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### MAXREFDES42# IO-Link RTD Temp Sensor Quick Start Guide

# (IQ<sup>2</sup> IO-Link Master Version)



Rev 0; 1/15

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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#### 1. Required Equipment

- PC with Windows® 7 or Windows 8 (Verify with IQ<sup>2</sup> Development that your version of Windows is supported before purchasing their software.)
- MAXREFDES42# board
- IQ<sup>2</sup> Development iqInterface® IO-Link® master with corresponding USB and power cables (This must be purchased separately.)
- IQ<sup>2</sup> Development IO-Link iqTool® (tested with version 1.1.0.4 and comes with the iqInterface IO-Link master)
- One IO-Link cable (This must be purchased separately.)
- One A-to-B Type USB cable
- RD42\_RL78\_V01\_XX.ZIP (Maxim-MAXREFDES42-20140824-IODD1.1.html), where XX = minor version



Figure 1. MAXREFDES42# Board Connected to an IQ<sup>2</sup> Development IO-Link Master

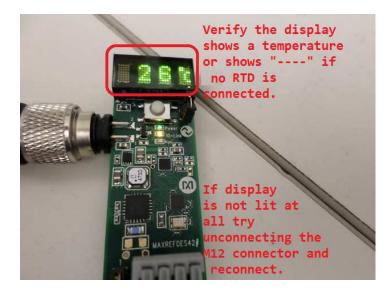


Figure 2. Green Display is Lit

#### 2. Overview

- 1. Connect power and all the cables to the iqInterface IO-Link Master as shown in Figure 1.
- 2. Connect the MAXREFDES42# proximity sensor board to the other side of the IO-Link cable. Make sure the green display is lit as shown in Figure 2.
- Download the latest "all design files" RD42V01\_XX.ZIP file located on the Design Resources tab at <u>www.maximintegrated.com/MAXREFDES42</u>. Alternatively, you can download the design files from <u>http://www.iq2-development.com/downloads/</u>.
- Install the IQ<sup>2</sup> Development IO-Link iqTool onto your Windows PC by referring to IQ<sup>2</sup> Development's iqInterface User Manual located at <u>http://www.iq2-development.com/downloads/</u>.
- Connect the MAXREFDES42# IO-Link RTD temperature sensor as a device in the IQ<sup>2</sup> Development IO-Link iqTool.
- 6. Read and write to the desired indexes by referring to IQ<sup>2</sup> Development's .html index definition file (Maxim-MAXREFDES42-20140824-IODD1.1.html).

#### 3. Included Files

The **RD42\_RL78\_V01\_XX.ZIP** contains the corresponding IO-Link Device Descriptor (IODD) files. The IODD contains information on communication properties, device parameters, identification, process, and diagnostic data. It includes an XML file, an image of the device, an icon image, and the manufacturer's logo. The IODD structure is the same for all devices of all manufacturers, and is always represented in the same way by the IODD interpreter tools. See Figures 3 to 6 for project structure and key filenames.

a grant and a second se	Construction of the local division of the lo
RD42_RL78_V01_00 ►	
Name	Date modified
Name Code_Documentation	
Name	Date modified 12/12/2014 5:27 PM 12/12/2014 5:27 PM

Figure 3. Directories inside RD42\_RL78\_VXX\_XX.ZIP.

RD42_RL78_V0	1_00 ▶ Code_Docum	entation 👻 😽
Name	~	Date modified
In the second second	les42.pdf	11/24/2014 10:21 AM

Figure 4. File inside the Code\_Documentation directory.

RD42_RL78_V01_00	
Name	Date modified
iq2dev-iqmaxrefdes42-ddd6184ef2fb.zip	12/2/2014 1:34 PM
	and had been successed and
iqmaxrefdes42-20141118-v132.hex	11/24/2014 10:21 AM

Figure 5. Files inside the Design\_Files directory. Source files are in the zip file.

• RD42_RL78_V01_00 ▶ IODD	▼ 49
Name	Date modified
Naxim-logo.png	1/27/2014 8:57 AM
Maxim-MAXREFDES42-20140824-IODD1.0.1.html	11/24/2014 10:23 AM
Maxim-MAXREFDES42-20140824-IODD1.0.1.xml	11/24/2014 10:23 AM
Maxim-MAXREFDES42-20140824-IODD1.1.html	11/24/2014 10:23 AM
Maxim-MAXREFDES42-20140824-IODD1.1.xml	11/24/2014 10:23 AM
💽 Maxim-MAXREFDES42-icon.png	11/24/2014 10:23 AM
尾 Maxim-MAXREFDES42-pic.png	11/24/2014 10:23 AM

Figure 6. Files inside the IODD directory. The .xml files are the IODD files and the .html files are the IQ<sup>2</sup> Development's .html index definition files.

#### 4. Procedure

- 1. Connect the A-to-B Type USB cable from the PC to the iqInterface IO-Link Master as shown in Figure 1.
- 2. Connect an IO-Link cable to the iqInterface IO-Link Master as shown in Figure 1.
- 3. Connect 24V DC and GND to the orange terminal block on the iqInterface IO-Link Master as shown in Figure 1. Pin 1 is +24V and pin 2 is GND.
- 4. Connect the MAXREFDES42# proximity sensor board to the other side of the IO-Link cable. Make sure the green display is lit as shown in Figure 2.
- Download the latest "all design files" RD42V01\_XX.ZIP file located on the DESIGN RESOURCES tab at <u>www.maximintegrated.com/MAXREFDES42</u>. Alternatively, you can download the design files from <u>http://www.ig2-development.com/downloads/</u>.
- 6. Extract the **RD42V01\_XX.ZIP** file to a directory on your PC.

 Install the IQ<sup>2</sup> Development IO-Link iqTool onto your Windows PC as shown in Figure 7 by referring to IQ<sup>2</sup> Development's iqInterface User Manual located at http://www.iq2-development.com/downloads/.

××	Setting	Update	•						IQ <sup>2</sup>	Development G
iqMaster	iqDevice									
IO-Link						Log and Macr	ō			
IO-Link	State:	O Inact	ive	10-L	nk Confi <u>o</u>	Clear log	Save log	Macro	IO-Link device power supply	, the
Go To:				Device	properties	-				
Diagnosi	is									
Error:	No Errors									
Event:										
Process	Data									
In:	ř.			hexa						
Out										
Out	.be			hexa						
On-reque	est Data Read	Request								
Index:	0×0000	hex +	Subindex	0x00	hex +					
Data:	00:00	- 22		2	hexar +					
					Read					
On-requi	est Data Write	Request								
Girioqui		- 72								
Index:		hex +	Subindex	0x00	hex *					
Data:	00:00				hexar +					
Data.					Write					

Figure 7. Newly installed IQ<sup>2</sup> Development IO-Link iqTool.

8. Make sure you are in the **iqMaster** tab, then press the **Setting** button. In the **IQ Connection Settings** window, select **auto** in the **Comport / USB** dropdown menu. Press **OK** to save setting as shown in Figure 8.

Connections	Common	Comport	
O Connect by	/ serial numbe	er 📃	9
<ul> <li>Comport / </li> </ul>	USB	auto	•
		Port	10001

Figure 8. IQ Connection Settings window.

9. Next, press the **Connect** button as shown in Figure 9.

S IO-Link iqTool v1.1.0.4		
Setting Update		
IO-Link	Log and Macro	
IO-Link State: O Inactive	O-Link Config Clear log Save	og Macro IO-Link device power supply off
Go To:	evice properties	
Diagnosis		
Error: No Errors		
Event:		
Process Data		
In:	exar 👻	
Out.	exar 👻 Set	
On-request Data Read Request		
Index: 0x0000 hex v Subindex 0x00	hex v	
Data: 00:00	hexar 💌	
	Read	
On-request Data Write Request		
Index: 0x0000 hex v Subindex 0x00	hex -	
Data: 00:00	hexar 🔻	
	Write	
<u></u>		

Figure 9. Press the Connect button in the iqTool.

10. If the COM port is not found automatically, open **Device Manager** in your Windows operating system as shown in Figure 10 to verify to which COM port the iqInterface hardware is connected. Then manually set that COM port in the **IQ Connection Settings** window and press the **Connect** button again. If you still cannot connect after doing this step, contact IQ<sup>2</sup> Development's technical support or refer to IQ<sup>2</sup> Development iqInterface user manual located at http://www.iq2-development.com/downloads/.

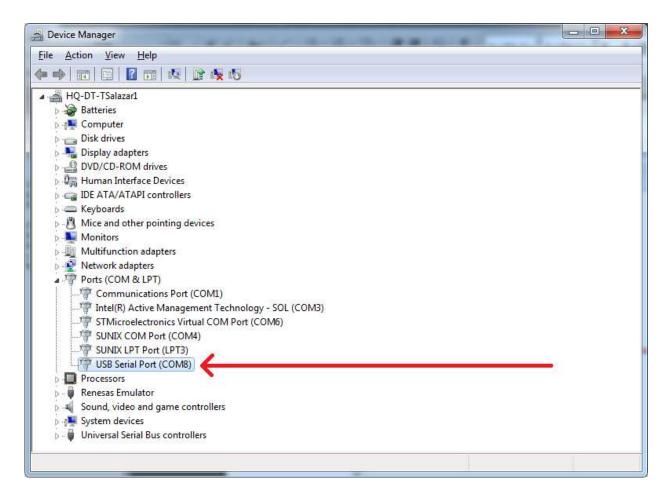


Figure 10. Device Manager built into Windows.

11. After the iqTool has connected to the correct COM port, press the **Auto** button as shown in Figure 11.

S IO-Link iqTool v1.1.0.4	
igMaster igDevice	Covelopment GmbH
IO-Link	Log and Macro
IO-Link State: O Inactive IO-Link Config Go To: Preoperate Auto Device properties	Clear log         Save log         Macro         IO-Link device power supply         on           2015.01.13 10:20:37.084 AM   Log started         00:00:00.000   igInterface is connected to COM8         IO-Link device power supply         IO-Link device power supply
Diagnosis	l i l
Error: No Errors Event:	
Process Data	
In: hexar + Out: hexar + Set	
On-request Data Read Request	
Index: 0x0000 hex v Subindex 0x00 hex v Data: 00:00 hexar v Read	
On-request Data Write Request	
Index: 0x0000 hex + Subindex 0x00 hex + Data: 00:00 hexar + Write	
iqFirmware: v1.1.0.5   iqBootloader: v0.0.0.3   iqStack Master: v1.1.1.6   Serial N	lumber: 20140055

Figure 11. iqTool Auto button.

12. You should now see a flashing green **Operate** circle and the **On-request Data Read Request** group should have become active (ungrayed out) as shown in Figure 12.

> IO-Link iqTool v1.1.0.4	
iqMaster iqDevice	
IO-Link	Log and Macro
IO-Link State: Operate IO-Link Config	Clear log Save log Macro IO-Link device power supply on
Go To: Fallback Device properties	2015.01.13 10:37:15.152 AM   Log started 00:00:00.000   iginterface is connected to COM8
Products	00:01:27.653   Set oper mode Auto request 00:01:28.106   PD Out is invalid
Diagnosis	00:01:28.200   Operate state is achieved
Error: No Errors	
Event:	
Process Data	
In: 23:7D:00 hexar -	
Out hexar + Set	
On-request Data Read Request	
Index: 0x0000 hex	
Data: 00:00 hexar 🗸	
Read	
On-request Data Write Request	
Index: 0x0000 hex	
Data: 00:00 hexar 🔹	
Write	
·	
Firmware: v1.1.0.5   iqBootloader: v0.0.0.3   iqStack Master: v1.1.1.6   Serial	Number: 20140055

Figure 12. iqTool Operate state.

13. Open the Maxim-MAXREFDES42-20140824-IODD1.1.html file to view the index numbers and data formats. Go to the index 261, which is the MAX31865 RTD code register value variable as shown in Figure 13. Note: RTD code register value is shifted by 1 bit so the value read back needs to be divided by two.

	a _ @ ×
← → C 🗋 file:///C:/Latest%20IO-Link%20Device%20IODDs/RD42_RL78_V01_00/IODD/Maxim-MAXREFDES42-20140824-IODD1.1.html	☆ =
Variable "MAX31865ATP+ RTD" index=261 id=V_MAX31865RTD data type: 16-bit Ulnleger default value: access rights: ro dynamic	
octet         0         1           bitoffset         15 - 8         7 - 0           element bit         15 - 8         7 - 0	
Variable "MAX31865ATP+ High Fault Threshold" index=262 id=V_MAX31865HighFaultThreshold data type: 16-bit Uinteger default value: 65535 access rights: rw excluded from data storage	
octet         0         1           bit offset         15-8         7-0           element bit         15-8         7-0	
Variable "MAX31865ATP+ Low Fault Threshold" index=263 id=V_MAX31865LowFaultThreshold data type: 16-bitUlnteger default value: 0 access rights: rw excluded from data storage	
octet         0         1           bit offset         15-8         7-0           element bit         15-8         7-0	
Variable "MAX31865ATP+ Fault Status" index=264 id=V_MAX31865FaultStatus defaultvalue:0 access rights:ro dynamic	
octet 0	

Figure 13. .html index definition file – Index 261.

- 14. Read the RTD code by performing the operations in the **On-request Data Read Request** group below, as shown in Figure 14.
  - Change Index type to uint16.
  - Enter **261** in the **Index** field.
  - Change the **Data** type to **uint16**.
  - Press the **Read** button.

Note: RTD code register value is shifted by 1 bit so the value read back needs to be divided by two.

RTD = (Code \* 400) / 2^15 = (18174 / 2) \* 400/ 2^15 = 110.925 Ohms

	10 <sup>2</sup>
Setting Update	
qMaster iqDevice	7
O-Link	Log and Macro
IO-Link State: Operate IO-Link Config	Clear log Save log Macro IO-Link device power supply on
Go To: Fallback Device properties	2015.01.13 10:37:15.152 AM   Log started 00:00.00.000 iginterface is connected to COM8 00:01:27 552 Loft core mode Auto request
Diagnosis	00:01:27.653   Set oper mode Auto request 00:01:28.106   PD Out is invalid 00:01:28.200   Operate state is achieved
	00:14:11.522   OD read request: index 261, subindex 0x00 00:14:11.600   OD read response: 18174 (2 bytes)
Error: No Errors	
Event:	
Process Data	
n: 23:7F:00 hexar 🔹	
Dut hexar - Set	
Dn-request Data Read Request	
Index: 261 uint16 V Subindex 0x00 hex V	
Data: 18174 uint16 •	
Read	
Dn-request Data Write Request	
Index: 0x0000 hex  Subindex 0x00 hex	
Index: UXUUU hex V Subindex UXUU hex V Data: 00:00 hexar V	

Figure 14. iqTool - On-request Data Read Request group – Index 261.

15. Next, go to index 268 in the **Maxim-MAXREFDES42-20140824-IODD1.1.html** file , which is the ambient temperature in degree C variable, as shown in Figure 15.

Maxim-MAX	XREFDES42-2014	ac ×				8 <u>-</u> 0 ×
<ul><li>↔ ⇒ C</li></ul>	🗋 file:///0	C:/Latest%2	0IO-Link%2	0Device%2	0IODDs/RD42_RL78_V01_00/IODD/Maxim-MAXREFDES42-20140824-IODD1.1.html	☆] 〓
Variable "A	mbient ter	nperature"	index=268	id=V_Tem	perature_C	*
data type: Float: default value: -2 access rights: ro	246.876					
octet bit offset element bit	0 31 - 24 31 - 24	1 23 - 16 23 - 16	2 15 - 8 15 - 8	3 7 - 0 7 - 0		
Variable "A data type: Float default value: 8 access rights: ro	32 6	nperature s	witch-point	t level" ind	ex=269 id=V_TemperatureSPLevel_F	
octet	0	1	2	3		
bit offset	31-24	23 - 16	15 - 8	7 - 0 7 - 0		
data type: Float default value: 3 access rights: ro	0					
octet	0	1	2	3		
bit offset	31 - 24	23 - 16	15 - 8	7 - 0		
element bit	31 - 24	23 - 16	15 - 8	7 - 0		
Variable "A data type: Float default value: 1 access rights: ro	32 .8	mperature s	witch-poin	t hysteresi	" index=271 id=V_TemperatureSPHysteresis_F	
octet	0	1	2	3		
bit offset element bit	31 - 24 31 - 24	23 - 16 23 - 16	15 - 8 15 - 8	7 - 0 7 - 0		
					s" index=272 id=V_TemperatureSPHysteresis_C	

Figure 15. .html index definition file – Index 268.

- 16. Read the ambient temperature value in degrees C by performing the operations in the **On-request Data Read Request** group below, as shown in Figure 16.
  - Enter **268** in the **Index** field.
  - Change the **Data** type to **hex**.
  - Press the **Read** button.
  - Convert read hex value to float32.

Temp = 0x41E00E8A = 28.007099 = 28.01 degrees C

1					
iqMaster	iqDevice				
IO-Link					Log and Macro
IO-Link	State:	O Operate	10-Link C	ontig	Clear log Save log Macro IO-Link device power supply on
Go To:		Fallback	Device prop	perties	2015.01.13 10:37:15.152 AM   Log started 00:00:00.000   igInterface is connected to COM8
Diagnos	is				00:01:27.653 [Set oper mode Auto request 00:01:28.106   PD Out is invalid 00:01:28.200   Operate state is achieved
Free	No Erroro				00:14:11.522 OD read request: index 261, subindex 0x00 00:14:11.600   OD read response: 18174 (2 bytes)
Error:	No Errors				00:37:55.623   OD read request: index 268, subindex 0x00 00:37:55.748   OD read response: 0x41E00E8A (4 bytes)
Event:					
Process	Data				
ln:	23:7D:00		hexar -	0	
Out	1		hexar +	Set	
			-	n	
On-requ	est Data Read F	Request			
Index:	268	uint16 - Subinde	x 0x00 [he	ex 🔹	
Data:	0x41E00E8A		he	ex ▼	
				Read	
			Į.		
On-requ	est Data Write F	Request			
Index:	0×0000	hex - Subinde	x 0x00 he	ex 🔹	
Data:	00:00		he	exar 👻	
			ſ	Write	

Figure 16. iqTool - On-request Data Read Request group – Index 268.

#### 5. Trademarks

IO-Link is a registered trademark of ifm electronic GmbH.

IQ<sup>2</sup> Development is a registered trademark of IQ<sup>2</sup> Development GmbH.

iqInterface is a registered trademark of IQ<sup>2</sup> Development GmbH.

iqTool is a registered trademark of IQ<sup>2</sup> Development GmbH.

Windows is a registered trademark and registered service mark of Microsoft Corp.

REVISION	REVISION	DESCRIPTION	PAGES
NUMBER	DATE		CHANGED
0	1/15	Initial release	—