



**Non - Galvanic Current  
Connection**

**Concentric Core Current  
Comparator**

**Input for External  
DC Reference**

**Harmonic Waveform  
Analysis**

**Built-in Comparator**

**Analog Sense**

**PC Interface**

**Maximum AC Measurement Error:  
50 ppm + Traceability Uncertainty**

### OVERVIEW

The RD-22 Primary Transfer Standard represents the state-of-the-art technology in a commercially available true DC to AC accuracy transfer reference. The RD-22 has typical AC measurement accuracies within the limits of traceability. Repeatability of 1 ppm can be attained at 120 V and 5 A inputs of specific models.

The RD-22 utilizes Radian's Dytronic measurement technology featuring a Radian designed Integrating Analog to Digital Signal Converter based upon a charge-balance conversion principle. The RD-22 also employs a new Radian electronically compensated concentric core current comparator transformer. This current comparator is autoranging and external to the standard, allowing for non-galvanic current connection to the unit. These two new technologies combine with existing Radian features to provide the highest degree of accuracy, stability and versatility ever offered in a primary transfer standard.

The RD-22 can be used to transfer accurate and traceable measurements from Radian Research's calibration laboratory. Alternatively, it can be calibrated directly by a National Metrology Laboratory, such as the National Institute of Standards and Technology (NIST).

The RD-22 can also be tested by using external DC primary reference sets of voltage, current, and time. These external DC references can be compared directly to the RD-22's internal reference sets. Additionally, the RD-22 can be used as the active reference to the Radian RS-933

Laboratory Reference System to provide a complete AC electric metrology lab.

The RD-22 provides four quadrant, single-phase simultaneous energy and power measurements. The potential input and current input are totally autoranging. This autoranging feature was pioneered by Radian Research and makes it impossible to damage the unit by applying a signal to the wrong tap. The potential input range is 60 to 600 V, the current input range is 0.2 to 125 A or 0.2 to 200 A. The external auxiliary power input converter provides 24 V DC to the auxiliary power input of the RD-22. The external auxiliary power converter minimizes 60/50 Hz line frequency interference from coupling to the measurement circuitry.

The RD-22 can optionally analyze harmonic waveforms through the 150<sup>th</sup> harmonic order. A second option enables the RD-22 to automatically calculate and display the error of standards being tested. The analog sense option allows for testing of transducers and other devices that provide an analog current output instead of a digital pulse output. The RD-22 also provides a serial communications port for direct connection to the RS-232 serial port of a personal computer.

Additional details of the RD-22 are provided on the back page of this bulletin.

# Technical Specifications

## RD-22 Optional Accessories:

- RM-1S Reset Switch
- RR-DS Meter Disk Sensor
- RR-PCSuite
- RR-1H Infrared LED Sensor
- RD-Kit Software
- RR-1H/v Visible LED Sensor
- RD-Calibrate Software
- RM-OA Optical Adapter
- RR-KYZ Pulse Input Adapter
- RM-111 Automated Comparator

## OPERATING RANGE

- Current Comparator (Autoranging)
  - 0.2 to 125 amps per input (125 amp option)
  - 0.2 to 200 amps per input (200 amp option)
- Input voltage: 60 to 600 volts (Autoranging)
- Auxiliary power converter input: 120 V or 240 V
- Auxiliary Power DC input: 24 volts nominal
- Frequency: 45 to 65 Hz
- Phase Angle: 0 to 360° or -180 to 180°
- Power Factor: -1 to 1 with no impact on accuracy
- Temperature: 18° to 30°C
- Humidity: 0% to 95% non-condensing
- Shock and vibration: Any that is not destructive

## PHYSICAL DESCRIPTION

- **Weight**
  - RD-22 + Current Comparator + Platform: 12 lbs (5.45kg)
  - Auxiliary Power Input Converter: 3 lbs (1.36kg)
- **Size**
  - RD-22: 190.5 mm (7.5") H x 139.7mm (5.5") W x 139.7mm (5.5") D
  - Platform: 19mm (0.75") H x 152.4mm (6" W x 508mm (20") D
- Backlit LCD, 4 line by 16 character
- Potential and Aux power inputs: 4mm Banana type jacks
- BNC (port 1) input/gating, time reference input
- BNC (port 2) pulse outputs
- BNC (port 3) three phase SYNC or analog sense
- 5 membrane button keypad: UP/DOWN/ESC-RESET/ENTER/MODE
- 8 pin RJ-45 jack for RS-232 communication
- Pickup input for direct interface to RR-DS, RR-1H, or RR-KYZ
- CCT input to external current comparator

## TEST AND CALIBRATION

- No physical adjustments, all calibration performed with software
- 50 or 60 Hz calibration can be provided
- Orientation: Upright only
- Re-calibration interval: 365 days
- Warm up time: 60 minutes

## ACCURACY

Accuracy specifications apply to all supported measurement functions using sinusoidal waveforms and across the entire operating range of the product between the temperatures of 18 to 30 C. Maximum guaranteed accuracy specification includes stability, traceability uncertainty, power factor, and test system errors.

- Typical Accuracy: within traceability uncertainties
- Guaranteed Accuracy:  $\pm 0.01\%$
- DC to AC Transfer Accuracy:  $\pm 0.005\%$

## PROTECTION

- Isolation: Complete: Input/output/power/case/control
- Dielectric withstand: 2.3 kVrms, 60Hz, 60 seconds
- Surge withstand: IEEE 472 and ANSI 37.90
- Fuses: #34.3117 for potential and auxiliary power

## INPUTS (Port 1)

- Display Gate: BNC with 150 ohms pull up to 5 volts, clamped at 5.7 volts
- Gate Rate: 200 nS pulse width minimum, maximum 20 Hz repetition rate

## OUTPUTS (Port 2)

- Type: BNC, Open collector, clamped at 27 volts (50mA max)
- Frequency: Max 2.1 MHz (200 nS pulse width minimum)
- Metrics: Selectable, i.e. Watt hours, Var hours, VA Hours, etc.
- Pulse value: Programmable (0.00001 Wh/pulse Default)

## QUALITY

- Meets all applicable ANSI and IEC specifications
- Radian Research's calibration procedures are in compliance with MIL-STD-45662A and ANSI/NCSL Z540-1-1994
- Radian Research's primary transfer standards are traceable to NIST
- Radian Research's quality system is ISO-9001 certified
- Warranty: Two years parts and labor

## MODEL

### RD-22-332

## MEASUREMENT FUNCTIONS

Dytronic Portable Standard, 0.005% Accuracy, Built-in comparator, Harmonic Analysis, One 200 Amp Current Comparator Transformer, Whrs, VARhrs, VAhrs, Qhrs, Volts, Amps, Watts, VARs, VA, Vhr, Ahr, V2hr, A2hr, Phase Angle, PF, Frequency. Min & Max Measurements: All Indicating Functions

## Options:

RR-TAD Transconductance Amplifier and Precision Divider. For use with Primary DC V & R. Used to convert Primary 10VDC cell into 3VDC for input to the RD-22. Used to divide (2) 10K ohm Primary resistors for current input to the RD-22.