications may have been exceeded. This is also useful because it eliminates potential errors when connecting to an unknown UUT.

Always check the mode of operation and range values before connecting to the unit under test. If the 2020 will not source the protection fuse has probably blown due to an excessive current being applied to the unit. This fuse can be found inside the 2020.

## USER DEFINABLE *SET POINT*

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The 2020 incorporates a unique feature, allowing the users to define a chosen 'set point' from the range of available ranges and modes. To use this function, simply set the MODE switch to 'SET' and select the desired function & range. Adjust the set point potentiometer using a slim flat blade screwdriver or potentiometer driver to the required setting. On return to this range and mode in the SET position a useful custom output can be repeated without further adjustment of output.

## VOLTAGE OUTPUT

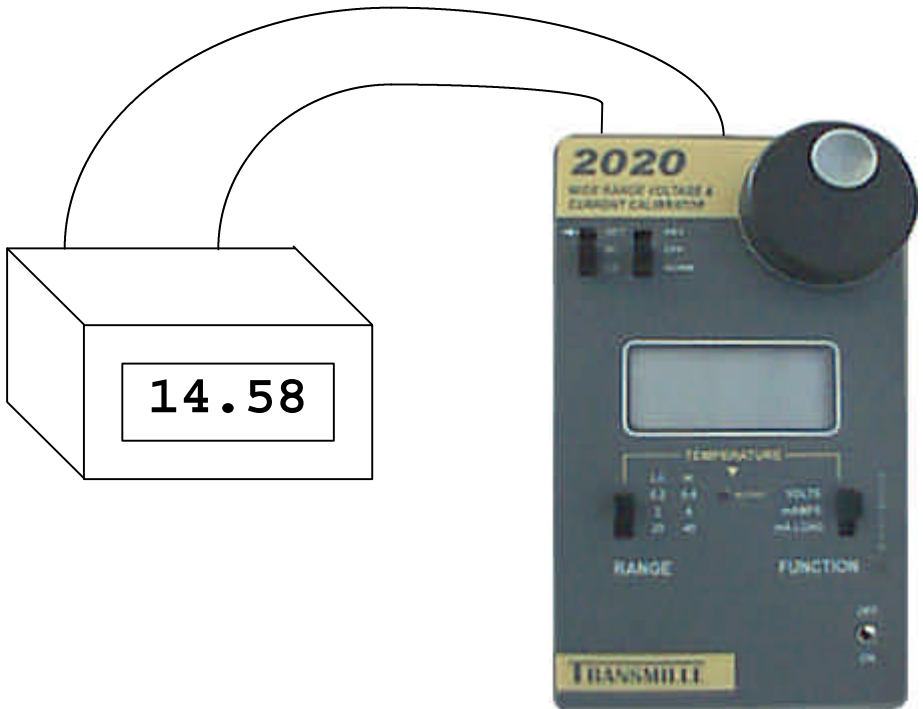
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To set a voltage output, set the function switch to VOLTS and set the appropriate voltage range - use the MODE switch to switch to HI or LO range. To set the required voltage, turn the potentiometer until the voltage displayed reaches the desired setting. The unit under test may now be connected observing the polarity.

## CURRENT OUTPUT

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To set a current output, set the function switch to mAMPS and set the appropriate current range - use the MODE switch to switch to HI or LO range, ensuring the output adjust potentiometer is set to zero. Connect the 2020 to the unit under test and set the required output by turning the potentiometer until the desired current is reached. To obtain a current reading, a load MUST be connected to the output of the 2020.



**TIP :** If the current output is set to maximum but is not indicated on the display, the output load is probably too high or the battery is low.

**SOLUTION :** Reduce the loop resistance or replace the battery.

## 4 to 20mA SYSTEM

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The 4 to 20mA system allows simulation of a transducer or to measure the current flow in a transducer loop. The following section outlines operation of the 2020 in a 4 to 20mA system, although detailed operation of 4 to 20mA systems is beyond the scope of this manual.

The basic requirement for any transducer with remote display is :

- Use as few connections as possible
- Ensure errors are not introduced into the signal from the transducer by the effects of interference or voltage drop due to lead resistance.
- Supply power to the transducer to enable amplifiers to be built into the transducer when the signal produced by the sensing element is too small to be transmitted without amplification.

As signals are transmitted as a current, lead resistance and voltage drop do not affect the accuracy. This allows the basic requirements to be met using two wires.

To enable a certain amount of standardisation, and to compensate for voltage drop or variation in the supply, transducers are designed to operate over a wide range of approx. 15 and 30 Volts and to take a 'zero' current of 4mA and a full scale current of 20mA.

## **4 to 20mA SYSTEM (Cont'd)**

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The simplest 4 to 20mA current loop system consists of 3 parts, although 2 parts are usually incorporated into the same unit. These are :

### **1) DC POWER SUPPLY (USUALLY 24V)**

The DC power supply generates the power for the system and can be considered as a battery.

### **2) 4 TO 20mA CURRENT METER**

The 4 to 20mA meter can be a passive moving coil mA meter with a zero offset. To obtain a reading, current must be applied.

### **3) TRANSDUCER**

The transducer completes the loop and allows current to flow around the loop depending on the level of stimulus to the transducer. It can almost be considered a potentiometer changing in resistance to let between 4 and 20mA flow.

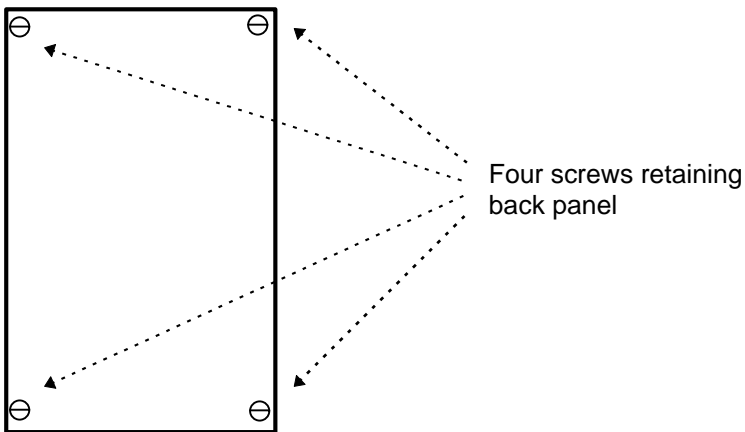
The 2020 can be used to check this system, and has a 15V compliance voltage when set to current source mode which will power a loop.

## BATTERY REPLACEMENT

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Battery life is dependant on the output currents drawn. With low output currents, battery life can exceed 50 Hours, but higher current outputs will shorten battery life to less than 5 Hours. If a short battery life is experienced, rechargeable batteries may be used, however the batteries must be charged EXTERNALLY.

To gain access to the battery compartment, remove the four screws on the rear of the unit. Detach the two batteries from their connectors and replace with high quality PP3 batteries that will not leak.



An optional 18V mains power supply adaptor may be used to power the 2020 via the 3.5mm jack socket on the right hand side of the instrument. This will switch OUT the internal battery supply of the instrument.

18V Power  
supply input



**RIGHT HAND SIDE VIEW**

## RECALIBRATION

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Recalibration of the 2020 is essential to ensure correct operation and to maintain accuracy. Recalibration is recommended annually.

This instrument is calibrated before it leaves the factory and the calibration controls will not normally need adjustment, although periodic recalibration on an annual basis is recommended. If recalibration is found to be necessary the follow this calibration procedure and adjust the outputs to the published specifications.

Equipment required for calibration is detailed below and should have at least 0.0% accuracy:

- Digital Multimeter
- Current Source

The calibration procedure is as follows - refer to pot position diagram (right) for exact location of trimmers :

The zero is factory set and should not require adjustment. Set the output adjust potentiometer to full scale. All adjustments are to be within  $0.05\% \pm 1$  count and are taken from the front panel LCD display.

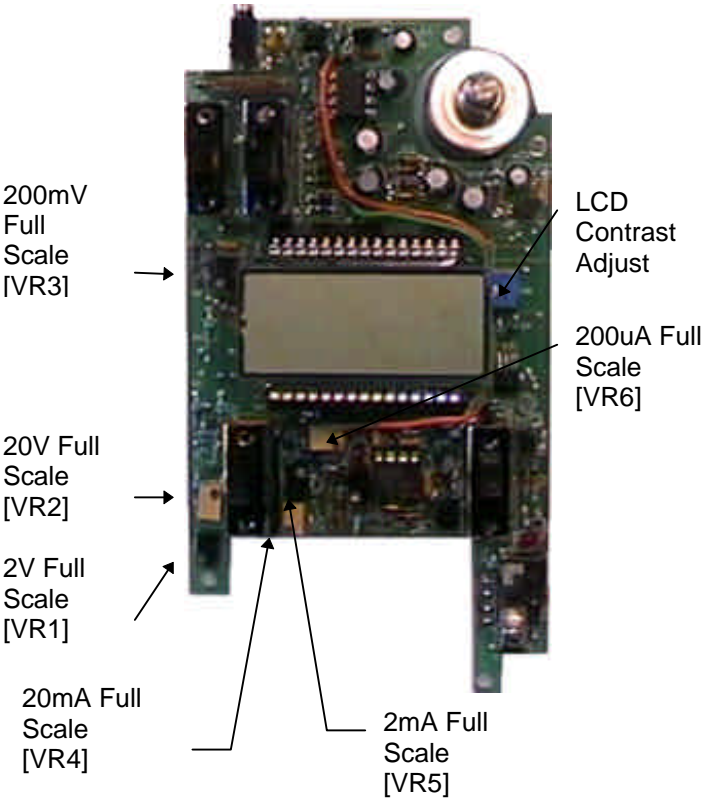
- 1) Locate VR3 and set the 2020 to the 200mV range and adjust VR3 to give 200mV.
- 2) Locate VR2 - 20V adjust. Select the 20V range and adjust VR2 for a reading of 20V.
- 3) Locate VR1 - 2V adjust. Select the 2V range and adjust VR1 for a reading of 2V.
- 4) Locate VR4 - 20mA adjust. Select the 20mA current range and adjust VR4 for a reading of 20mA.
- 5) Locate VR5 - 2mA adjust. Select the 2mA current range and adjust VR5 for a reading of 2mA.
- 6) Locate VR6 - 200uA adjust. Select the 200uA current range and adjust VR6 for a reading of 200uA.

# RECALIBRATION

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## TRIMMER LOCATION

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## FAULT DIAGNOSIS

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<b>FAULT</b>	<b>SOLUTION</b>
2020 is completely dead with no indication shown in the display	Battery low or completely discharged - Replace battery
	Polarity of external power input reversed - reverse polarity
2020 indicates an output but no output is available	The fuse has blown - Investigate why this has occurred, then replace fuse with correct rating and type.
Current output not available	Ensure a load is connected - this is required to allow the current to flow through the circuit.
The indicated value on the display of the 2020 drops when the unit under test is connected	This is a feature of the 2020, where the 'actual' value is indicated. The loading of the unit under test may be more than the maximum drive capability of the 2020.
	Battery low - Replace battery

## **GUARANTEE**

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Transmille Ltd. guarantees this instrument to be free from defects under normal use and service for a period of 1 year from purchase. This guarantee applies only to the original purchaser and does not cover fuses, or any instrument which, in Transmille's opinion, has been modified, misused or subjected to abnormal handling or operating conditions.

Transmille's obligation under this guarantee is limited to replacement or repair of an instrument which is returned to Transmille within the warranty period. If Transmille determines that the fault has been caused by the purchaser, Transmille will contact the purchaser before proceeding with any repair.

To obtain repair under this guarantee the purchaser must send the instrument in its original packaging (carriage prepaid) and a description of the fault to Transmille at the address shown below. The instrument will be repaired at the factory and returned to the purchaser, carriage prepaid.

**Note :**

TRANSMILLE ASSUMES NO RESPONSIBILITY FOR DAMAGE IN TRANSIT

THIS GUARANTEE IS THE PURCHASER'S SOLE AND EXCLUSIVE GUARANTEE AND IS IN LEIU OF ANY OTHER GUARANTEE, EXPRESSED OR IMPLIED. TRANSMILLE SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS.

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