

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

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



Rev 0; 1/15

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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 Branar (Britan) a Br
RD42_RL78_V01_00 >	
Name	Date modified
Code_Documentation	12/12/2014 5:27 PM
퉬 Design_Files	12/12/2014 5:27 PM
퉬 IODD	12/12/2014 5:27 PM

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

RD42_RL78_V01_00   Code_Documentation	<b>- - - - + - + + + + + + + + + +</b>
Name	Date modified
🔁 iqmaxrefdes42.pdf	11/24/2014 10:21 AM

Figure 4. File inside the Code\_Documentation directory.

RD42_RL78_V01_00   Design_Files	<b>- - €</b> <del>2</del>
Name	Date modified
iq2dev-iqmaxrefdes42-ddd6184ef2fb.zip iqmaxrefdes42-20141118-v132.hex readme.txt	12/2/2014 1:34 PM 11/24/2014 10:21 AM 12/1/2014 2:30 PM

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

RD42_RL78_V01_00 ► IODD	▼ 4y 5
A	
Name	Date modified
Maxim logo ppg	1/27/201/ 9.57 AM
Maxini-logo.prig	1/2//2014 0.5/ AIVI
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
💽 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/.

<ul> <li>IO-Link i</li> </ul>	iqTool v1.1.0.4	-	-	_	-					
××	Setting	Upda	te						١Q <sup>°</sup> ۵	evelopment
iqMaster	iqDevice									
IO-Link						Log and Macro	)			
IO-Link	State:	🔿 Inac	tive	IO-Lir	nk Config	Clear log	Save log	Macro	IO-Link device power supply	off
Go To:				Device	properties					
Diagnosi	•									
Diagnosi	3									
Error:	No Errors									
Event:										
Process	Data									
in:				hexar	Ŧ					
Out:				hexar	▼ Set					
On-reque	est Data Read	Request								
Index:	0×0000	hex	Subindex	0x00	hex -					
Data:	00:00				hexar 👻					
					Read					
On-reque	est Data Write	Request								
Index:	0x0000	hex	Subindex	0×00	hex =					
	00:00				hexar 👻					
Data:	00.00									

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.

☆ IQ Connection Settings	
Connections Common Co	omport
O Connect by serial number	
<ul> <li>Comport / USB</li> </ul>	auto
	Port 10001
	ok cancel

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	1	
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:	avice 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	
J Setting Update iqMaster iqDevice	
IO-Link	Log and Macro
IO-Link State:     Operate     IO-Link Config       Go To:     Fallback     Device properties	Clear log         Save log         Macro         IO-Link device power supply         on           2015.01.13 10:37:15.152 AM   Log started         00.000         00.00
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
Error: No Errors Event:	
Process Data	
In: 23:7D:00 hexar   Out: hexar  Set	
On-request Data Read Request	
Index: Dx0000 hex  Subindex Dx00 hex  Data: 00:00 hexar  Read	
On-request Data Write Request	
Index: 0x0000 hex v Subindex 0x00 hex v Data: 00:00 hexar v Write	
iqFirmware: v1.1.0.5   iqBootloader: v0.0.0.3   iqStack Master: v1.1.1.6   Serial Nu	mber: 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.

C Maxim MAXREF0E542-2014( ×	8 <u>- 0 x</u>	J
← → C 🗋 file:///C:/Latest%20IO-Link%20Device%20IODDs/RD42_RL78_V01_00/IODD/Maxim-MAXREFDES42-20140824-IODD1.1.html	☆ <b>=</b>	:
Variable "MAX31865ATP+ RTD" index=261 id=V_MAX31865RTD data type: 16-bit Ulnieger default value: 0 access rights: ro dynamic		•
octet U 1 bit offset 15-8 7-0		
Variable "MAX3865ATP+ High Fault Threshold" index=262 id=V_MAX31865HighFaultThreshold data type: 16-bit Ulnleger default value: 5535 access fights: rw excluded from data storage		
octet         0         1           bit offset         15 - 8         7 - 0           element bit         15 - 8         7 - 0		
Variable WAX51060ATF*LOW Fault Intesticid Index-2031d-V_WAA31665LOWFault Intesticid data bps:15-ball Unleger default value: 0 excluded fom data storage	ļ	
octet         0         1           bitoffset         15 - 8         7 - 0           element bit         15 - 8         7 - 0		
Variable "MAX31865ATP+ Fault Status" index=264 id=V_MAX31865FaultStatus data type: 8-bit Uinteger default value: 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

IO-Link iqTool v1.1.0.4	
igMaster iqDevice	
IO-Link	Log and Macro
IO-Link State: Operate IO-Link Config Go To: Fallback Device properties	Clear log         Save log         Macro         IO-Link device power supply         on           2015.01.13 10:37:15.152 AM   Log started         00:00:00.000   ightnerface is connected to COM8         00:01:27.653   Set oper mode Auto request         00:01:27.653   Set oper Auto Request
Diagnosis Error: No Errors Event:	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)
Process Data In: 23:7F:00 hexar -	
Out: Set	
On-request Data Read Request	
Index: 261 uint16 v Subindex 0x00 hex v Data: 18174 uint16 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	umber: 20140055

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	REFDES42-201	4C × 📃				
← ⇒ C <sup>i</sup>	🗋 file:///0	C:/Latest%2	0IO-Link%2	0Device%	20IODDs/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: Float3 default value: -2 access rights: ro	32 46.876					
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		
data type: Float3 default value: 86 access rights: ro	32	nporatare e				
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		
data type: Float3 default value: 30 access rights: ro	32					
octet	0	1	2	3		
Dit offset	31 - 24	23 - 10	15 - 8	7-0		
Variable "A data type: Float3 default value: 1.1 access rights: ro	mbient ter	nperature s	witch-point	thysteres	is" index=271 id=V_TemperatureSPHysteresis_F	
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	mbient ter	nperature s	witch-poin	hysteres	is" index=272 id=V_TemperatureSPHysteresis_C	-
😂 Start		0		§ %	💊 💊 💌 🚿	🖀 🕿 🖈 🕞 🛱 📶 🌘 4:47 PM 🖿

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

♦ IO-Link	iqTool v1.1.0.4								
ioMaster	Setting Update								
	·								
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   iqinterface is connected to COM8 00:0112.7653   Set oper mode Auto request							
Diagnos	s	00:01:28.106   PD Out is invalid 00:01:28.200   Operate state is achieved							
Error:	No Errors	00:14:11.522   OD read request: index 261, subindex 0x00 00:14:11.600   OD read response: 18174 (2 bytes) 00:37:55.623   OD read request: index 268, subindex 0x00 00:37:55.748   OD read response: 0x41E00E8A (4 bytes)							
Event:									
Process	Data								
In:	23:7D:00 hexar 🗸								
Out:	hexar 👻 Set								
On-requ	On-request Data Read Request								
Index:	268 uint16 v Subindex 0x00 hex v								
Data:	0x41E00E8A hex								
	Read								
On-requ	On-request Data Write Request								
Index:	0x0000 hex  Subindex 0x00 hex								
Data:	00:00 hexar •								
iqFirmware	: v1.1.0.5   iqBootloader: v0.0.0.3   iqStack Master: v1.1.1.6   Serial N	umber: 20140055							

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	—



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