

March 2015

## Description

A unique digital/analog hybrid, the RIY Programmable RTD Transmitter combines smart digital technology with advanced analog operation to deliver superior reliability, accuracy, and ease of use.

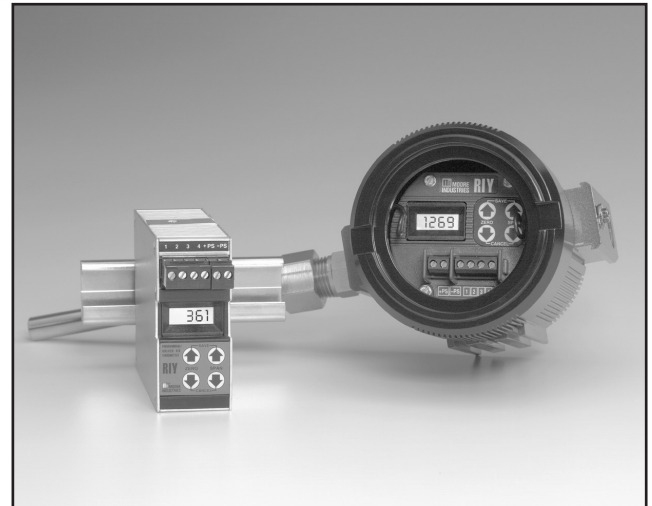
Microprocessor-based, the 2-wire RIY accepts a non-linear temperature input from any standard 2-, 3-, or 4-wire RTD. It provides a highly accurate 4-20mA output that is linear with temperature or with the ohm input. Output can be either direct or reverse.

**No Hand-Held Configurator Required**—The RIY is fast and simple to configure. RTD type, range, and upscale/downscale drive can be quickly selected in the field using tactile push buttons and easily-accessible switches.

**No Calibrator Needed**—The RIY features Moore Industries' revolutionary Quick Ranging calibration method. Using the push buttons and the integral indicator, precise zero and span adjustments can be made in seconds without a calibrator. The zero or span is displayed on the indicator while push buttons are used to scroll up or down to the desired value. The value is then instantly stored in the unit's microprocessor via the push buttons. The RIY retains the configured values even if power to the unit is lost.

**Display Shows Current Temperature**—The RIY's integral digital indicator is independent of the calibrated temperature range. During start-up, and even if the output goes overrange or underrange, the RIY continuously shows the current process temperature within the limits of the range code.

**Superior Protection Available**—Protect your RIY and other DIN instruments with our rugged new enclosure for rail-mounted instruments, the R-BOX. The R-BOX comes in a variety of widths with customizable conduit entries, and protects your RIY against harsh environments. For explosion-proof protection at an affordable price, purchase a hockey-puck style RIY in our new BH housing. Contact the nearest Moore Industries' center for more information.

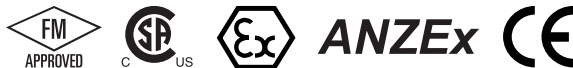


*For field-mounting, the RIY can be ordered in a rugged, explosion-proof enclosure. The DIN-style housing is perfect for high-density, control room applications.*

## Features

- **Universal input type and range.** Ideal as a plant standard, the RIY configures to accept any 2-, 3-, or 4-wire RTD and temperature range.
- **Fast and simple to calibrate.** Unique Quick Ranging calibration eliminates the need for hand-held terminals, calibrators, and tools.
- **Integral digital indicator.** Input in °C, °F or ohms, as well as span and zero adjustments, can be viewed on the display.
- **Diagnoses RTD Failure.** If a break in any of the RTD wires is detected upon start-up or during operation, the RIY indicates which wire is broken on its integral display.
- **True differential temperature input.** The RIY accepts two separate inputs and provides an output reflecting their true temperature difference.
- **Complete isolation.** Input/output isolation prevents false signals due to ground loops.
- **Complete temperature assemblies.** Moore Industries offers a complete line of sensors, thermowells and fittings.

**Certifications** (Check the listing on page 6 for full certification details)



# RIY

Programmable, Isolated  
RTD Transmitter

## Specifications

**Performance Accuracy of Output:** See Table 1 for accuracy within each range code  
**Stability:**  $\pm 0.1\%$  or better of calibrated span for 6 months  
**Ripple:** Less than 10mV peak-to-peak max. (up to frequencies of 120 Hz) measured across a 250 ohm resistor  
**Sensor Excitation Current:** 250 $\mu$ A, nominal  
**Burnout Protection:** Upscale drive is standard; Downscale drive is user-selectable  
**Output Protection:** Transient protection on output, reverse polarity on output  
**Output Current Limiting:** 125% of span, typical; 130% of span, maximum.  
**Load Capability:** (Vs - 12V)/ 0.024A = ohms  
**Isolation (input/output terminals):** 1000Vdc

**Performance (continued) Over Voltage Protection:** No damage up to  $\pm 5$ Vdc on input;  $\pm 60$ Vdc on output  
**RFI/EMI Protection:** When tested according to SAMA Standard PMC 33.1, all housings rate 20V/m - ABC 0.1% of ohms reading.

**Ambient Temperature Operation:** -40°C to +82°C (-40°F to +180°F)  
**Effect:**  $\pm 0.006\%$  of span/°C change  $\pm 10$ ppm of ohm reading/°C ( $\pm 0.003\%$  of span/°F change,  $\pm 5.6$  ppm of ohm reading/°F)  
 See note below

**Adjustments Zero and Span:** Front panel tactile push buttons are used to scroll to the desired values  
**Input Range:** Span changes within an input range (see Range Codes in Table 1) are made with the front panel push buttons; input range (Range Code) is selected via a rotary switch

**Adjustments (continued) Additional Parameters:** LCD display in °F, °C, or ohms, number of input wires, upscale or downscale on fault, and ranging method (quick ranging or standard) are selected via a single in-line package (SIP) switch

**Indicators Type:** 4-digit LCD indicates input value in °C, °F, or ohms (user-selectable); also indicates zero and full scale values, problem codes (including which RTD wire has failed), and high or low table limit warnings  
**Display Accuracy:**  $\pm 0.1\%$  of maximum span for range code,  $\pm 1$  digit

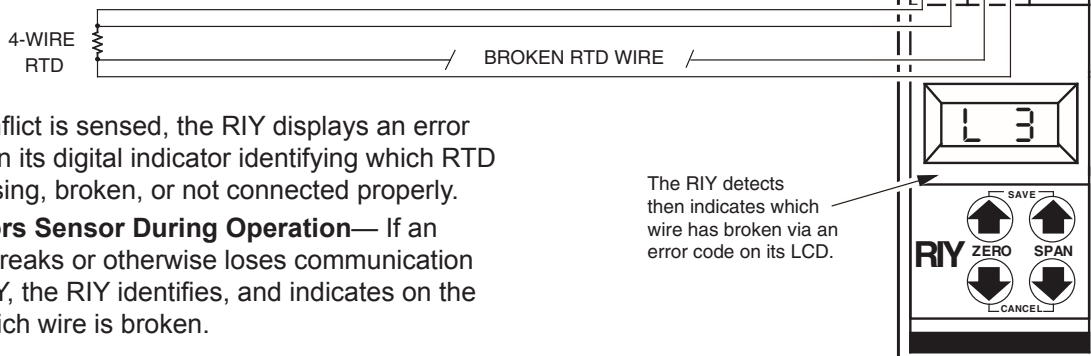
**Weight DIN Housing:** 141 grams (5 ounces)  
**HP and FL Housings:** 184 grams (6.5 ounces)

**NOTE:** Temporary, recoverable dimming of display may occur at temperatures below rated range

## Total Sensor Diagnostics

A first-of-its-kind feature is the RIY's ability to perform continuous RTD diagnostics to speed troubleshooting.

**Identifies Sensor at Start-Up** — The RIY verifies that the connected RTD matches the type (2-, 3-, or 4-wire) that it is configured to accept.



If a conflict is sensed, the RIY displays an error message on its digital indicator identifying which RTD wire is missing, broken, or not connected properly.

**Monitors Sensor During Operation**— If an RTD wire breaks or otherwise loses communication with the RIY, the RIY identifies, and indicates on the display, which wire is broken.

## Ordering Information

Unit	Input	Output	Power	Options	Housing
RIY Programmable, Isolated, RTD Transmitter	See Range Codes in Table 1 (Special ranges also available, consult the factory for pricing and availability)	4-20MA into 600Ω with 24Vdc power supply	12-30DC (required for Intrinsic Safety)  12-42DC	-DD Downscale drive (open input sends output downscale; user activated)  -ISC CSA approved Intrinsically Safe (requires 12-30DC power)  -ND No display (no indicator provided)  -CE EMC conformant	<p><b>BH2NG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two ½-inch NPT entry ports and a glass cover</p> <p><b>BH2TG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two ¾-inch NPT entry ports and a glass cover</p> <p><b>BH2MG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two M20 x 1.5 NPT entry ports and a glass cover</p> <p><b>BH3NG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two, ½-inch NPT side-entry ports, one ½-inch NPT bottom-entry port, and a glass cover</p> <p><b>BH3TG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two, ¾-inch NPT side-entry ports, one, ½-inch NPT bottom-entry port, and a glass cover</p> <p><b>BH3MG</b> (*) or (‡) Aluminum Explosion-Proof enclosure with two, M20 x 1.5 side-entry ports, one 1/2" bottom-entry port, and a glass cover</p> <p><b>D2LC</b> 2-Hub, low base, clear cover, NEMA 4X (IP 66) enclosure</p> <p><b>D2LS</b> 2-Hub, low base, solid metal cover, NEMA 4X (IP 66) enclosure</p> <p><b>HP</b> Hockey-puck housing (only) includes spring clips for mounting in the above enclosures</p> <p><b>FL</b> Hockey-puck housing with flanges for surface or relay track mounting</p> <p>* Either <b>A</b> or <b>E</b> suffix (comes supplied with 2" pipe mount hardware)  <b>A</b> suffix indicates ANZEx/TestSafe (Ex d) Flameproof approvals (i.e. BH2MGA)  <b>E</b> suffix indicates ATEX (Ex d and tD) Flameproof approvals (i.e. BH2MGE)  ‡ <b>P</b> suffix indicates enclosure comes equipped with base plate and U-bolts for mounting on a 2-inch pipe (i.e. BH2NGP)  See BH and D-BOX Datasheets for additional information.</p>
RIY Programmable, Isolated, RTD Transmitter	See Range Codes in Table 1 (Special ranges also available, consult the factory for pricing and availability)	4-20MA into 600Ω with 24Vdc power supply	12-42DC	-DD Downscale drive (open input sends output downscale; user activated)  -ND No display (no indicator provided)  -CE EMC conformant	<b>DIN</b> DIN housing mounts on "G" or Top Hat Rail

**When Ordering, specify:** Unit / Range code, temperature or ohm range and scale (°C, °F, or ohm) / Output / Power / Options [Housing]

**Model Number Examples:** RIY / R1-0-400°C / 4-20MA / 12-42DC [BH2NG]

**Table 1. Range Codes and Accuracy for RTD and Ohm Input Ranges**

Range Code	Input Type	Description	Range	Accuracy
R0	100 ohm Platinum 385 RTD	100 ohms @0°C $\alpha = 0.003850$ ohms/ohm/°C	-200°C to +850°C (-328°F to +1562°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R1	100 ohm Platinum 3923 RTD	98.129 ohms @0°C $\alpha = 0.003923$ ohms/ohm/°C	-200°C to +600°C (-328°F to +1112°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R2	100 ohm Platinum 3916 RTD	100 ohms @0°C $\alpha = 0.003916$ ohms/ohm/°C	-200°C to +510°C (-328°F to +950°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R3	100 ohm Platinum 3902 RTD	100 ohms @0°C $\alpha = 0.003902$ ohms/ohm/°C	-200°C to +650°C (328°F to +1202°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R4	200 ohm Platinum 385 RTD	200 ohms @0°C $\alpha = 0.003850$ ohms/ohm/°C	-200°C to +630°C (-328°F to +1166°F)	±0.05% of Span, ±0.13°C (±0.05% of Span, ±0.23°F)
R5	500 ohm Platinum 385 RTD	500 ohms @0°C $\alpha = 0.003850$ ohms/ohm/°C	-200°C to +630°C (-328°F to +1166°F)	±0.05% of Span, ±0.10°C (±0.05% of Span, ±0.18 °F)
R6	1000 ohm Platinum 385 RTD	1000 ohms @0°C $\alpha = 0.003850$ ohms/ohm/°C	-200°C to +630°C (-328°F to +1166°F)	±0.05% of Span, ±0.10°C (±0.05% of Span, ±0.18°F)
R7	1000 ohm Platinum 375 RTD	1000 ohms @0°C $\alpha = 0.003750$ ohms/ohm/°C	-185°C to +540°C (-301°F to +1004°F)	±0.05% of Span, ±0.10°C (±0.05% of Span, ±0.18°F)
R8	2 or 3, 100 ohm Platinum 385 RTDs Avg.	Average of 2 or 3 Range Code R0 Inputs	-200°C to +850°C (-328°F to +1562°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R9	2, 100 ohm Platinum 3923 RTDs Diff.	Differential of 2 Range Code R1 Inputs	-550°C to +800°C (-958°F to +1472°F)	±0.05% of Span, ±0.40°C (±0.05% of Span, ±0.72°F)
R10	2, 100 ohm Platinum 385 RTDs Diff.	Differential of 2 Range Code R0 Inputs	-550°C to +1050°C (-958°F to +1922°F)	±0.05% of Span, ±0.40°C (±0.05% of Span, ±0.72°F)
R11	2, 500 ohm Platinum 385 RTDs Diff.	Differential of 2 Range Code R5 Inputs	-550°C to +830°C (-958°F to +1526°F)	±0.05% of Span, ±0.20°C (±0.05% of Span, ±0.36°F)
R12	120 ohm Nickel RTD	120 ohms @0°C $\alpha = 0.00672$	-80°C to +320°C (-112°F to +608°F)	±0.05% of Span, ±0.14°C (±0.05% of Span, ±0.25°F)
R13	10 ohm Copper RTD	9.035 ohms @0°C $\alpha = 0.00427$	-50°C to +250°C (-58°F to +482°F)	±0.05% of Span, ±1.6°C (±0.05% of Span, ±2.88°F)
R14	Ohms	0-4000 ohms	0-4000 ohms	±0.05% of Span, ±0.2 ohm
R15	FLEX-SOR™ Sensor	1000 ohms @0°C $\alpha = 0.00285$	-90°C to +175°C (-130°F to +347°F)	±0.05% of Span, ±0.08°C (±0.05% of Span, ±0.14°F)
PRG	No Code	Programmable input. Unspecified at time of order. Specify this when input type and range are undetermined, or when the unit is to be stocked as a universal spare (PRG default is R0, -300 to 267°F).		

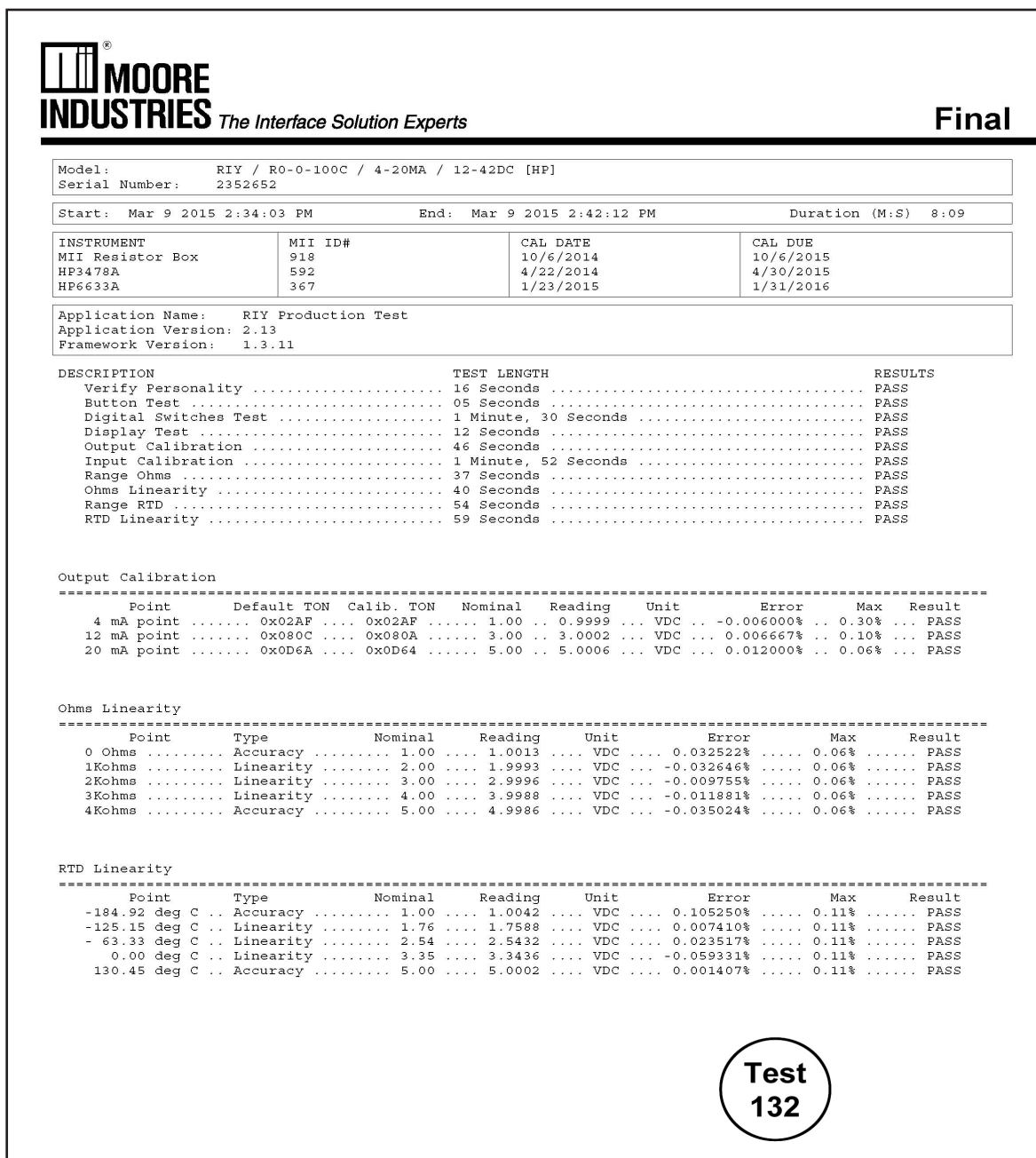
## Computer Testing

Advanced, computerized calibration and testing ensures that each RIY will perform to specifications. During automated testing, each unit is first calibrated to NIST (National Institute of Standards and Technology) traceable standards.

Next, power-up current, line voltage, load effect, and linearity are thoroughly tested. After testing, each unit is subjected to an extended, cyclical power, burn-in test to expose any components that may be prone to failure during actual operation.

A computerized, test report print-out is available for each RIY ordered. Consult your Moore Industries Sales Engineer for details.

Figure 1. RIY Computerized Test Report.



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Figure 2. Outline Dimensions for DIN-Style Housing.

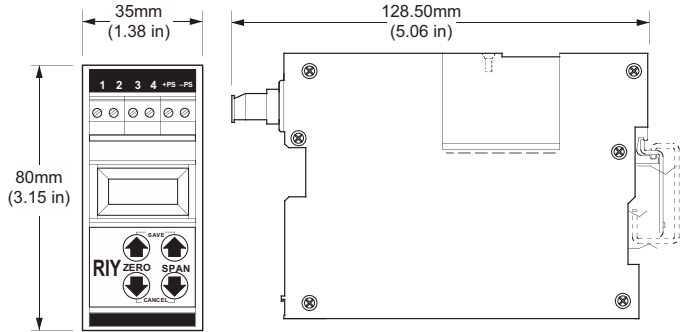


Figure 3. Outline Dimensions for FL and HP Housings.

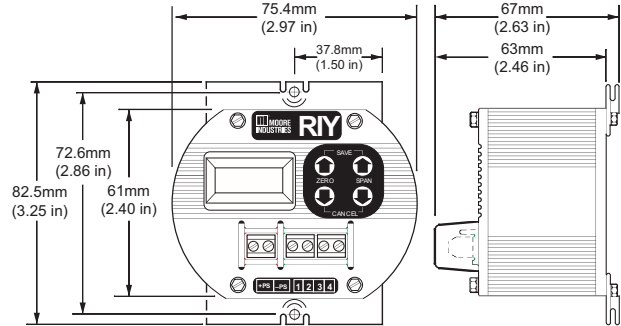
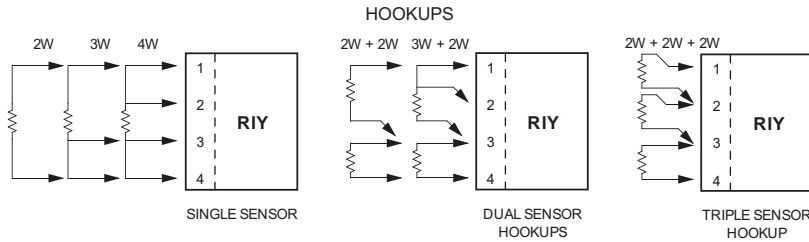


Figure 4. Sensor Hookup Diagrams



## Certifications

### RIY-HP



**CSA Group (Canadian Standards Associations):**  
Intrinsically-Safe

Class I, Division 1, Groups A, B, C, D, T4



**FM Global Group (FM Approvals):**  
Non-Incendive

Class I, Division 2 Groups A, B, C, D



**CE Conformant – EMC Directive 2004/108/EC: EN61326**

### RIY-DIN



**FM Global Group (FM Approvals):**  
Non-Incendive

Class I, Division 2 Groups A, B, C, D



**CE Conformant – EMC Directive 2004/108/EC: EN61326**

### RIY-HP in BH or SB Housing



**CSA Group (Canadian Standards Associations):**  
Explosion-Proof\*

Class I, Division 1, Groups A\*, B, C, D

Class II, Division 1, Groups E, F, G

Class III, Division 1

Type 4X, IP66

\*For U.S. Group A applications, seal all conduits within 18"



**FM Global Groups (FM Approvals):**  
Explosion-Proof\*

Class I, Division 1, Groups A\*, B, C, D

\*For Group A applications, seal all conduits within 18"

**Dust-Ignition Proof**

Class II & III, Division 1, Groups E, F, G

**NEMA 4; IP66; T6 @ 60°C Maximum Ambient**

### ANZEx

**Test Safe – ANZEx (Australia)**

**Flameproof**

Ex d IIC T6 (Tamb 60°C)

ANZEx 07.3027



**ISSeP – ATEX**

**Flameproof**

Ex II 2 G Ex d IIC T6 Gb

Ex II 2 D Ex tb IIIC Db T85°C IP66



**CE Conformant – EMC Directive 2004/108/EC: EN61326**



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