World Champion Model X88 Portable Calibrator

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Read or Source RTD, T/C, mA, mV, Frequency, and Resistance Signals Directly (*without* Accessory Modules)

Dual 4.5 Digit LCD Displays for Simultaneous Indication of Inputs and Outputs

Direct Reading in °F or °C for Both T/C and RTD Signals

Five Programmable Values When Sourcing T/C, mA, mV, and Frequency Signals

Manual or Auto Sequence Through Programmed Output Values

Two-Wire Transmitter Simulation

Internal 24 Vdc Power Supply for Powering a Two-Wire Transmitter Current Loop

Exchangeable/Rechargeable Nicad Battery Pack

Small, Light Weight, and Portable Design

Rugged Extruded Aluminum Housing and Padded Carrying Case

Includes Battery, Battery Charger, Test Leads, and Carrying Case

NIST Calibration Certificate

With the introduction of the X88, Ronan has again outclassed the competition in the portable multifunction calibrator market. The tradition of high accuracy and reliability in our field proven X85 and X86 calibrators has been carried on in the X88. In addition, we have added those important features and capabilities our customers have been requesting. The result is the most value packed field calibrator available in the world. But, the X88 isn't just a field instrument. With the AC adapter and NIST traceable calibration certificate, the X88 can actually provide the accuracy needed for a laboratory grade calibration standard. Ronan can also provide periodic re-certification upon request. The X88 is truly a champion in a strongly competitive arena.

★ *New, customer requested features.*

SPECIFICATIONS

Input Type	Range	Resolution	Accuracy
mV	±150 mV	10 µV	±0.01% of Range
			±0.02% of Reading
V	±1.5 V	100 µV	±0.01% of Range
			±0.02% of Reading
V	±15.0 V	1 mV	±0.01% of Range
			±0.02% of Reading
V	±150 V	10 mV	±0.01% of Range
			±0.02% of Reading
mA	±100 mA	10 µA	±0.01% of Range
			±0.02% of Reading
Ohms	0-150 Ohms	0.01 Ohm	±0.01% of Range
			±0.02% of Reading
Ohms	0-1.5 Kohms	0.1 Ohm	±0.01% of Range
Hz	10 Hz to 10 KHz	1 Hz	±0.015% of Range
E T/C	-200 to +1000°C	-200 to -155°C: 1 to 2°C	±2°C ±30 µV
		-155 to +1000°C: 1°C	±1°C ±30 µV
	-328 to +1830°F	-328 to -265°F: 1 to 3°C	±3°F ±30 µV
		-265 to + 145°F: 1 to 2°F	±2°F ±30 µV
		+145 to +1830°F: 1°F	±1°F ±30 µV
J T/C	-200 to +1025°C	1°C	±1°C ±30 µV
	-328 to +1830°F	1°F	±1°F ±30 µV
K T/C	-200 to +1370°C	1°C	±1°C ±30 µV
	-328 to +2498°F	-328 to -220°F: 1 to 2°F	±1°F ±30 µV
		-220 to +2498°F: 1°F	±1°F ±30 µV
T T/C	-215 to +400°C	1°C	±1°C ±30 µV
	-355 to 750°F	-355 to -200°F: 1 to 2°F	±2°F ±30 µV
		-200 to +750°F: 1°F	±1°F ±30 µV
R T/C	0 to 1760°C	1°C	±1°C ±15 µV
	32 to 3200°F	32 to 485°F: 1 to 2°F	±2°F ±15 µV
		485 to 3200°F: 1°F	±1°F ±15 µV
S T/C	0 to 1760°C	1°C	±1°C ±15 µV
	32 to 3200°F	32 to 645°F: 1 to 2°F	±1°F ±15 µV
		645 to 3200°F: 1°F	±1°F ±15 µV
B T/C	250 to 1650°C	250 to 500°C: 1 to 2°C	±2°C ±15 µV
		500 to 1650°C: 1 to 2°C	±2°C ±15 µV
	440 to 3000°F	440 to 840°F: 2 to 4°F	±3°F ±15 µV
		840 to 1840°F: 2°F	±3°F ±15 µV
		1840 to 3000°F: 1°F	æ2°F ±15 µV
N T/C	0 to 1300°C	1°C	±1°C ±30 µV
	32 to 2370°F	1°F	±1°F ±30 µV
100Ω Pt. RTD, α = 0.00385	-100 to 790°C	0.5°C	±0.5°C
	-100 to 1450°F	0.5°F	±0.5°F
100Ω Pt. RTD, α = 0.00392	-100 to 650°C	0.5°C	±0.5°C
	-100 to 1200°F	0.5°F	±0.5°F
120Ω Ni RTD, α = 0.00672	-75 to 250°C	0.5°C	±1°C
	-100 to 480°F	0.5°F	±1°F
9.035Ω Cu RTD (10Ω @ 25°C)	-100 to 260°C	0.5°C	±0.5°C
	-148 to 500°F	0.5°F	±1°F

Input	Impedance	Temperature Stability
mV, Volts T/C:	10 M	±0.001% of Range
		±0.003% of Reading/°C
Current:	10 Ohms	±0.001% of Range
		±0.003% of Reading/°C
Ohm RTD:	1 mA Source	±0.001% of Range
		±0.0005% of Reading/°C
Frequency:	100 Kohms	±0.015% of Reading/°C

Output Type	Range	Resolution	Accuracy
mV	0 to 100 mV	10 µV	±0.02% of Range
			±0.01% of Reading
10 V	0 to 10 V	1 mV	±0.02% of Range
			±0.01% of Reading
100 mA	0 to 100 mA	10 µA	±0.02% of Range
			±0.01% of Reading
Ohms	0 to 1100 Ohms	0.1 Ohm	See Input Spec.
10 KHz	1 Hz to 10 KHz (0 to 5 V sq. wave with 10 K pull-up resistor)	1 Hz	±0.05% of Range
E T/C	-210 to 1000°C	1°C	1°C ±20 µV
	-340 to 1832°F	1°F	1.5°F ±20 µV
J T/C	-210 to 1200°C	1°C	1°C ±20 µV
	-340 to 1999°F	1°F	1.5°F ±20 µV
K T/C	-210 to 1372°C	1°C	1°C ±20 µV
	-340 to 1999°F	1°F	1.5°F ±20 µV
T T/C	-270 to 400°C	1°C	1°C ±20 µV
	-450 to 750°F	1°F	1.5°F ±20 µV
R T/C	0 to 1765°C	1°C	1°C ±20 µV
	+40 to 1999°F	1°F or 5 µV	1.5°F ±20 µV
S T/C	0 to 1765°C	1°C	1°C ±20 µV
	+40 to 1999°F	1°F or 5 µV	1.5°F ±20 µV
B T/C	50 to 1665°C	1°C or 5 µV	1°C ±20 µV
	100 to 1999°F	1°F or 5 µV	1.5°F ±20 µV
N T/C	0 to 1300°C	1°C	1°C ±20 µV
	-40 to 1999°F	1°F	1.5°F ±20 µV

Output	Impedance	Temperature Stability
mV, Volt:	< 0.1 Ohm	±0.001% of Range
		±0.003% of Reading/°C
mA:	> 1 Mohm	±0.001% of Range
		±0.005% of Reading/°C
Frequency:	10 K pull up to 5 Vdc	±0.007% of Reading/°C
T/C (R, S, B):	< 0.1 Ohm	±0.3 µV ±0.003% of Reading/°C
T/C (E, J, K, N, T):	< 0.1 Ohm	±0.2 µV ±0.003% of Reading/°C

Output Currents: Volts, mV, Temperature Outputs; 10 mA, over range at 15 mA.

Two-Wire Transmitter Power: + 24 Vdc at 20 mA.

Two-Wire Transmitter Simulation:
Max. external supply voltage = 50 Vdc.
$R_{\text{Load Max.}}$ = (Sply Volt-4) ÷ Max. Load Current.

Additional Information:
Operating Temperature: 0 to 50°C.
Storage Temperature: -20 to 50°C.
Input to Output Isolation: 300 Vrms.
Battery Type: Replaceable/rechargeable NiCad.
Battery Life: > 6 hours (> 3.5 hours at 20 mA output).
Battery Recharge: 15 hours.
Warm-Up Time: 2 minutes (to rated specifications).
Traceability: Certified traceable to NIST.
Recommended Recalibration: 6 months.
Weight: 4.3 lbs. (with included accessories).
Size: 9.3" H x 5.3" W x 4" D.

To Order Replacement Accessories:
Test Leads = X86 LEADS; Battery Chargers = X85NB50 (115 Vac 50/60 Hz), or X85NL50 (220-230 Vac 50/60 Hz); Carrying Case = X88-CC1; Battery Pack = X85-BTY2; Fuses = (2) 0.25 Amp No. 216.250-MG-00 and (1) 0.5 Amp No. 217.500.

Specifications apply at 23 ± 2°C unless stated otherwise, and are subject to change without notice.

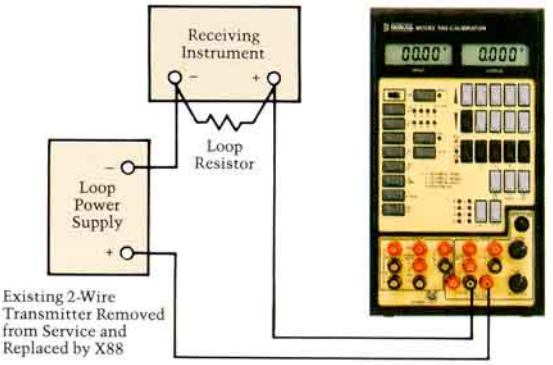
ACCESSORIES *(Included with X88 purchase.)*

- ★ **Carrying Case:** The carrying case is heavy duty vinyl with padding to protect the X88. An integral storage compartment can hold the battery charger, test leads, and a spare battery. The snug fitting carrying case and integral shoulder strap provides convenience and protection for field applications.
- ★ **Test Leads:** Two sets of red and black test leads are provided. Dual miniature banana plugs and high spring tension insulated alligator clips provide reliable low resistance connections to both the X88 and the device being tested.
- ★ **Battery Pack:** The X88 uses the same high energy rechargeable Nickel Cadmium battery that is used in the X85 and the X86 calibrator. This means users that have already bought spare or backup battery packs for their X85's and X86's can use the same batteries in the X88. The encapsulated battery can be easily removed and recharged outside of the calibrator.
- ★ **Battery Charger:** The X88 battery charger is available in 115 Vac / 50-60 Hz or 220 Vac / 50-60 Hz versions. This charger is designed to recharge batteries while in or out of the calibrator. The charger can also power the X88 directly for continuous use on the bench.

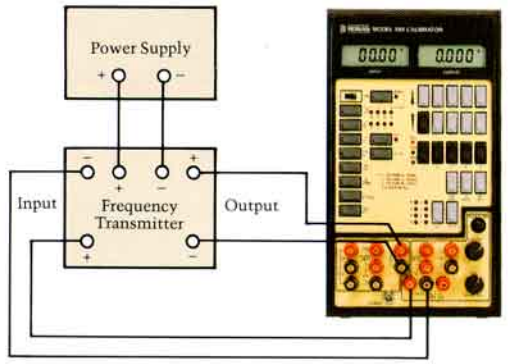
APPLICATIONS

The X88 portable calibrator is designed as two instruments in one. The input half and the output half are independent and electrically isolated from one another in order to prevent interaction or ground loop problems. This independence, and the multi-functional capabilities, also allows the monitoring and outputting of signals with different analog signal formats. The following examples show only a few of the more common applications for which the X88 is uniquely suited.

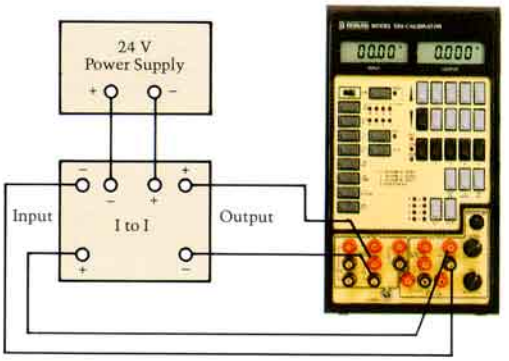
TWO-WIRE TRANSMITTER SIMULATION



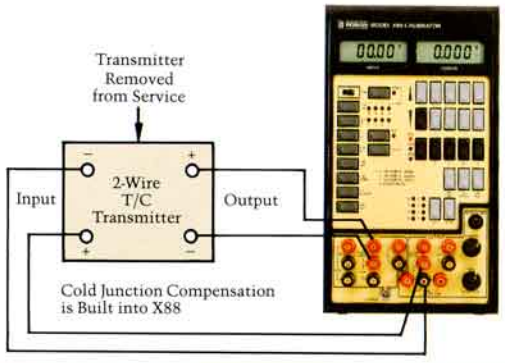
CALIBRATION OF FOUR-WIRE FREQUENCY TRANSMITTER WITH 1-5 V OUTPUT



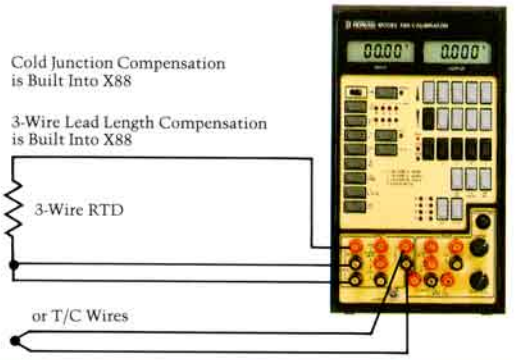
FOUR-WIRE I TO I ISOLATOR CALIBRATION



TEST AND CALIBRATION OF TWO-WIRE T/C TRANSMITTER USING X88'S INTERNAL LOOP POWER SUPPLY



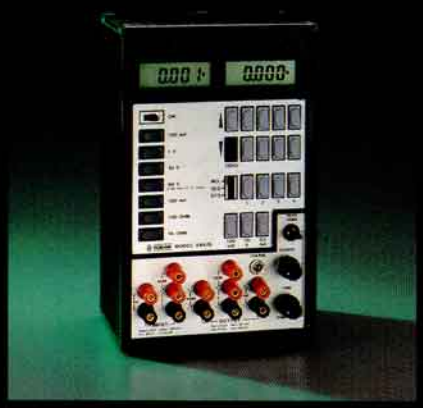
DIRECT RTD OR T/C MEASUREMENT IN °F OR °C



A FAMILY OF CHAMPIONS

Model X85

The X85 is the orginal work horse of Ronan's calibrator line. Some customers prefer the continuously variable adjustment of the output signal levels provided by the output level adjustment controls. The X85 is an ideal choice for those with tight budgets and a need for a basic calibrator.



Model X86

The X86 is medium priced and offers expanded options not provided on the X85. Key user requested features include dual digital displays and the ability to store predetermined output levels in memory for instant recall or automatic sequencing. The X86 has long been the calibrator of choice for many field service engineers.

Model X88

The X88 is our new top-of-the-line calibrator. Building on proven technology, we added a variety of capabilities not provided in the X85 or X86 products. These include: Direct °F or °C reading for RTD or T/C signals; Direct reading and sourcing of frequency signals; and expanded ranges and memory capability.

SUMMARY OF KEY FEATURES AND CAPABILITIES

The following "Summary of Key Features and Capabilities" will help you decide which Ronan calibrator will best fill your needs. Detailed data sheets for X85 and X86 models are available from your local Ronan representative or any of the offices listed below.

	Model X85	Model X86	Model X88
Read/Source Millivolt and Voltage Signals	•	•	•
Read/Source Milliamp Signals	•	•	•
Read/Source Resistance Signals	•	•	•
Read/Source Frequency Signals	*	*	•
Read/Source T/C mV Signals	*	*	•
Read/Source T/C or RTD Signals in °F or °C	NA	NA	•
Dual 4.5 Digit LCD Digital Displays	NA	•	•
Number of Programmable Output Levels	2	4	5
Simulate 2-Wire Transmitters	•	•	•
24 Vdc Power for 2-Wire 4-20 mA Current Loop	NA	NA	•

*• = Available * = Available with plug-in adapter accessory NA = Not available*

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