734A and 7001 DC Reference Standards

Transcription

① 734A and 7001 DC Reference Standards Technical Data 734A: The simple way to maintain and disseminate your volt The Fluke 734A DC Reference Standard is a direct voltage reference used to maintain the volt in primary and secondary standards laboratories. It consists of four electrically and mechanically independent 732B DC Standards and a rackwidth enclosure. Individual 732Bs provide 10 V and V outputs and may be transported easily to remote locations while the reference is maintained in the laboratory. Stability for each output is ± 2 ppm per year (10 V) and ± 0.8 ppm per month (1.018 V). Each 10 V output can drive up to 12 ma of current to simplify use with instrumentation with low input impedance. The 734A Reference Standard was designed for laboratories that need to maintain traceability to national standards and to distribute the volt to production, service, calibration laboratories or other remote locations. To simplify shipment, each 732B Standard is small and highly portable. And its 72-hour battery life which can be extended to more than 130 hours with the optional external battery and charger means it s practical to ship a 732B across town or around the world.

② Because each 732B in the 734A Reference Standard is based on the same technology pioneered in the popular 732A the first standards lab quality 10 V electronic reference you can rely on it to provide the same high stability and predictable drift rate you ve come to expect, in a smaller, more portable package. To simplify support of your 734A, Fluke offers a variety of calibration services to assign values and predicted performance for the 10 V output, traceable to national standards and to the Fluke 10 V Josephson Array. Why a four-cell reference? A four-cell reference is desirable any time you need to maintain and disseminate a reference voltage. At a minimum, three cells are intercompared to detect and identify changes in the output of any one cell. A fourth cell may be used as a spare or to transport the volt to or from remote locations. When it returns to the laboratory, it can be compared to the other three to determine if its output has shifted during transport. However, there is more to a four-cell reference than four outputs. According to NBS Technical Note 1239, published by the U.S. National Bureau of Standards (now NIST) in 1987, four to six references are required to provide measurement integrity and redundancy, and to minimize the number of measurements required. References must be completely independent of one another. Otherwise, common elements, such as a power supply or oven, might affect the correlation of reference outputs. In addition, with frequent intercomparisons of four cells, you can detect when any one of the cells begins to drift beyond specifications or needs to be repaired. The Fluke Standards Laboratory offers traceability to its own 10 V Josephson Array, an intrinsic standard of voltage, and to national standards. Each 732B is a stand-alone dc standard with its own power supply, oven, supporting electronics and packaging. Each may be purchased separately, or as a full 734A system, which includes four 732Bs that slide into a rack-width enclosure. A fractional ppm 10 V reference in your lab With the 734A, it is remarkably simple to establish and maintain a fractional part per million (ppm) primary voltage standard in your laboratory. Over time, with frequent intercomparisons of your four cells, and regular calibrations of one or more cells, you can reduce the uncertainty of your 734A by a factor of three. From 1984 until the acquisition of our 10 V Josephson Array, the Fluke Primary Standards Laboratory maintained its corporate volt in this manner, reducing the absolute uncertainty to ± 0.35 ppm traceable to national standards. Taking your reference to the workload Standards laboratory operations have changed. In the past, people brought their workload to the standards lab. Today, the functions of the standards lab are being distributed, requiring that many calibrations be performed in the field. The 734A, and its electrically and mechanically independent 732B Standards, was designed to meet that need. The voltage reference remains undisturbed in your laboratory, while at the same time you can distribute the volt to remote locations outside the lab. When the unit is returned to the lab, comparisons can be made to the reference to determine if a shift has occured during the transfer. To maintain traceability to national standards, one cell may be transported to a national lab or other primary standards lab for calibration, again, without disturbing the reference. 2 Fluke Corporation 734A and 7001 DC Reference Standards

③ Each 732B Standard is relatively light, weighing just 5.9 kg, and its 72-hour battery life provides ample capacity for long shipments. An optional external battery extends that capacity to 130 hours. A special transit case, designed to hold one 732B and an external battery, simplifies transport even further. The 732B can stand up to a lot of abuse. The inputs can be shorted indefinitely and are protected up to 1100 V dc, 25 ma, without damaging the cell or affecting its output. Ideal support for artifact calibration Combined with 742A-1 and 742A-10k Resistance Standards, a single 732B makes a tough and compact artifact calibration support package for instruments like the 5700A and 5720A Calibrators from Fluke or the 3458A Multimeter from Agilent. Why should you prefer the 734A? Independence. The 734A is the only standard of its type offering complete mechanical and electrical independence of each of its four standards. Portability. Each 732B Standard is designed for portability. Each is small, light, rugged and has a long operating battery life. Confidence. The 732B is based on the proven technology of the Fluke 732A. The 732A was the first standards lab quality electronic reference to gain wide acceptance as a replacement for saturated standard cells. Originally designed for internal transfers of Fluke s corporate volt to the production floor, thousands are now in service worldwide in a variety of applications from maintaining an institutional reference to transferring values from national labs or privately-operated 10 V Josephson Arrays. The 732B s reference amplifier and resistors are identical to those used in the 732A. But the package is now half the weight, 75 % smaller, more rugged and offers greatly extended battery life. The rack-width enclosure provides a convenient way to store cells in your lab. And the internal battery is now a common, off-the-shelf model that can be purchased from a wide range of electronic components suppliers, simplifying your support. Or you can use your own battery, connecting it to the 12 V to 15 V dc input on each 732B. The 734A Reference and 732B Standards are a practical way to maintain and disseminate your volt and to support artifact calibration of instruments like the 5700A and 5720A Calibrators. 3 Fluke Corporation 734A and 7001 DC Reference Standards

④ The advantages to maintaining your reference at 10 V The primary benefits of maintaining your voltage reference at 10 V rather than V center on efficiency and ease-of-use. At 10 V, you can intercompare standards directly with a digital voltmeter. The effects of noise and thermal EMFs are diminished by a factor of 10 compared to standard cells. And with 10 V Josephson Arrays becoming more common, working at the 10 V level further simplifies the process of establishing traceability. Finally, most modern dc instrumentation today requires a 10 V standard for calibration. When you ratio up to 10 V from V, you lose considerable performance. The 734A supports V as well In applications where saturated standard cells are still used, the V output of each 732B Standard in the 734A Reference greatly simplifies intercomparisons of cell banks. And, like the 10 V output, each V output is completely electrically and mechanically independent to preserve the integrity of your reference. Unlike standard cells, the V output of the 732B may be used immediately after shipment, eliminating the need to let cells stabilize for an extended period. Supporting your traceability requirements Fluke provides the products and services you need to manage your traceability requirements. New 732Bs can be ordered with or without calibration certificates. The standard 732B comes without any calibration certificate, with the intention of the owner providing traceability as required locally. When delivery of a new 732B with a calibration certificate is required, then three alternatives are possible: Calibration. The 732B/H is a 732B where Fluke performs an output voltage calibration on your new standard. Before shipment, your standard is compared to direct voltage standards maintained at Fluke. Your standard, shipped under power, includes a Report of Calibration showing the deviation from nominal and the uncertainty of the calibration. This certificate is traceable to NIST via Fluke s Josephson Array, an intrinsic standard of voltage. Calibration and drift characterization. The 732B/C is similar to the 732B/H, but it adds drift rate characterization before shipment. The output voltage is compared to a Fluke standard for 90 days. Once the drift rate is known, total uncertainty as a function of time is greatly reduced. The projected output voltage is tabulated for 12 months following calibration. Uncertainty of the projection varies linearly, from ppm at the time of calibration to ppm after 12 months. 732B Standards are small, light and rugged. Their 72-hour battery life, which can be extended to 130 hours with the optional external battery and charger, make them ideal for transfer standards. The Fluke 732B Standard uses the same specially selected zener reference technology pioneered in the popular 732A. Accredited calibration. Normally, the 732B calibration certificates are traceable to NIST but are not considered accredited calibrations. For an extra charge, an accredited calibration certificate is available. Contact your Fluke representative for details. Both the 732B/H and 732B/C require that the standard is shipped to you under power. This continuous power on condition is required during shipment through delivery to your lab for the calibration to remain valid. If continuous power is not maintained, then the validity of the calibration certificate may be compromised. Contact your Fluke representative to determine if the 732B/H or 732B/C alternatives are available in your area. For existing 732Bs or similar standards that are already in use, the Direct Voltage Maintenance Program is a service where Fluke can provide calibration certificates for these standards. This service consists of two calibration alternatives that can be used depending on your needs. 4 Fluke Corporation 734A and 7001 DC Reference Standards

⑤ Calibrations done by Fluke. Calibration certificate services can be easily performed on standards returned to Fluke service facilities. Contact your Fluke representative or your local Fluke service center for details regarding these calibration certificate alternatives. Calibration in your laboratory. With the 732B- 200 services, a standard owned and calibrated by Fluke, including all necessary connecting cables and clear operating instructions, is sent to your site for comparison with one or more of your own reference standards. You make a series of readings over five days and forward the standard to the next laboratory, then return the measurement results to the Fluke Standards Laboratory. A value for your reference relative to the Fluke standard is assigned. Within one week, a preliminary Report of Calibration is returned to you. Once the standard is returned to Fluke, it is compared to the Fluke Voltage Standard. A final value is assigned to your reference, and a final Report of Calibration is sent to you. The 732B-200 service provides a calibration certificate for one local standard. Each additional standard that requires a certificate can use the 732B-201 service. In this way, comparing multiple standards to a single Fluke standard will provide any required number of standards with individual calibration certificates. (Note: this service is not available in all areas. Contact your local Fluke representative for details). 5 Fluke Corporation 734A and 7001 DC Reference Standards 734A specifications voltages s of 10.0 V and V are provided at separate binding-post pairs with the following characteristics: Stability Stability for the 732B is specified by the following at a temperature of Tcal ± 1 C (15 C Tcal ± 35 C): Voltage 30 Days Stability (ppm) 90 Days 1 Year 10 V V 0.8 NA NA Noise at output terminals noise is specified for both day-to-day observations and for short-term observations. The former is given by the standard deviation about the regression line of a 90-day regression model. The latter is terms of its rms value in a bandwidth as follows: Voltage Day-to-Day (S1) (ppm) 0.01 Hz 10 Hz (ppm) 10 V rms V rms current and impedance Voltage Current Impedance 10 V 12 ma* 1 mw V NA 1 kw * current is limited to 0.1 ma to realize 72-hour operation under battery power adjustment 10 V: 0.15 ppm resolution V: Set at nominal ± 1 mv No adjustment is provided, however the output value changes when the 10 V output is adjusted Retrace (hysteresis) error (Constant temperature) 0.1 ppm, 10 minute power off 0.25 ppm, 1 to 24 hours power off Stabilization time (Constant temperature) For best results, allow a 14-day stabilization period after power has been off for an extended period of time No power interruption No stabilization time is required after moving into another environment Power off <1 hour 1-hour warm up required Power off 1 to 24 hours 24-hour warm up required Temperature coefficient (TC) of output In the temperature range of 15 C to 35 C, the magnitude of TC is bounded by the following: 10 V TC 0.04 ppm/ C V TC 0.1 ppm/ C Load regulation 10 V output will change less than 1 ppm for a full load change from 0 to 12 ma and less than 0.1 ppm for a load change from 0 to 2 ma Line regulation The outputs will change no more than 0.05 ppm for any 10 % line voltage change or for the entire operating range of the battery protection All outputs can be shorted indefinitely without damage to the instrument. The 10 V output can withstand voltages from other sources as follows: 1. For voltages 220 V dc, the unit is protected for up to 50 ma continuous current 2. For voltage 1100 V dc, the unit is protected for up to 25 ma continuous current or up to 0.6 joules of energy Environment Normal Operation Safe Operation Storage (no batt) Temp Relative C Range Humidity % Altitude meters (feet) ,830 (0-6,000) (0-10,000) non-cond 0-12,200 (0-40,000) Compliance with external standards ANSI ISA-S2 IEC 348 CSA C22.2 #231 IEC 1010 UL 1244

⑥ Line power requirements Voltage Frequency 90 V to 132 V ac 47 Hz to 63 Hz 180 V to 264 V ac 47 Hz to 63 Hz Battery operation When fully charged, the batteries will maintain the 732B for a minimum of 72 hours at 23 C ±5 C, with an output current <0.1 ma. The batteries are rechargeable in less than 24 hours with a selfcontained battery charger. A rear-panel input has been provided to accept an external 12 V battery or equivalent 12 V to 15 V dc power source. Isolation The resistance from any 732B output terminal to earth ground or to the ac mains is at least 10,000 MΩ shunted by less than 1000 pf. Guard and grounding Chassis ground terminals are provided on both front and rear panels. Access to the internal guard is provided by a front-panel terminal. Explanation of stability verification Stability for a given period of time is defined as the output uncertainty minus the calibration uncertainty at the 99 % confidence level. When the output voltage is characterized by a regression model, stability is given by the following equation: P b + S 1 t where ( ) 2 S ra t [2 + S 1 t 1] 1 + (P -x) (n) [ ] 2 Σ(Xi-x) 2 b = slope of regression in ppm/year S 1 = standard deviation about the regression (SDEV) S ra = SDEV of data filtered with 7-day moving average filter (MAF) P = period of time under consideration in days = mean time for regression data n = 180 periods (typically 2 measurements per day) Xi = ith period t 1 = student s t statistic for (n-2) degrees of freedom (typically 2.6) n t 2 = student s t statistic for degree of freedom (typically 2.81) 7 x [( )] 2 Each data point for the computation of the regression parameters is the average voltage of 50 readings taken in a 50-second measurement period. Reference standard comparison selection guide Model B 734A 1 10 V output Stability (± ppm), 90 days Stability (± ppm), 1 year Predictability After 5 points, 3 months apart ± 0.5 ppm/year typ. ± 0.4 ppm/year typ. ± 0.2 ppm/year typ. Temperature coefficient (15 C to 35 C) < 0.05 ppm < 0.04 ppm Noise 0.01 Hz to 10 Hz Std. dev. of 90 days regression < 0.10 ppm RMS < 0.10 ppm RMS < 0.06 ppm RMS < ppm Hysteresis recovery (after battery discharge) < 0.1 ppm [2] 0.2 ppm [3] current resistance Battery type Back-up period Recharge time (typical) Half life Reference conditioning (power loss recovery) Temperature Operating Transit Warm-up period 12 ma < 10 mw 16 hours 2 hours 5 years Yes +15 C to 35 C -18 C to 45 C 10 min. to ± 0.1 ppm of final output value 12 ma < 1 mw 72 hours 24 hours No < 0.03 ppm RMS < 0.04 ppm RMS +15 C to 35 C -40 C to 50 C 1 hour (power off for less than 1 hour) Power < 1 W < 10 W < 40 W Dimensions (H x W x D) 137 x 85 x 290 mm (3.5 x 2.1 x 11.4 in) 135 x 99 x 419 mm (5.3 x 3.9 x 16.5 in) 191 x 432 x 502 mm (7.5 x 17 x in) Weight 2.1 kg (4.5 lb) 5.9 kg (13 lb) 29.6 kg (65 lb) Safety UL3111; CE marked; EN ;1993/ A2; 1995; CETL UL1244; CE marked; CSA C22.2 # 231; IEC 348; IEC 1010 Notes: All specifications, including 732B, are stated with 98 % confidence level. [1] 734A specifications are using a mathematical average of four cells. [2] After conditioning cycle and maintained within environments down to 10 C. [3] Conditioning not available. Specification assumes reference remains within a temp controlled environment. [4] Actual resistance = 500/n, where n = number of references in the Average. 6 Fluke Corporation 734A and 7001 DC Reference Standards

⑦ 7001: 10 volt solid-state dc voltage reference The fully isolated, compact 7001 solid state 10 V and V direct voltage standard is designed to be robust and portable; its internal batteries support hot shipment and plugin. However, should complete power be lost at any time, patented reference conditioning technology over-comes reference device hysteresis and restores the last powered value to the module. The 7001 modules also feature patented dc-dc convertor technology, which achieves unparalleled isolation from the external ac-dc line power adaptor. This makes the 7000 series particularly well suited to Josephson Junction direct comparison Self-contained 10 V dc voltage reference Reference module interchangeable with nanoscan and transref system 10 V and V outputs Economical entry point into 10 V metrology Suitable for unpowered shipment Self-contained 10 V dc voltage reference Owning a precision dc voltage reference standard needn t be expensive or inconvenient. The Model 7001 is a complete self-contained solid-state 10 V dc voltage reference in portable unit measuring only 137 x 85 x 290 mm and weighing a mere 2.1 kg (4.6 lb) including batteries. Yet it s capable of delivering 1-year stabilities of better than 1 ppm. Unique new dc/dc isolation technique Utilizing a low-temperature oven that minimizes the ageing rate of its zener references diodes, plus thin-film resistor arrays that dramatically reduce the drift and temperature coefficient of its gain defining networks, the Model 7001 gives you a drift predictability after 2-years of better than 0.3 ppm/ year and a temperature coefficient better than 0.05 ppm/ C. And because it utilizes a unique new dc/dc isolation technique, 7001 specifications you won t find that the output voltage shifts when you switch between back-up battery and ac line supply power. Patented zener reference conditioning The Model 7001 isn t solely reliant on its batteries during transportation. Although it s an advantage to keep the zener diode oven up to temperature during transportation, patented zener reference conditioning guarantees that both the 10 V and V outputs return to within ± 0.5 ppm of their previous values if deep discharge of the battery caused oven control to be lost. As a result, unpredicted delays during shipment mean that your 10 V reference won t need complete recalibration. The optional ruggedized transit case not only protects the unit, it also includes a temperature monitor that tracks environmental conditions during shipment. 10 V output Stability 90 days (± ppm): Year (± ppm): 1.8 Predictability ± 0.5 ppm/year typical after 5 verification points, 3 months apart Temperature coefficient < 0.03 ppm/ C (15 C to 35 C) Noise (rms) 0.01 Hz to 10 Hz: ± 0.10 ppm RMS Standard deviation of 90 day regression: ± 0.10 ppm RMS Hysteresis recovery < 0.1 ppm (after conditioning cycle and battery discharge) current 12 ma resistance < 5 mw Battery Type NiMH Backup Period >24 hours from fully charged Recharge time (typical) 2.5 hours Half Life 5 years Environment Temperature Operating: +15 C to 35 C Transit: -18 C to 45 C Warm-up period: 10 minutes to ± 0.1 ppm of final output value General specifications Power, battery life < 1 W 12 V dc connection Yes Dimensions (H x W x D) 137 x 85 x 290 mm (3.5 x 2.1 x 11.4 in) Weight 2.1 kg (4.5 lb) Safety UL3111, CE marked, EN :1993/A2:1995 CETL 7 Fluke Corporation 734A and 7001 DC Reference Standards

⑧ Ordering information Models 734A Reference Standard Includes four 732Bs in a rack-width enclosure. Calibration of each 732B output optional. 732B DC Standard, without calibration certificate, shipped under a power-off condition. 732B/H DC Standard, with calibration certificate included, shipped under power. 732B/C DC Standard with drift characterization and calibration certificate included, shipped under power Stand alone 10 V/1.018 V Reference Module complete with calibration certificate and 12 V dc power supply Direct Voltage Maintenance Program (U.S. only) 732B V Voltage Calibration On Site 732B-201 Additional 10 V Voltage Calibration at the same site Accessories 7001-CASE Enclosure and Power Supply for Single 7000 Module Ruggedized Transit Case for 7001 also fits 7100, 7101, 7000 and 7000S 7004-PWR 12 V DC Power Supply for 7000, 7001, and 7004 instruments Bibliography of technical references Emery, Kletke and Voorheis, A New Approach to Specifying a DC Reference Standard, Proceedings of the 1992 Measurement Science Conference. Field, NBS Technical Note 1239: Solid-State Voltage Standard Performance and Design Guidelines, Electricity Division, Center for Basic Standards, National Measurement Laboratory, National Bureau of Standards, September, Huntley, A Primary Standard of Voltage Maintained in Solid- State References, IEEE Transactions on Instrumentation and Measurement, Vol. 1M-36, No. 4, December Fluke Corporation, Technical Information: Fractional PPM Traceability Using Your 732A, Application Note B0196A, January, National Conference of Standards Laboratories, Array Josephson Junction, Recommended Intrinsic/Derived Standards Practice, RISP-1, August, Fluke. Keeping your world up and running. Fluke Corporation PO Box 9090, Everett, WA U.S.A. Fluke Europe B.V. PO Box 1186, 5602 BD Eindhoven, The Netherlands For more information call: In the U.S.A. (800) or Fax (425) In Europe/M-East/Africa +31 (0) or Fax +31 (0) In Canada (800)-36-FLUKE or Fax (905) From other countries +1 (425) or Fax +1 (425) Web access: Fluke Corporation. Specifications subject to change without notice. Printed in U.S.A. 5/ E D-EN-N Modification of this document is not permitted without written permission from Fluke Corporation. 8 Fluke Corporation 734A and 7001 DC Reference Standards

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113 Electrical Multimeter Instruction Sheet Safety Information A Warning statement identifies hazardous conditions and actions that could cause bodily harm or death. A Caution statement identifies conditions
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6 1 2-Digit Digital Multimeter, 1.8 MS/s Isolated Digitizer, and LCR Meter
NI PXI-4072 FlexDMM Superior accuracy and measurement rates Multifunction device 6 1 2-digit digital multimeter 1.8 MS/s isolated digitizer LCR meter (inductance, capacitance, and resistance) 20 built-in
More information

Fluke Norma 4000/5000
Fluke Norma 4000/5000 High Precision Power Analyzers Reliable, highly accurate measurements for the test & development of power electronics Technical Data Compact Fluke Norma Series power analyzers include
More information

OP735. Benchtop Optical Power Meter Instruction Manual
Benchtop Optical Power Meter Instruction Manual www.optotest.com 1.805.987.1700 Contacting OptoTest Corporation 1.805.987.1700 (7:30 a.m. to 5 p.m. PST) www.optotest.com engineering@optotest.com OptoTest
More information

The Effect of Changing the Applied Sequence Using the TVC on the Accuracy of the AC Signal Calibration
Sensors & Transducers 2013 by IFSA http://www.sensorsportal.com The Effect of Changing the Sequence Using the TVC on the Accuracy of the AC Signal Calibration Rasha S. M. Ali National Institute for Standards
More information

Cost-Effective Traceability for Oscilloscope Calibration. Author: Peter B. Crisp Head of Metrology Fluke
Cost-Effective Traceability for Oscilloscope Calibration Author: Peter B. Crisp Head of Metrology Fluke Precision Instruments, Norwich, UK Abstract The widespread adoption of ISO 9000 has brought an increased
More information

Each click of a dial opens a doorway to precision. 2553A. Precision DC Calibrator. Bulletin 2553A-01EN
Each click of a dial opens a doorway to precision. Precision DC Calibrator Bulletin -01EN Yokogawa is a leader in providing high precision measurement equipment electric voltage/current, electric resistance,
More information

Agilent N8700 Series System DC Power Supplies
Agilent N8700 Series System DC Power Supplies Models: N8731A-42A (3.3 kw), N8754A-62A (5 kw) Data Sheet 21 Models: 3300 W and 5000 W output power Up to 600 V and up to 400 A Small, high density 2 U package
More information

ION PRODUCTS. Sensor Testers
ION PRODUCTS Sensor Testers ION s Sensor subsidiary is the leading designer and manufacturer of precision geophones used in seismic data acquisition and for industrial use. Sensor has access
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EUROPE S LARGEST SELECTION OF TEST & MEASUREMENT EQUIPMENT FOR HIRE INLEC.COM WHY BUY WHEN
EUROPE S LARGEST SELECTION OF TEST & MEASUREMENT EQUIPMENT FOR HIRE INLEC.COM Nationwide Low Call 0333 6000 600 WHY BUY WHEN YOU CAN HIRE Fluke 1730 Three-Phase Electrical Energy Logger Technical Data
More information

Three-Phase Transformer Test Systems
Three-Phase Transformer Test Systems PHENIX TECHNOLOGIES R Testing Applications Models Available Perform tests on utility distribution and power transformers in accordance with IEC 60076 and ANSI / IEEE
More information

80i-110s AC/DC CURRENT PROBE
Table of Contents 3 80i-110s AC/DC CURRENT PROBE Users Manual November 1996 1994, 1996 Fluke Corporation. All rights reserved. All product names are trademarks of their respective companies. Printed in
More information

RIGOL Data Sheet DM3058/DM3058E Digital Multimeter Product Overview Applications Easy to Use Design Main
RIGOL Data Sheet Product Overview DM3058/DM3058E [1] is a digital multimeter designed with 5 ½ digits readings resolution and dual-display especially fitting to the needs of high-precision, multifunction
More information

Power Quality Measurements the Importance of Traceable Calibration
Power Quality Measurements the Importance of Traceable Calibration H.E. van den Brom and D. Hoogenboom VSL Dutch Metrology Institute, Delft, the Netherlands, hvdbrom@vsl.nl Summary: Standardization has
More information

Isolated, Frequency Input 5B45 / 5B46 FEATURES APPLICATIONS PRODUCT OVERVIEW FUNCTIONAL BLOCK
Isolated, Frequency Input 5B45 / 5B46 FEATURES Isolated Frequency Input. Amplifies, Protects, Filters, and Isolates Analog Input. Generates an output of 0 to +5V proportional to input frequency. Model
More information

Two-Wire Programmable Transmitter for:
TM Smart Process Instrumentation Revision 2 Two-Wire Programmable Transmitter for: Industrial Thermocouple or RTD Temperature Measurements Highlights: Exceptional speed and accuracy Guaranteed measurement
More information

PXIe Contents. Required Software CALIBRATION PROCEDURE
CALIBRATION PROCEDURE PXIe-5160 This document contains the verification and adjustment procedures for the PXIe-5160. Refer to ni.com/calibration for more information about calibration solutions. Contents
More information

The 7 secrets to better infrared image quality
Leading the field in feature innovation Fluke has more experience than most infrared providers. Our design team has been on the job and in the field for thousands of hours with our thermography customers.
More information

DM-45 Digital Multimeter
INSTRUCTION MANUAL DM-45 Digital Multimeter Read and understand all of the instructions and safety information in this manual before operating or servicing this tool. Description The Greenlee DM-45 Digital
More information

2-Terminal IC 1.2 V Reference AD589
2-Terminal IC 1.2 V Reference AD589 FEATURES Superior Replacement for Other 1.2 V References Wide Operating Range: 50 A to 5 ma Low Power: 60 W Total P D at 50 A Low Temperature Coefficient: 10 ppm/c Max,
More information

Bilateral Comparison of 10 V and V Standards between the NML (Forbairt) and the BIPM, April 1998
Bilateral Comparison of 10 V and 1.018 V Standards between the NML (Forbairt) and the BIPM, April 1998 Rapport BIPM-98/14 by K. Armstrong**, D. Avrons*, O. Power**, D. Reymann* and T.J. Witt* *Bureau International
More information

Keysight Technologies 1 mw 50 MHz Power Reference Measurement with the N432A Thermistor Power Meter.
Keysight Technologies 1 mw 50 MHz Power Reference Measurement with the N432A Thermistor Power Meter Application Note Introduction This application note explains the application procedure for using the
More information

Specifications. 744 Users Manual
80T-150U Temperature Probe 80PK series thermocouples 80i-410 Clamp-on DC/AC Current Probe 80i-1010 Clamp-on DC/AC Current Probe 80i-500s Clamp-on AC Current Probe (requires the Y9108 adapter) 80i-1000s
More information

Beamex MC2 HAND-HELD CALIBRATOR. Practicality in calibration
Beamex MC2 HAND-HELD CALIBRATOR 51 Practicality in calibration 52 MC2 series: three different hand-held calibrators for field use Practicality in calibration. The Beamex MC2 series includes three different
More information

Fluke 1750 Three-Phase Power Recorder
TECHNICAL DATA Fluke 1750 Three-Phase Power Recorder Never miss capturing a disturbance with the exclusive threshold-free measurement system, it s automatic. Capture every measurement, every event, on
More information

APPENDIX D DISCUSSION OF ELECTRONIC INSTRUMENTS
APPENDIX D DISCUSSION OF ELECTRONIC INSTRUMENTS DC POWER SUPPLIES We will discuss these instruments one at a time, starting with the DC power supply. The simplest DC power supplies are batteries which
More information

Making sense of electrical signals
APPLICATION NOTE Making sense of electrical signals Devices that convert electrical power to mechanical power run the industrial world, including pumps, compressors, motors, conveyors, robots and more.
More information

User's Manual: Series 450T AC Current Input (External Sensor), AC-Powered Transmitters
User's Manual: Series 450T AC Current Input (External Sensor), AC-Powered Transmitters Table of Contents Page Introduction 1 Description 1 Specifications 2 Installation 3 Calibration 4 General Maintenance
More information

IRIS POWER TGA-B. Periodic Online Partial Discharge Monitoring Instrument for Turbine Generators
IRIS POWER TGA-B Periodic Online Partial Discharge Monitoring Instrument for Turbine Generators and Motors We have not found another test method that produces as much decision support data for generator
More information

MODEL INFORMATION. AccuLoss MODELS ALMS 2100, ALMS 4100, ALMS 4200, ALMS 6200 & ALMS 4300
AccuLoss MODELS ALMS 2100, ALMS 4100, ALMS 4200, ALMS 6200 & ALMS 4300 The measurement of electric power and energy at high voltages and currents at low power factors is becoming increasingly important
More information

HIGH RESISTANCE MEASUREMENT ACCESSORIES
HIGH RESISTANCE MEASUREMENT ACCESSORIES Complete Selection of Measurement Accessories for Your Teraohmmeters andteraohm-bridge Meters! 65326 Lead Set The 65326 Lead Set is used with either the 6530 TeraOhm-Bridge
More information

Agilent 86030A 50 GHz Lightwave Component Analyzer Product Overview
Agilent 86030A 50 GHz Lightwave Component Analyzer Product Overview 2 Characterize 40 Gb/s optical components Modern lightwave transmission systems require accurate and repeatable characterization of their
More information

Arbitrary/Function Generator AFG1000 Series Datasheet
Arbitrary/Function Generator AFG1000 Series Datasheet 99 Washington Street Melrose, MA 02176 Phone 781-665-1400 Toll Free 1-800-517-8431 Visit us at www.testequipmentdepot.com Compatible with TekSmartLab
More information

36 AC/DC True RMS. Clamp Meter. P Read First: Safety Information
36 / True RMS Clamp Meter Instruction Sheet P Read First: Safety Information To ensure safe operation and service of the meter, follow these instructions: Avoid working alone so assistance can be rendered.
More information

IRIS POWER PDTracII. Continuous On-line Partial Discharge Monitoring for Motors, Generators, Dry Type
IRIS POWER PDTracII Continuous On-line Partial Discharge Monitoring for Motors, Generators, Dry Type Transformers, and Air-Insulated Switchgear. We have not found another test method that produces as much
More information

Datasheet. SDM3065X Digital Multimeter. Product Overview. Main Feature. Application fields. Main
Datasheet SDM3065X Digital Multimeter Product Overview SDM3065X is a 6 ½ digit digital (2,200,000 count) multimeter incorporating a dual display and is especially well suited for the needs of high-precision,
More information

Solutions In Calibration TRANSMILLE PRODUCT GUIDE 2015/16 PROVIDING SOLUTIONS IN CALIBRATION
TRANSMILLE PRODUCT GUIDE 2015/16 PROVIDING SOLUTIONS IN CALIBRATION WORLDWIDE PRODUCT MATRIX WORKLOAD Multiproduct Calibrators Electrical Test Equipment Calibrator 1000 3000A 4000 9000A 3200B DMMS Up to
More information

Use of infrared thermography in electronics
APPLICATION NOTE Use of infrared thermography in electronics By Sal Sandhu, Fluke Corporation Electronic circuitry components come in a variety of shapes and forms. All electronics operate with current
More information

NA100 NA200 NA300. NA Series Frequency Agile Medium Wave Broadcast Transmitters
NA100 NA200 NA300 NA Series Frequency Agile Medium Wave Broadcast Transmitters Making Digital Radio Work. Nautel NA100, NA200 & NA300 Quick Specs Field tunable to any frequency in the medium wave band
More information

CSM High-Voltage Measurement Systems
CSM High-Voltage Measurement Systems Safe Measurement on High-Voltage Components CSM HV Modules // High-Voltage Safe Measurement Systems Safe Measurement on High-Voltage Components E-mobility: enhancing
More information

High Voltage Current Shunt Monitor AD8212
High Voltage Current Shunt Monitor FEATURES Adjustable gain High common-mode voltage range 7 V to 65 V typical 7 V to >500 V with external pass transistor Current output Integrated 5 V series regulator
More information

PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT. HRRS 5kV AND 10kV SERIES. High Resistance, 5kV and
PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT HRRS 5kV AND 10kV SERIES High Resistance, 5kV and 10kV Decade Substituter User and Service Manual Copyright 2013 IET Labs, Inc. Visit www.ietlabs.com for
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Series OLH10KD 10kW HIGH VOLTAGE POWER SUPPLIES
Series OLH10KD FEATURES 10kW of output power Wide dynamic range with dual supply configuration Output voltages from 60kV to 500kV for high range Output voltages from 6kV to 10kV for low range Robust IGBT
More information

Agilent 87415A, 87400A Microwave Amplifiers
Agilent 87415A, 87400A Microwave Amplifiers Technical Overview 2 to 8 GHz Features and Description 25 db gain 23 dbm output power GaAs MMIC reliability >1 x 10E6 hours MTBF Compact size, integral bias
More information

Loop calibration and maintenance
Loop calibration and maintenance pplication Note Introduction Process instrumentation requires periodic calibration and maintenance to ensure that it is operating correctly. This application note contains
More information

Exposure Level Tester ELT-400
Safety Evaluation within a Magnetic Field Environment Exposure Level Tester ELT-400 Direct Evaluation of Field Exposure Compared to Major Standards (IEEE C95.6) Automatic Exposure Evaluation for Various
More information

C330 / C330X PC-Programmable Universal, 2-wire Transmitter
C330 / C330X PC-Programmable Universal, 2-wire Transmitter The IPAQ C330 transmitter is a universal, isolated, temperature transmitter with additional voltage and resistance input. Its robust design and
More information

DC Voltage Linearity Measurements and DVM Calibration with Conventional and Programmable
20th IMEKO TC4 International Symposium and 18th International Workshop on ADC Modelling and Testing Research on Electric and Electronic Measurement for the Economic Upturn Benevento, Italy, September 15-17,
More information

Comparison of the NIST and NRC Josephson Voltage Standards (SIM.EM.BIPM-K10.b)
Comparison of the NIST and Josephson Voltage Standards (SIM.EM.BIPM-K10.b) Yi-hua Tang National Institute of Standards and Technology (NIST) Gaithersburg, MD 0899, USA Telephone: + (301) 975-4691, email:
More information

HP 8491A/B, 8492A, 8493A/B/C, 11581A, 11582A and 11583A/C Coaxial Attenuators. Product Overview
HP 8491A/B, 8492A, 8493A/B/C, 11581A, 11582A and 11583A/C Coaxial Attenuators Product Overview dc to 26.5 GHz HP 8491A/B HP 8492A HP 8493A/B HP 8493C High accuracy Low SWR Broadband frequency coverage
More information

Agilent U2000 Series USB Power Sensors. Data Sheet
Agilent U2000 Series USB Power Sensors Data Sheet Features Perform power measurement without a power meter Frequency range from 9 khz to 24 GHz (sensor dependent) Dynamic range from 60 dbm to +20 dbm Internal
More information

OPERATING INSTRUCTIONS AND SPECIFICATIONS. NI 9207E 16-Channel, ±20 ma/±10 V, 24-Bit Analog
OPERATING INSTRUCTIONS AND SPECIFICATIONS NI 9207E 16-Channel, ±20 ma/±10 V, 24-Bit Analog Input Module This document describes how to use the National Instruments 9207E and includes dimensions, pin assignments,
More information

Harris IRT Enterprises Multi-Channel Digital Resistance Tester Model XR
Harris IRT Enterprises Multi-Channel Digital Resistance Tester Model 6012-06XR Specifications & Dimensions 2 Theory of Operation 3 System Block Diagram 4 Operator Controls & Connectors 5 Test Connections
More information

2-3 Calibration of Standard Voltage and Current Generator
2-3 Calibration of Standard Voltage and Current Generator Katsumi FUJII, Kojiro SAKAI, Tsutomu SUGIYAMA, Kouichi SEBATA, and Iwao NISHIYAMA This paper describes the calibration method of standard voltage
More information

1507/1503. Insulation Testers. Users Manual
1507/1503 Insulation Testers 1507/1503 Insulation Testers Introduction The Fluke model 1507 and 1503 are battery-powered insulation testers (hereafter, "the Tester"). Although this manual describes
More information

American Association for Laboratory Accreditation
Page 1 of 6 5700A/5720A/3458A Purpose of Study This Measurement Advisory Committee (MAC) working group was formed to focus on the performance enhancement offered by artifact calibration for the Fluke 5700A,
More information

V P N. Voltage transducer DVM 4200 = 4200 V
Voltage transducer DVM 42 N = 42 V For the electronic measurement of voltage: DC, AC, pulsed...., with galvanic separation between the primary and the secondary circuit. Features Bipolar and insulated measurement
More information

True RMS Bench Multimeters 2831E and 5491B
Data Sheet True RMS Bench Multimeters and True RMS Bench Multimeters with Dual Display The B&K Precision models and are versatile and dependable bench multimeters suitable for applications in education,
More information

9640A RF Reference Source Calibration made simpler
9640A RF Reference Source Calibration made simpler The Fluke 9640A Reference Source Broad workload coverage The Fluke 9640A and 9640A-LPN Reference Sources can help you calibrate a broad range of RF test
More information

ISOBE5600. Data sheet. Isolated Probe Systems. - ISOBE5600 Isolation system - ISOBE5600 Transient recorder.
ISOBE5600 Isolated Probe Systems - ISOBE5600 Isolation system - ISOBE5600 Transient recorder Data sheet Features and Benefits ISOBE5600 Isolation system - Cost-effective - Fiber-optic isolation - Analogue-in
More information

Utility Systems Technologies, Inc. Sag Fighter. Deep Voltage Sag Protection.
Utility Systems Technologies, Inc. Sag Fighter TM Deep Voltage Sag Protection D e e p V o l t a g e S a g P r o t e c t i o n f o r three phase application Q u a l i t y P o w e r B e t t e r B u s i n
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