



Innovative Measurement Electronics



PT Ltd.

RD4, RD5, RD6

**Weighing
Remote Display**

Instruction Manual

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1 SAFETY

Safety Statement



CAUTION! READ THIS MANUAL BEFORE OPERATING OR SERVICING THIS EQUIPMENT. FOLLOW THESE INSTRUCTIONS CAREFULLY. SAVE THIS MANUAL FOR FUTURE REFERENCE. DO NOT ALLOW UNTRAINED PERSONNEL TO OPERATE, CLEAN, INSPECT, MAINTAIN, SERVICE, OR TAMPER WITH THIS EQUIPMENT. ALWAYS DISCONNECT THIS EQUIPMENT FROM THE POWER SOURCE BEFORE CLEANING OR PERFORMING MAINTENANCE. CALL PT LTD FOR PARTS, INFORMATION, AND SERVICE.



WARNING! ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.



WARNING! FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.

WARNING! DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING ANY CONNECTION, OPENING THE ENCLOSURE OR SERVICING.



WARNING! BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.



CAUTION! OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

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2 DESCRIPTION

2.1 INTRODUCTION

The RD4, RD5 and RD6 are high quality remote displays for industry in durable housings. The displays connect to the PT Azure Signature series weighing indicators and transmitters with continuous output and offer clear display of weight at extended viewing distances where the operator cannot be near the weight controller.

The RD5 and RD6 have industrial type robust stainless steel housings designed especially for outdoor installations. A large (57mm and 100mm respectively) bright high-efficiency LED display supported by an included sun visor provides excellent readability. Various serial data interfaces (RS-232C, RS-485 and 20mA CL) with automatic sensing are provided for transmission distances to 300 meters.

2.2 DEFINITIONS

ADC:

Analogue to digital converter, converts the analogue signal into a digital signal.

DAC:

Digital to analogue converter, converts the digital signal to an analogue signal, usually after some digital signal processing.

Dead weight:

Dead weight is the self weight of the platform or scale load carrying structure on the load cells without the contents or items to be weighed. The output voltage of the load cell in response to the weight of the platform is usually the zero offset. The zero offset must be within the range of the instrument adjustment for correct operation.

Live weight:

The weight that is applied to the scale and shown on the indicator.

Excitation voltage:

The voltage that is supplied by the indicator to the load cell.

Load cell:

Load cell is a device that converts force to electronic voltage. A load cell consists of two parts. The first part is a sensor that can be linearly distorted according to the force applied to it. The second part is the strain gauge element which changes its resistance according to the distortion of the sensor.

Load cell rated output:

The output voltage from the load cell divided by the excitation voltage at load cell rated capacity. This is usually expressed in mV/V.

FSO:

Full scale output. Errors may be presented as a % of the full output range after calibration.

RS-232C:

A method of transmitting serial data, historically used between computers and terminals and suitable for shorter distances

RS-485:

A method of transmitting serial data using balanced digital transmission with multiple devices on the transmission line. It is appropriate for longer distances.

20mA Serial Current Loop:

A method of transmitting serial data using a current loop. This is good for longer distance and noisy environments. This is not the same as 4-20mA analogue transmission.

2.3 FEATURES

- 13.5mm – 100mm bright LED display.
- Displays weight and status
- RS-232C and R-S485 data ports standard.
- Automatic communications sensing.
- Weather/sun visor included with wall mount models.
- Mounting accessories included.

3 SPECIFICATIONS

3.1 GENERAL

Model	RD4	RD5	RD6
Mounting	1/8 DIN Panel mount	Wall mount	Wall mount
Display height	13.5mm	57mm	100mm
Display type	6 digit Seven Segment bright LED	6 digit Seven Segment bright LED	6 digit Seven Segment bright LED
Protocols	Toledo, Baykon	SMA, Toledo, Baykon	SMA, Toledo, Baykon
Size [HxWxD] mm(inch)	55x99x100 (2.16x3.90x3.94)	182x467x70 (7.2x18.4x2.8)	200x700x80 (7.9x27.6x3.2)
Power Supply	11-28VDC	220-240VAC	220-240VAC
Input	RS232C, RS-485. Auto-sensing	RS232C, RS-485, 20mA serial Current Loop. Auto- sensing	RS232C, RS-485, 20mA serial Current Loop. Auto- sensing
Housing	Aluminium with plastic front and stainless steel back.	Stainless Steel, IP65 with sun visor	Stainless Steel, IP65 with sun visor
Environment	-10C to +45C, IP65	-10C to +45C, IP65	-10C to +45C, IP65

4 INSTALLATION

4.1 GENERAL RULES

Warning: Please take care to note the following warnings for design of the control cabinet to maximise system reliability.

The installation should be designed so that the instrument can operate safely. The remote display should be placed in a clean area, away from direct sun light if possible and sheltered from the weather, with a temperature between -10 °C and +45 °C. All external cables should be installed safely to avoid mechanical damage.

The RD instruments use low level serial transmission. To avoid electrical noise that could interfere with the signal, the RD should be separated from any equipment that produces electrical noise. Signal cable trays must be separated from other cables, if possible. If there is noise-generating equipment such as heavy load switches, motor control equipment, inductive loads etc., please take care to protect against EMC interference.

Note: If the local power supply has excessive electrical interference a separate supply line may be needed or power conditioning device.

All serial data cables must be shielded to avoid problems, especially with longer cable lengths.

Warning: Please do not forget that the instrument must be powered off before inserting or removing any peripheral connector or cables.

Follow the installation and commissioning steps described below carefully to prevent unwanted results after installation.

4.2 INSTALLATION

Install the Remote Display in a suitable location to ensure visibility and preferably out of direct sunlight which may make the instrument harder to read and where the instrument may overheat.

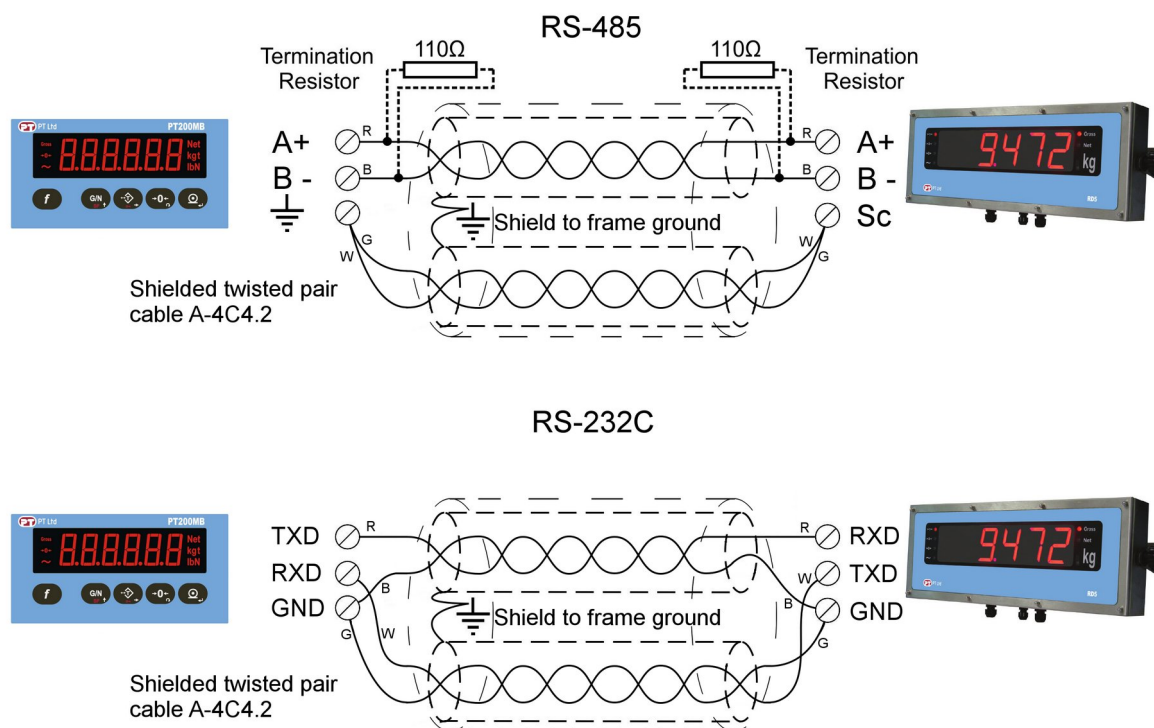
If installed outdoors shelter the display from bad weather for improved durability.

The RD4 installs in a control panel or enclosure with cutout dimension complying with 1/8 DIN standards. The opening should be 92mm x 47mm. Allow adequate room behind the display for cable connections.

The RD5 and RD6 include a bracket that swivels for mounting to a wall or structure. Securely mount the display, adjust the angle and tighten the knobs to lock in place.

4.3 CONNECTING THE REMOTE DISPLAY

Lay the cable from the remote display to the indicator or transmitter. Recommended cable is shielded twisted pair cable, available from PT. Search A-4C4.2 on our web site. Different cables can be used with different connections schemes and for short transmission distances there is less chance of errors using a basic connection. For longer cable runs or noisy environments only the best cable connection schemes are recommended. The connections shown below with cable from PT are recommended for best performance and may achieve transmission distances up to 50m for RS-232C and 600m for RS-485.



The RD5 and RD6 will need to be opened to connect the cable. Unscrew the nuts on the front and gently prise the front panel and electronic circuit board from the sealing rubber gasket.

Connect the serial cable to the appropriate serial port with the connector as detailed below, choosing the same type of port (RS-232C, RS-485, 20mA CL) as will be used on the indicator or transmitter.

For the RD5 and RD6 close the remote display, fit the sun visor over the top row of screws and fit the nuts removed previously and tighten to 1.5Nm torque.

Note: If the remote display will be at the far end of the RS485 serial line and there are no more devices past the remote display, fit a termination resistor of 110 ohms between A and B.

Connect the serial cable to the serial port of the display or transmitter.

Note: If the display or transmitter will be the other end of the RS485 serial line and there are no more devices past the indicator or transmitter, fit a termination resistor of 110 ohms between A and B.

4.4 CONFIGURE THE INDICATOR

Set the serial output from the Azure Signature Series indicator or transmitter to be continuous data (continuous data -1) output mode. Baud rate is recommended to be 9600 – 19200. A slower baud rate has less chance of transmission errors. 8 data bits, no parity and 1 stop bit (8N1) is a good option. Transmission of <CR> and <LF> is required but transmission of a checksum is optional.

Other instruments that use the Toledo or SMA serial protocols can connect to the RD5 and RD6. This includes the PT200M, PT200P, PT200X, PT600R and Cardinal, Rinstrum instruments with custom print string.

4.5 CONNECTING TO A PC OR PLC

The RD4, RD5 and RD6 can be connected to display a weight from a PC or PLC, the output should be to be continuous data (continuous data -1) output format. Baud rate is recommended to be 9600 – 19200. A slower baud rate has less chance of transmission errors. 8 data bits, no parity and 1 stop bit (8N1) is a good option. Transmission of <CR> and <LF> is required but transmission of a checksum is optional. To keep the remote display refreshed, transmit the weight continuously every second or faster.

4.6 DATA PROTOCOLS

The RD4 supports the Toledo/Baykon serial data format below. The RD5 and RD6 also support the SMA data format.

Toledo, Baykon Continuous-1 Data Format

The data format of the Continuous-1 data output is;

Status				Displayed Weight							Tare									
STX	STA	STB	STC	D5	D4	D3	D2	D1	D0	D5	D4	D3	D2	D1	D0	CR	LF	CHK		

Following is the definition table for status bytes STA, STB and STC;

Definition Table for Status A (STA)								Definition Table for Status B (STB)							
Bits 0, 1 and 2			Bits 3 and 4			Bits 5,6	Bit 7	Bit 0	Bit 1	Bit 2	Bit 3	Bits 4,5	Bit 6	Bit 7	
0	1	2	Decimal point	3	4	Always 1	X	1 = Net	1 = Weight negative	1 = Error	1 = Unstable	Always = 1	1 = Zeroed with power on	X	
1	0	0	XXXXXO	1	0			X 1	0 = Gross	0 = Weight positive	0 = No Error		0 = Stable		0 = Not zeroed with power on
0	1	0	XXXXXX	0	1			X 2							
1	1	0	XXXXX.X	1	1			X 5							
0	0	1	XXXX.XX												
1	0	1	XXX.XXX												
0	1	1	XX.XXXX												

Only the Displayed Weight (D5-D0) is displayed, Tare (D5-D0) is not displayed. Displayed Weight (D5-D0) can be ASCII letters [A..Z] to display a message. Leading zeros can be either of the characters '0' (0x30) or 'space' (0x20).

Status C (STC) is always hex '30'.

STA bits 0,1,2 control the display of a decimal point, bits 0,1,2 = 010 has the same result as bits 0,1,2 = 100. Generally bits 0,1,2 = 100 will not be used from a PC/PLC.

STA bits 3,4 have no effect on the display of the weight.

STB bit 0 is used to indicate if the displayed value is Gross or Net weight.

STB bit 1 is used to indicate a negative value.

STB bit 2 can be used to indicate an error condition. 0000 is displayed with this bit = 1.

STB bit 3 is used to show the motion symbol to indicate an unstable weight.

An example transmission to display a stable gross weight of 12.160 would be the following; represented in hexadecimal. 026D3020203132313633303130353030D0A represented in plain characters <STX>m0 12163011500<CR><LF>

Note: The weight data is represented right aligned and the error messages (UNDER, OVER and ADCOUT) are represented left aligned in the Displayed Weight field.

SMA Data Format

The data format for the SMA (Scale Manufacturers Association) protocol is below.

		Status					Displayed Weight										Unit			
	LF	S	R	N	M	F	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	U1	U2	U3	CR
Example			1	N							0	.	7	5	0		k	g		

SP = ASCII space

S = Z-Centre of zero, O-Over cap, U-Under cap, E-Weight not currently being displayed, ASCII space-None of the above conditions.

R = 1-First range, 2-Second range, 3-Third range.

N = G-Gross weight, T-Tare weight, N-Net weight, g-Gross weight in increased resolution, n-Net weight in increased resolution.

M = M-motion, ASCII space-no motion

F = ASCII space

When using PT200M, PT200P, PT200X, PT600R instruments with software version 4.00 and above a custom print string can be used to configure serial output complying with the SMA protocol although the first status byte will not convey Over, Under or E-Weight not currently being displayed.

Loading a custom print string with the viewer software, load \0A\E3\31\EB\E9\20\AA\9A\D9\4B\47\20\0D Loading a custom print string over the serial port, check serial port settings match and; send 20120146:0AE331EBE920AA9AD94B47200D <CR><LF>

4.7 ENERGISING THE INSTRUMENT

The RD4 should be connected to a stable DC power source of 11 to 28VDC, preferably try to avoid electrical noise from switching or motors. The RD5 and RD6 should be connected to a low noise electrical source as per the specifications. Check the following before energising the instrument.

- Mechanical installation, grounding, serial cable connection and power supply connection.
- The remote display cabling has been installed to suit the transmission type.

If everything is correct energise the instrument. The instrument will show WAIT (||Ait) and should auto-learn the communication parameters, so have the instrument receiving weight data when it is energised for best results.

4.8 TESTING PERFORMANCE

Check the display performance by comparing the remote display with the indicator or transmitter reading, loading up to the maximum loading value, checking repeatability, etc. before putting the scale into use.

5 OPERATION

There should be nothing to do in respect of operating the RD. The RD should emulate the display on the weighing instrument or accurately display the weight from the transmitter, PC or PLC. From time to time it may be necessary to clean the front panel to restore visibility, this can be done with a soft damp cloth. The RD5 remote display has 4 annunciators on the left and 2 on the right. Info = error condition (STB bit 2), ~ = unstable weight (STB bit 3), >0< which will illuminate if the display is 0 and D which indicates data is being received. Net/Gross on the right are set by (STB bit 0).

The RD6 remote display has 4 annunciators on the left. N = NET weight (STB bit 0), ~ = unstable weight (STB bit 3), >0< which will illuminate if the display is 0 and D which indicates data is being received.

6 TROUBLE SHOOTING

The RD4, RD5 and RD6 displays have been designed as a very reliable and virtually error free instruments. However if a problem occurs, do not attempt to repair the equipment before you understand the cause. Note the status of the front panel LEDs, and try to find the problem with the help of the table given below. Don't let unauthorised people interfere with the instrument.

<i>Problem</i>	<i>Remedies</i>
The display is completely blank.	If the display is not showing any LED, check the power supply connection and then the serial connection.
The display value is incoherent.	Check the communications settings in the weighing indicator or transmitter. Check the serial cable connections. Check for possible interference from electrical noise.
The Remote Display has power but no weight is showing.	Check the wiring. Ensure that the serial cable connects the same format at each end and is wired appropriately. RS-232C to RS-232C, RS-485 to RS-485 or 20mA CL to 20mA CL. Check the indicator or transmitter configuration. Check with a multimeter that the indicator is transmitting and that the remote display has signal at the input. A multimeter on AC volts should show some activity.

7 CONFORMITY

We;
PT Limited

7 Marken Place, Auckland, New Zealand

Declare under our sole responsibility that the products; **RD4, RD5 and RD6** to which this declaration relates, are in conformity with the following standard(s) or other normative document(s).

EC Directive:

Applicable Standards:

Low Voltage Directive (LVD): (2006/95/EC)

EN 60950-1

Electromagnetic Compatibility (EMC): (2004/108/EC)

EN 61326-1

PT Limited, September 2015
S M Edmonds



Technical Director