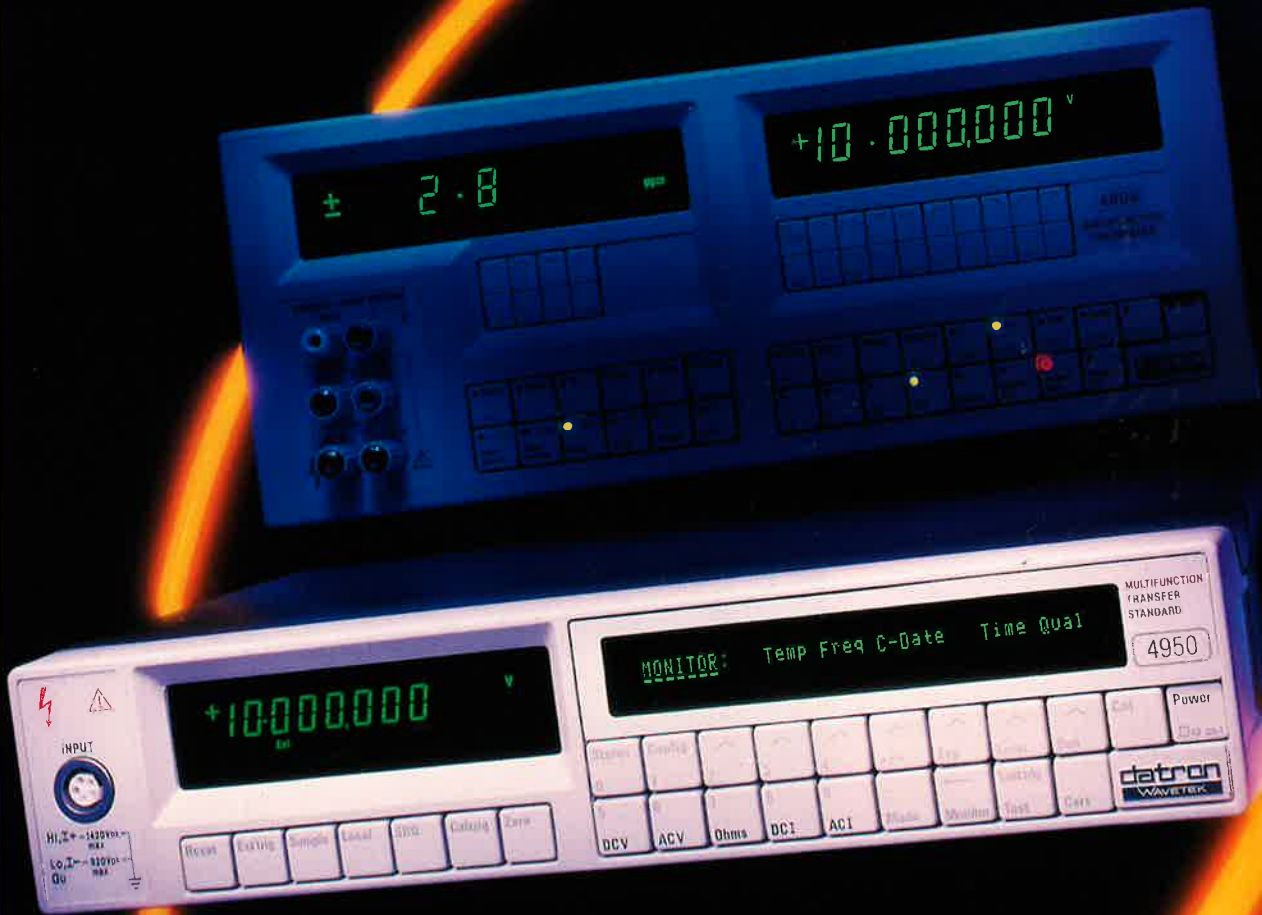


Model 4950

WAVETEK

Multifunction Transfer Standard

The Next Best Thing to National Standards.



Model 4950

A Revolution in Multifunction Calibrator Support

The dramatic improvement in the accuracy of multifunction calibrators — which are now often only three to four times less accurate than National Standards — has left calibration managers with a dilemma. How do they arrive at a cost effective calibrator support strategy which doesn't involve returning the calibrators to a cal lab, yet still meets stringent quality and traceability requirements.

Now Wavetek's Model 4950 Multifunction Transfer Standard provides the answer — because it transfers traceability between cal lab standards and several calibrators, without having to move the calibrators an inch. So there's no expensive down-time, and shipment costs are reduced from the cost of sending each individual calibrator back to the cal lab to that of sending a single instrument — Model 4950.

Accurate, Repeatable Results

The entire transfer process can be automated at both ends of the transfer process — in the cal lab and during in-place calibrator recalibration — so the accuracy and repeatability of the Model 4950's transfer

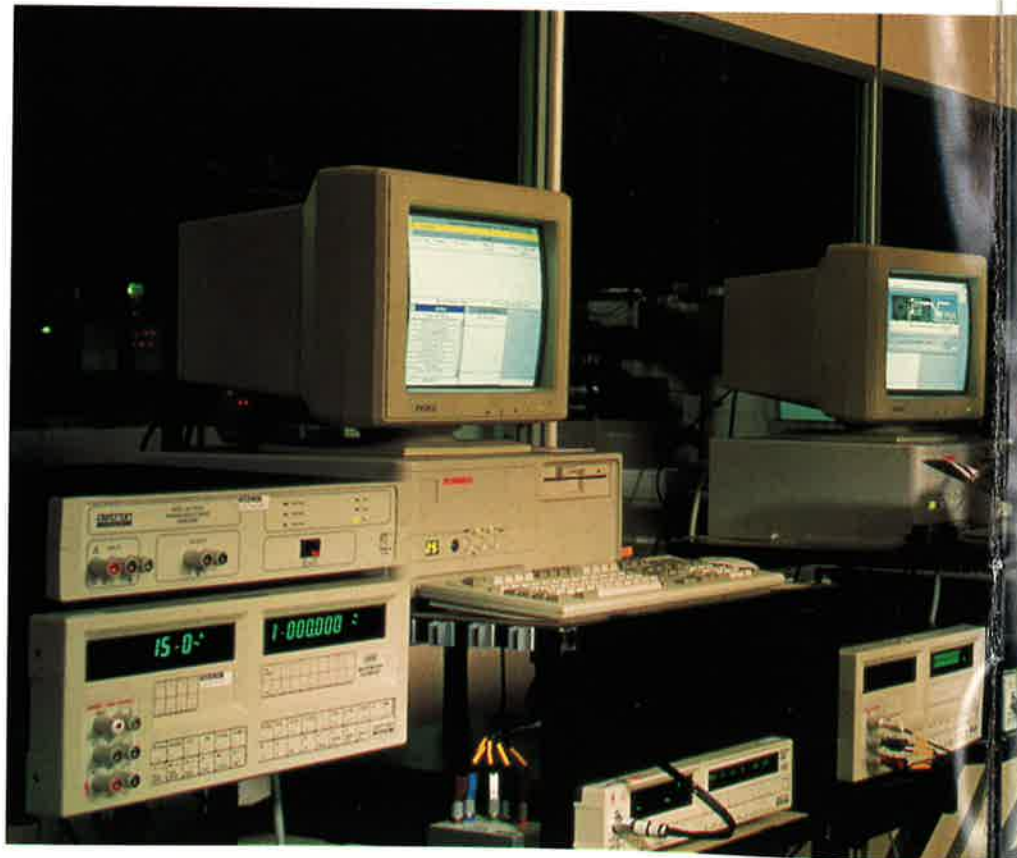
measurements are assured. And because Model 4950 allows its stability during the round trip to the cal lab to be monitored, it meets the "best practice" requirements of the latest closed-loop calibration methodologies.

Unlike other transfer standards, Model 4950 transfers traceability directly to the calibrator's output terminals on every range of every calibrator function — at up to 140 individually calibrated measurement points if necessary. So Model 4950 will work with *any* manufacturer's calibrators, not just those with special internal calibration circuitry. And because it doesn't require the use of external AC/DC

transfer devices or ratio dividers either, the cost per cal point achieved by the Model 4950 is surprisingly low.

Whatever mix of calibrators you have to support — from the simple 4-1/2 digit units to the latest 8-1/2 digit multifunction calibrators — Model 4950 fulfills all your traceability requirements. Add to that the enhanced confidence levels

Model 4950		
FUNCTION	TRANSFER STABILITY	
	30 day	90 day
DCV	1.5 ppm	2.1 ppm
ACV	10 ppm	14 ppm
DCI	7 ppm	9.8 ppm
ACI	40 ppm	56 ppm
Ohms	3 ppm	4.1 ppm



you'll achieve by always having an instrument on-hand to check calibrator performance, and the Model 4950 makes sound economic sense — whether you're supporting one calibrator or a hundred.

A Systems Approach to Traceability

When you buy Wavetek Model 4950 you're not only buying the best multifunction transfer instrument in the world — you're buying a complete transfer measurement system for DC voltage, AC voltage, DC current, AC current, and resistance that meets the most rigorous of traceability requirements.



Model 4950 is the nearest thing you'll get to a fully functional cal lab in a suitcase.

The closed-loop methods used by the 4950 already have international recognition from leading quality approval authorities, which is why major corporations in the US and Europe have chosen the 4950 as the prime link between their

calibration laboratories and their shop-floor calibrators.

Everything—from the temperature, shock, and humidity recorders in the 4950 transit case, to the sophisticated PC software that logs the instrument's performance before and after shipment—ensures that Model 4950 moves

traceability out of the cal lab and right to your calibrators, wherever they are.

Designed for Travel

Specifically designed for maximum stability under transport conditions, the Model 4950 measurement circuits include no mechanical adjustments to get jarred out of place. Instead, the tolerance of all critical components is compensated digitally, using correction factors stored in two, independent, nonvolatile 'Autocal' memories — one of which is used periodically to align the 4950 to higher-order cal lab standards. The other is dedicated to assessing the 4950's own long-term performance because when it comes to assessing the confidence level of your calibration system, history is just as important as accuracy.



Multifunction calibrators are prepared for overnight calibration as part of the Wavetek Datron Division manufacturing process.

A Revolution in Multifunction Calibrator Support

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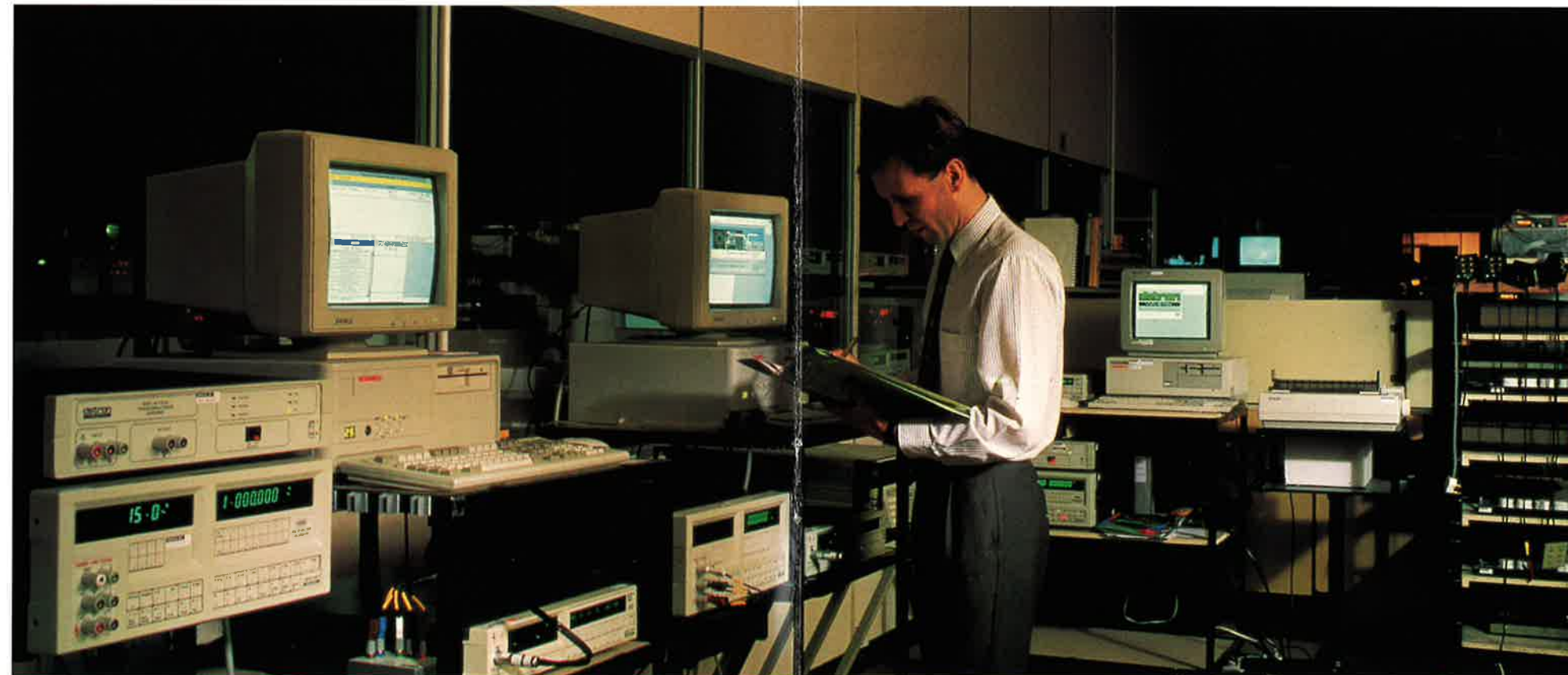
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Software for Total System Control

Supplied as an integral part of the Model 4950 MTS System, the PC-based 4950 MTS Control Software fully automates the transfer measurement process, both when comparing the Model 4950 to cal lab standards and when using it to carry out in-place recalibration of calibrators. Operating in a Windows™ environment and using Wavetek's powerful WaveTest® instrument control software, the 4950 MTS software dramatically reduces the likelihood of human error—ensuring the accuracy and repeatability of transfer measurements and the overall quality of the calibration process.

DMM calibrations that consumed a day or more of a skilled calibration engineer's time can now be done automatically in a matter of hours. The 4950 has two independent calibration stores. The "baseline" store is used to determine successful loop closure and monitor long term drift. The "certified" store is used during the calibration process to carry traceability between calibration laboratories.

The entire transfer process can be automated at both ends—in the cal lab and during in-place calibrator recalibration—so the accuracy and repeatability of the Model 4950 measurements are assured.

After ensuring that transportation has had no adverse effect on its accuracy, Model 4950 proceeds to align your calibrator to its cal-lab certified performance. A delayed-start capability even allows the process to be carried out overnight, during the electrically quiet hours of the early morning.

If necessary, you can modify the procedures to reflect customized calibration intervals and enter new specification limits where these differ from the calibrator's data sheet specifications.

And once you've captured data (via a totally automated procedure if you use Model 4950 with a Wavetek Datron Division calibrator) you

can transfer it into spreadsheet programs such as Lotus 1-2-3® or Excel® for analysis, archiving, and report generation.

Statistical Process Control

In the spreadsheet environment you can use Statistical Process Control (SPC) techniques to analyze the data. The spreadsheet environment also allows you to compare current data with that acquired during previous 4950 MTS transfer measurements, so that you can evaluate calibrator drift rates. With this historical information at your fingertips you have the opportunity to adopt more cost effective calibration strategies—extending the cal-

ibration intervals of low drift rate units, or characterizing individual calibrators for special ultra-high performance applications.

Reliability and Support

At every step in the closed-loop calibration process we've provided comprehensive checks and operator guidance to ensure the highest confidence levels.

When you need to prepare a Model 4950 for transit to or from a certifying laboratory, comprehensive documentation guides you through every step of the procedure—from preparing the 4950 MTS for calibration to packing the instrument in its transit case and checking its shock, vibration, and temperature excursion sensors.

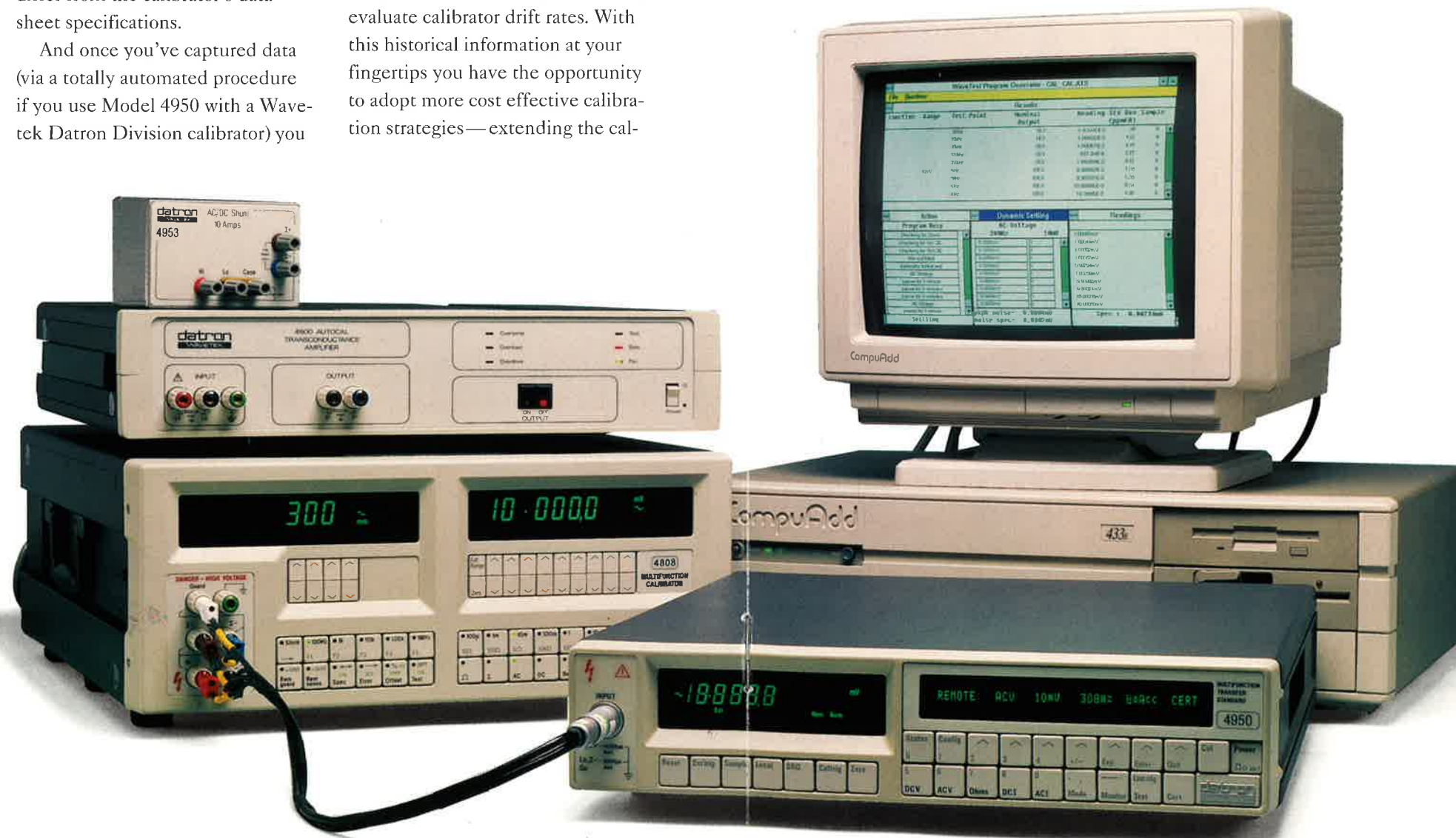
Whenever Model 4950 is powered up, it automatically times out

its own warm-up period, warning the operator against using the instrument to its full accuracy until warm-up is complete. A single keystroke then initiates the Model 4950 self-test routine, which checks all major circuit elements for correct operation and automatically diagnoses any problems down to printed circuit board assembly level.

The 4950 MTS Control Software also has its own test and debug facilities built in. Password-protected procedures let you trace all IEEE-488 bus activity and capture all intermediate results data, a big help to service departments trying to locate system-level failures.

The Model 4950 is built with meticulous care from the highest grade components to ensure that it provides you with uninterrupted service. Wavetek Datron Division's ISO-9000 approval is proof that our in-house quality management systems meet the most exacting of standards. That's why we cover Model 4950 with the full Wavetek Datron Division warranty.

Model 4950 is supported by Wavetek Service Centers worldwide. So whatever level of support you're looking for—service and repair facilities, telephone assistance, or a 5-day course on the latest calibration methodologies—help is never far away.



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Model 4950

4950 Specifications

Specifications are \pm ppm of reading valid within the measurement band and within $\pm 1\%$ of all frequencies

Function	Transfer Point [1]	Frequency	Transfer Stability [2] ppm $\pm 1^\circ\text{C}$ TCAL		Temperature Coefficient ppm / $^\circ\text{C}$ [3]	MTS_CAL[4] calibration uncertainty	CAL_CAL[4] uncertainty [5] [6]		
			30 day	90 day					
DC Voltage	$\pm 100\text{mV}$		3	4.2	0.6	4.0	5.0		
	$\pm 1\text{V}$		1.5	2.1	0.5	2.2	2.6		
	$\pm 10\text{V}$		1.5	2.1	0.5	1.4	2.1		
	$\pm 19\text{V}$		1.5	2.1	0.5	1.8	2.3		
	$\pm 100\text{V}$		2	2.8	0.8	2.0	2.9		
	$\pm 1000\text{V}$		2	2.8	0.8	2.0	2.9		
AC Voltage	1mV, 10mV & 100mV [7]	10Hz	20+2 μV	28+2 μV	1	117*	120+2 μV *		
		20Hz	20+2 μV	28+2 μV	1	117	120+2 μV		
		30Hz	20+2 μV	28+2 μV	1	117	120+2 μV		
		40Hz	20+2 μV	28+2 μV	1	117	120+2 μV		
		55Hz	20+2 μV	28+2 μV	1	117	120+2 μV		
		300Hz	20+2 μV	28+2 μV	1	89	91+2 μV		
		1kHz	20+2 μV	28+2 μV	1	89	91+2 μV		
		10kHz	20+2 μV	28+2 μV	1	103	105+2 μV		
		20kHz	20+2 μV	28+2 μV	1	117	119+2 μV		
		30kHz	20+2 μV	28+2 μV	1	190	191+2 μV		
		50kHz	30+2 μV	42+2 μV	5	190	192+2 μV		
		100kHz	50+3 μV	70+3 μV	5	356	359+3 μV		
		300kHz	100+3 μV	140+3 μV	5	579*	588+3 μV *		
		500kHz	200+3 μV	280+3 μV	40	607*	639+3 μV *		
		1MHz	300+3 μV	420+3 μV	40	945*	992+3 μV *		
AC Voltage	1V & 10V	10Hz	10	14	1	36	38		
		20Hz	10	14	1	36	38		
		30Hz	10	14	1	36	38		
		40Hz	10	14	1	24	26		
		55Hz	10	14	1	24	26		
		300Hz	10	14	1	24	26		
		1kHz	10	14	1	24	26		
		10kHz	10	14	1	24	26		
		20kHz	10	14	1	24	26		
		30kHz	10	14	1	26	26		
		50kHz	20	28	5	26	37		
		100kHz	30	42	5	37	47		
		300kHz	70	98	10	96	119		
		500kHz	100	140	40	202	226		
		1MHz	200	280	40	557	591		
19V	1kHz	10	14	1	24	26			
AC Voltage	100V	10Hz	10	14	2	41	42		
		20Hz	10	14	2	41	42		
		30Hz	10	14	2	41	42		
		40Hz	10	14	2	36	38		
		55Hz	10	14	2	36	38		
		300Hz	10	14	2	26	28		
		1kHz	10	14	2	26	28		
		10kHz	10	14	2	26	28		
		20kHz	10	14	2	26	28		
		30kHz	10	14	2	29	31		
		50kHz	20	28	5	35	40		
		100kHz	30	42	5	64	71		
		200kHz	50	70	10	239*	244*		
		AC Voltage	700V	50kHz	50	70	8	110	121
				100kHz	50	70	8	344	348
AC Voltage	1000V	55Hz	15	21	2	37	40		
		300Hz	15	21	2	37	40		
		1kHz	15	21	2	37	40		
		10kHz	15	21	2	42	44		
		20kHz	15	21	2	47	49		
		30kHz	15	21	2	74	75		

[1] Measurements within $\pm 10\%$ of band and $\pm 1\%$ of frequency except the 190% bands.

[2] Assumes a successful 4950 transportation loop closure within $\pm 1^\circ\text{C}$ of TCAL (TCAL = 20°C or 23°C).

[3] Within $\pm 5^\circ\text{C}$ of TCAL.

[4] MTS_CAL & CAL_CAL refer to Wavelek automatic calibration software.

* Estimated but not fully traceable.

4950 Specifications

Function	Transfer Point [1]	Frequency	Transfer Stability [2] ppm $\pm 1^{\circ}\text{C}$ TCAL		Temperature Coefficient ppm/ $^{\circ}\text{C}$ [3]	MTS_CAL[4] calibration uncertainty	CAL_CAL[4] uncertainty [5] [6]
			30 day	90 day			
DC Current	$\pm 100\mu\text{A}$		7	9.8	10	20	21
	$\pm 1\text{mA}$		7	9.8	10	11	13
	$\pm 10\text{mA}$		7	9.8	10	11	13
	$\pm 100\text{mA}$		7	9.8	10	14	16
	$\pm 1\text{A}$		15	21	10	24	28
	$\pm 10\text{A}$ [2]		20	28	10[2]	54	57
AC Current	100 μA	10Hz	50	70	20	122	132
		20Hz	50	70	20	122	132
		30Hz	50	70	20	107	118
		40Hz	50	70	20	85	99
		55Hz	50	70	20	85	99
		300Hz	50	70	20	85	99
		1kHz	50	70	20	85	99
		5kHz	100	140	20	129	163
		10kHz	300	420	30	459*	548*
		AC Current	1mA, 10mA, 100mA & 1Amp [7]	10Hz	40	56	20
20Hz	40			56	20	113	120
30Hz	40			56	20	96	104
40Hz	40			56	20	75	85
55Hz	40			56	20	75	85
300Hz	40			56	20	75	85
1kHz	40			56	20	75	85
5kHz	70			98	20	115	134
10kHz	200			280	30	410*	456*
AC Current	10 Amp[8] Option 4953			10Hz	200	280	40
		20Hz	200	280	40	234*	310*
		30Hz	200	280	40	234*	310*
		40Hz	200	280	40	212	292
		55Hz	200	280	40	200	280
		300Hz	200	280	40	200	280
		1kHz	200	280	40	200	280
		5kHz	300	420	50	300	395
		10kHz	600	840	80	337	688
		20kHz	1000	1400	120	1234*	1590*
Resistance	1 Ohm		20	28	1.2	7*	9*
	2 Ohm		15	21	1.2	7*	9*
	10 Ohm		5	7	1.2	7	9
	19 Ohm		5	7	1	7*	9*
	30 Ohm		3	4.2	1	6*	7*
	100 Ohm		3	4.2	1	6	6.5
	190 Ohm		3	4.2	1	6*	7*
	300 Ohm		3	4.2	1	3*	5*
	1k Ohm		3	4.2	1	3	4.5
	1.9k Ohm		3	4.2	1	3*	5*
	3k Ohm		3	4.2	1	3*	5*
	10k Ohm		3	4.2	1	3	4.5
	19k Ohm		3	4.2	1	3*	5*
	30k Ohm		5	7	1	6*	8*
	100k Ohm		5	7	1	6	7.5
	190k Ohm		5	7	1	6*	8*
	300k Ohm		8	11.2	1.5	11*	14*
	1M Ohm		8	11.2	1.5	11	13.5
	1.9M Ohm		8	11.2	1.5	11*	14*
	3M Ohm		12	16.8	2	21*	24*
	10M Ohm		12	16.8	2	21	23.5
19M Ohm		12	16.8	2	21*	24*	
30M Ohm		180	252	20	82*	198*	
100M Ohm		180	252	20	82	198	

[5] Combined uncertainties to 95% minimum confidence level for calibrator calibration assuming 4950 successful loop closure within 30 days.

[6] Assumes a successful 4950 transportation loop closure within the 4950 30 day transfer specification.

[7] Uncertainties quoted are for the 100mV and 10mA ranges. Other uncertainties are available on request.

[8] Only when used in conjunction with the 4953.

* Estimated but not fully traceable.

4950 Multifunction Transfer System Ordering Information

The 4950 MTS is supplied with the following:

401009	4950 Multifunction Transfer Standard
630395	MTS Control Software
401035	Signal Input Lead
450922-1	Ruggedized Transit Case
630388	National GPIB Interface Monitor
630386	Transit Environmental Monitor
630393	Shock Monitor

Accessories

Model 4953	10 Amp Current Shunt Kit
Option 80	115V 60Hz line
Option 81	115V 50Hz line
Option 90	Rack Mount Kit
Option 95	Slide Rack Mount Kit

General

Line Supply: Power supply specs - 90v-145V or 187V-292V (selectable from rear panel) 46Hz-66Hz

Power Consumption: 37VA maximum

Dimensions: (H x W x D): 88mm (3.46 ins) x 427mm (16.8 ins) x 480mm (18.9 ins)

Weight: 13.5kg (30lbs)

Interface Compatibility: IEEE 488.1 for electrical interface spec and IEEE 488.2 for the syntax and protocols

External Current Shunt: A 10A current shunt, Model No 4953, is available for the instrument. The Characteristics of this shunt and its serial number will be entered into the 4950 during calibration

Signal Input Lead: A Signal Input Lead will be provided with the instrument. The characteristics of this and its serial number will be entered into the 4950 during calibration

Safety: Designed to UL 1244, IEC 348

Warranty: 1 year

Worldwide Sales Offices

United Kingdom Sales Office

Tel: (44/603) 404824

Fax: (44/603) 483670

Telex: 975173 DATRON G

Germany Sales Office

Tel: (49/89) 9609490

Fax: (49/89) 967170

Telex: 5 212996 WVTK D

Asia Pacific Sales Office

Tel: (852) 8651903

Fax: (852) 8656716

Telex: 230 446655 WVTK HKG

North and South America Sales Office

Tel: (619) 279-2200

(800) 223-9885

Fax: (619) 450-0325

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Wavetek

Datron Division

Hurricane Way

Norwich NR6 6JB, England

Telephone: (0603) 404824

FAX: (0603) 483670

Telex: 975173