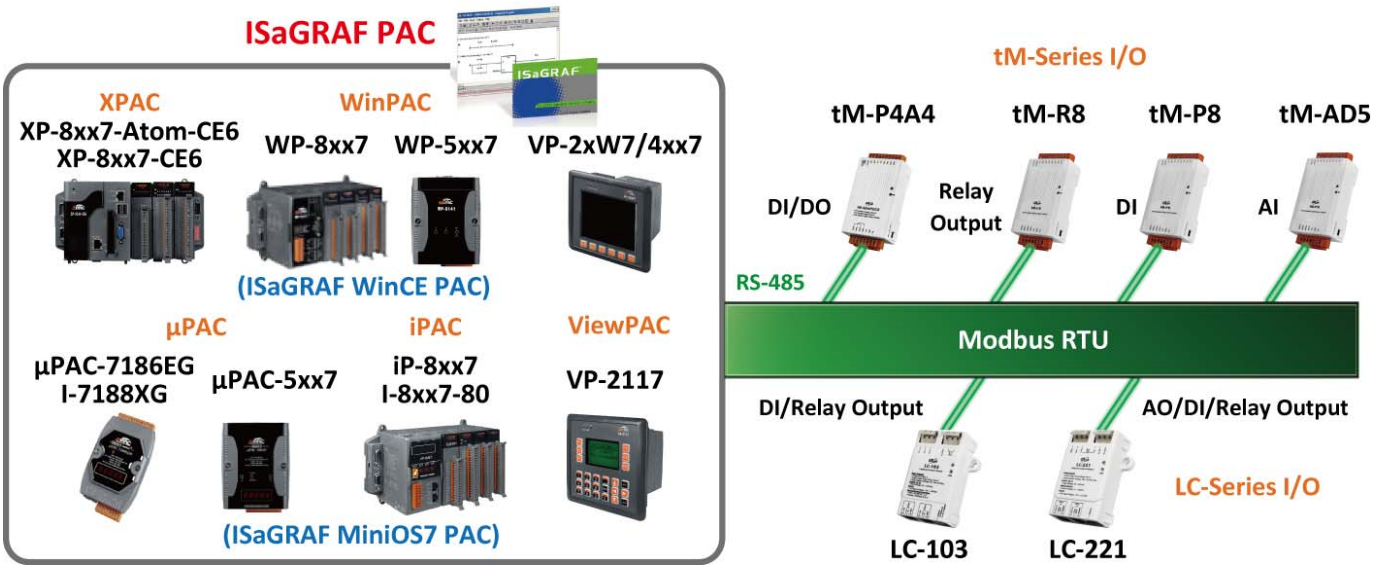
How to use the ISaGRAF PAC to control the tM-series and LC-series Modbus I/O Modules?



ICP DAS ISaGRAF PACs support Modbus RTU protocol that allows the tM-series and LC-series I/O modules control through RS-485 serial bus. The tM-series tiny RS-485 I/O modules support various I/O types, like photo-isolated digital input, relay contact, photoMOS relay, and open-collector output, etc. The LC-series I/O modules are lighting control modules.

Please refer to the website for more information about tM-series and LC-series I/O modules:
http://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+RS-485__I_O__Modules+tM__series#473

http://www.icpdas.com/en/product/guide+IIoT+BA_HA+Lighting__Control#577

Note: **Recommended that No connect more than 12 Modbus I/O modules via one Modbus RTU Port to reduce the scan time. It's better to enable two or more Modbus RTU Port of the ISaGRAF PAC for connecting many Modbus I/O modules.**

For more about the ways to enable the Modbus RTU Master Port, please refer to http://www.icpdas.com/en/download/show.php?num=333&nation=US&kind1=&model=&kw=isagraf Chapter8 or https://www.icpdas.com/en/faq/index.php?kind=280#751 FAQ-47, 75, 113, 161

LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.1. Download Demo Programs and Documents

The following ISaGRAF driver versions support the tM-series and LC-series I/O modules.

ISaGRAF PAC	ISaGRAF Driver Version	ISaGRAF PAC	ISaGRAF Driver Version
WinCE PAC:		**MiniOS7 PAC:**	
XP-8xx7-CE6	Ver. 1.37 or later	uPAC-7186EG	Ver. 1.20 or later
XP-8xx7-Atom-CE6	Ver. 1.01 or later	I-7188XG	Ver. 3.18 or later
WP-8xx7	Ver. 1.57 or later	uPAC-5x07	Ver. 1.01 or later
WP-5147	Ver. 1.03 or later	iP-8xx7	Ver. 1.17 or later
VP-2xW7/4xx7	Ver. 1.43 or later	I-8xx7-80	Ver. 4.22 or later
		VP-2117	Ver. 1.01 or later

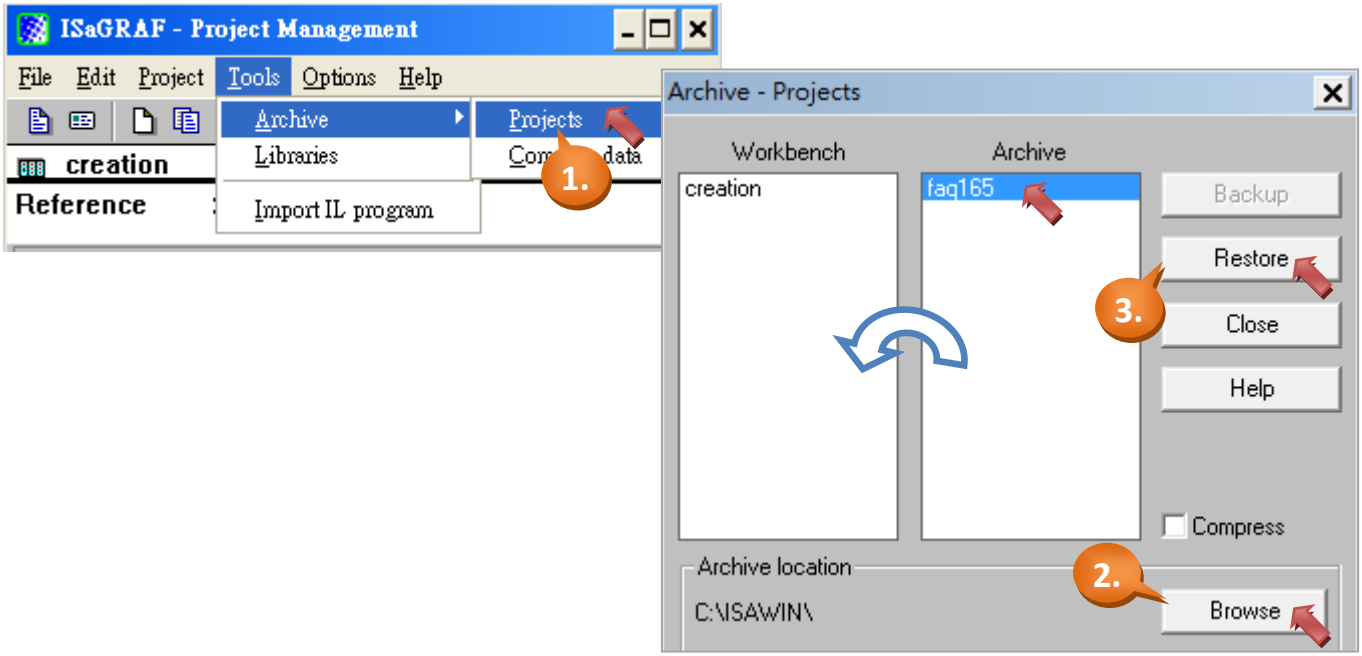
Download the ISaGRAF Driver:
If your driver version is the earlier one, you may download the new ISaGRAF Driver from http://www.icpdas.com/en/download/show.php?num=368&nation=US&kind1=&model=&kw=isagraf and then follow the attached document to update it to your ISaGRAF PAC.

Download the ISaGRAF Demo Project:
This paper is the ISaGRAF FAQ-165. User can download the document and ISaGRAF demo (faq165.pia) from https://www.icpdas.com/en/faq/index.php?kind=280#751 **> 165**

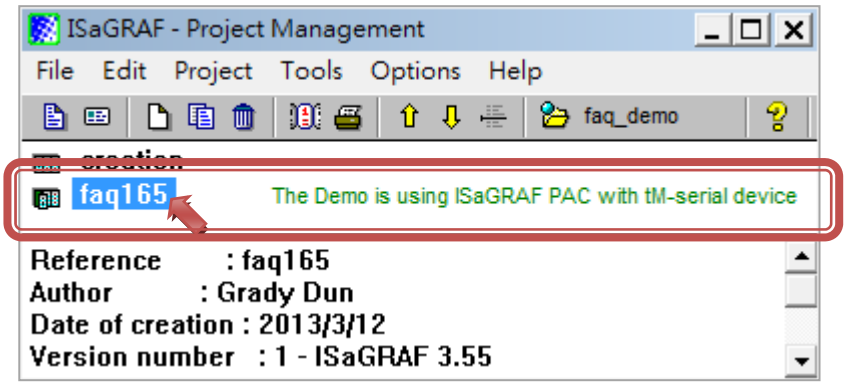
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.2.Restore Demo Program

Restore the ISaGRAF Demo Program:
After downloading the ISaGRAF demo program (faq165.pia), users need to restore it to the PC/ISaGRAF. Please follow the instructions as below:



(Mouse double-click the “faq165” to open this program.)



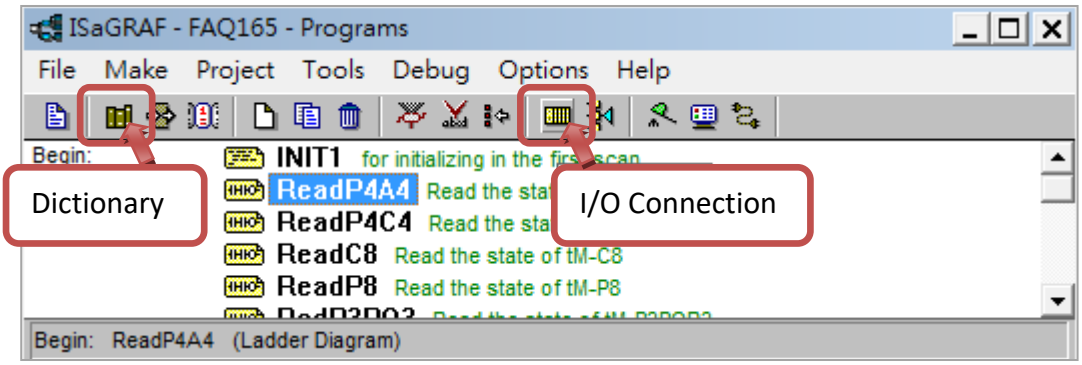
1.3. Description of ISaGRAF Program

This demo program (faq165.pia) provides read/write functions for various I/O modules. It allows the ISaGRAF PAC to control the tM-series and LC-series I/O modules via COM3 (RS-485).

Note: If the PAC’s COM3 is not a RS-485 port, please modify the ISaGRAF program to use other RS-485 port. For example, the COM2 of WP-5147.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

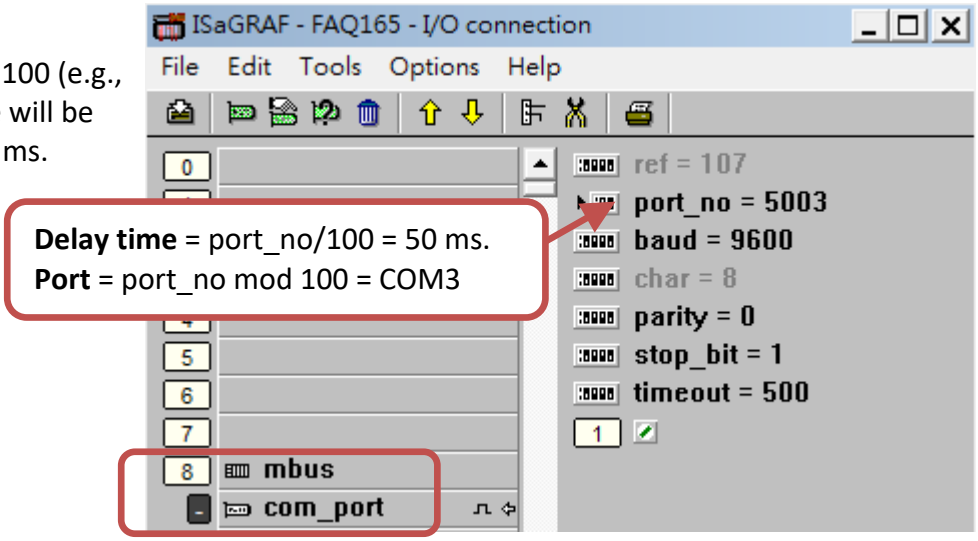
1.3.1. "I/O Connection" & ISaGRAF Variables :



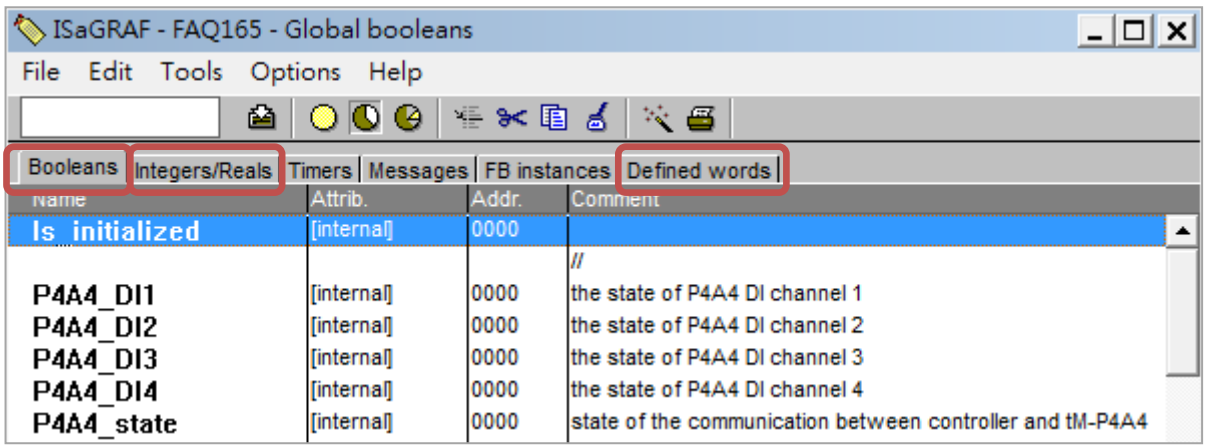
1. Click "I/O Connection" to see the I/O feature.

2. Using the "mbus" feature to enable the Modbus Master Port. In this example, the ISaGRAF PAC uses COM3, the delay time between two Modbus commands is 50 ms and the baud rate is 9600.

Note:
If the "port_no" is less than 100 (e.g., port_no = 2), the delay time will be set as the default value 100 ms.

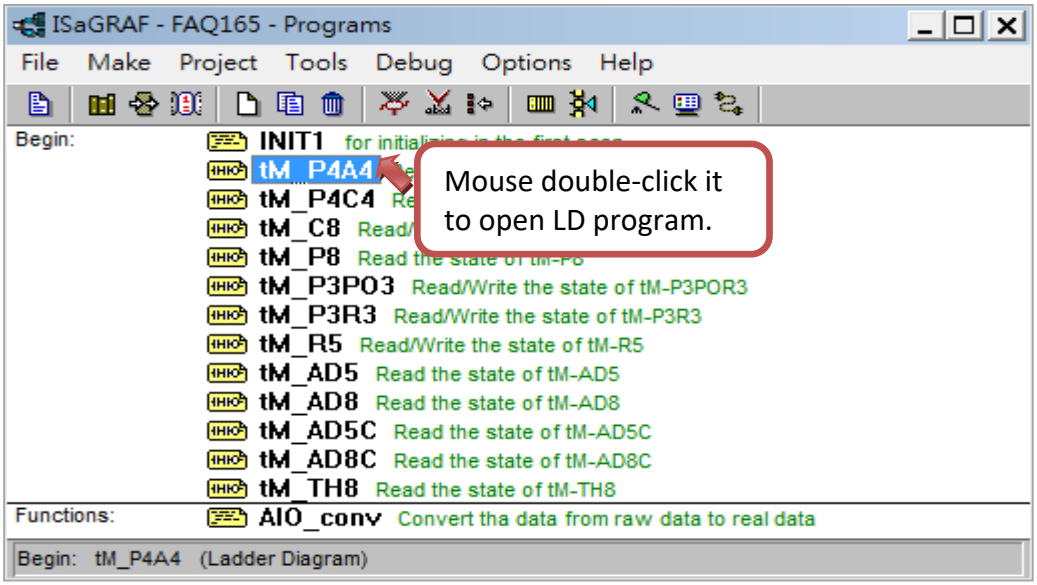


3. Click "Dictionary" (figure 1) to see the ISaGRAF Variables in this program.



LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.3.2. Demo program (faq165.pia):



LD program:

This program (faq165.pia) provides the read/write functions for various I/O modules. Users can open each program to see the detailed content.

tM-series and LC-series I/O modules **:**

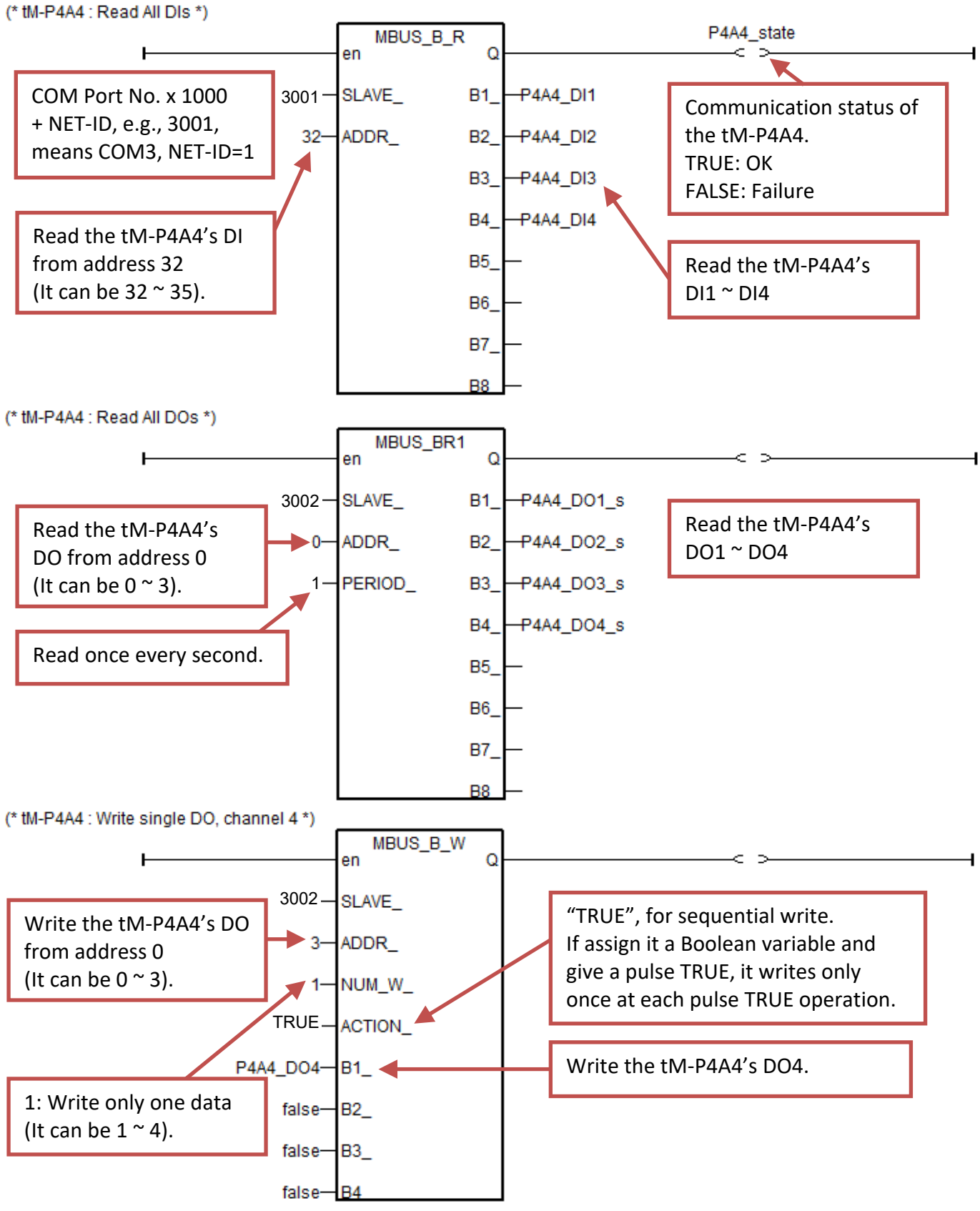
http://www.icpdas.com/en/product/guide+Remote__I_O__Module__and__Unit+RS-485__I_O__Modules+tM__series#473

http://www.icpdas.com/en/product/guide+IIoT+BA_HA+Lighting__Control#577

Model	AI	AO	DI	DO	Relay Output
	Channels (Corresponding Address)				
tM-P4A4	-	-	4 (Addr. 32~35)	4 (Addr. 0~3)	-
tM-P4C4			4 (Addr. 32~35)	4 (Addr. 0~3)	
tM-C8			-	8 (Addr. 0~7)	
tM-P8			8 (Addr. 32~39)	-	
tM- P3POR3			3 (Addr. 32~34)	-	3 (Addr. 0~2)
tM-P3R3			3 (Addr. 32~34)		3 (Addr. 0~2)
tM-R5			-		5 (Addr. 0~4)
tM-AD5	5 (Addr. 0~4)	-	-	-	-
tM-AD8	8 (Addr. 0~7)				
tM-AD5C	5 (Addr. 0~4)				
tM-AD8C	8 (Addr. 0~7)				
tM-TH8	8 (Addr. 0~7)				
LC-103	-	-	1	-	3 (Addr. 0~2)
LC-221	-	1 (Addr. 32)	1	-	1 (Addr. 0)

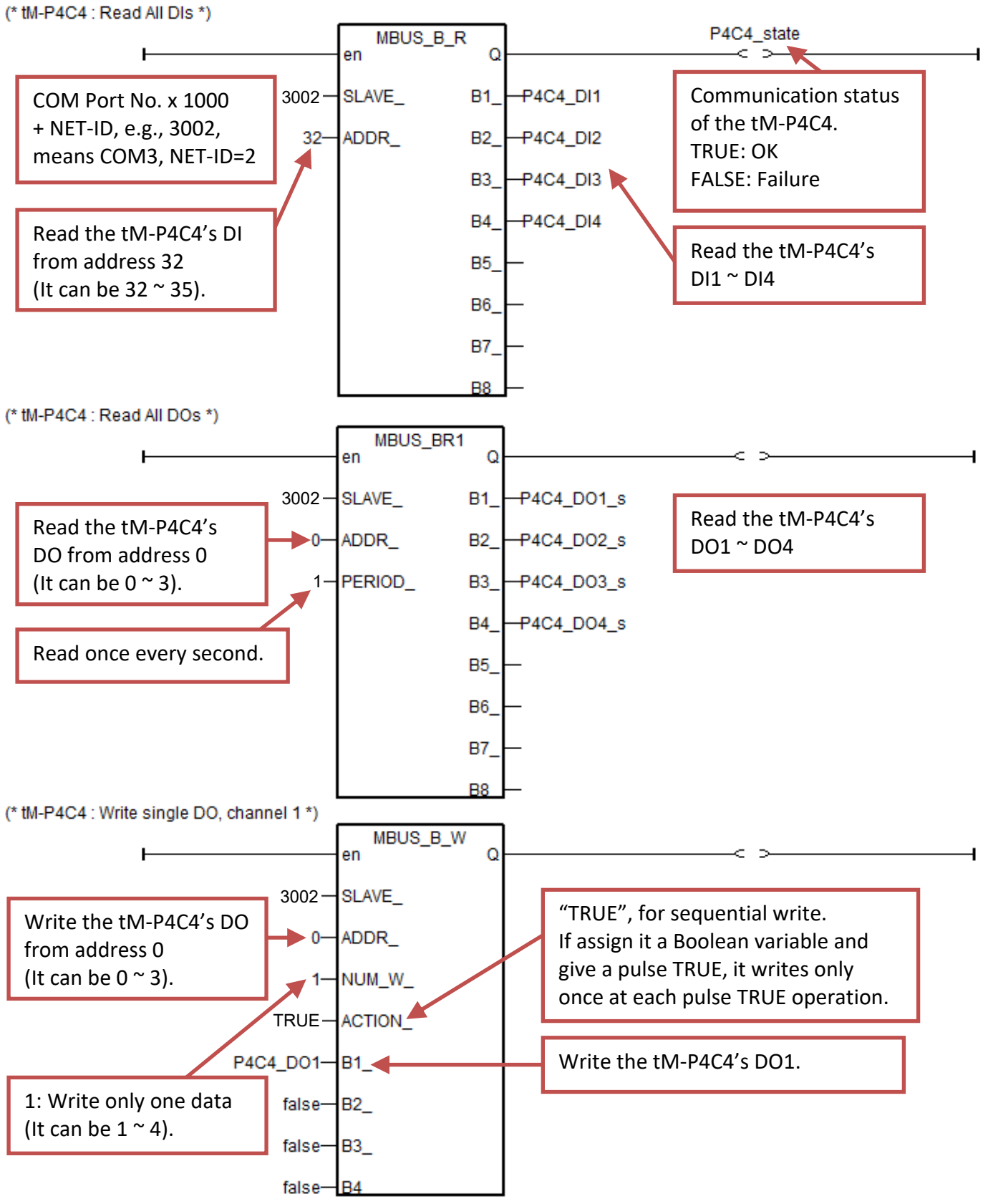
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_P4A4 (4 DI, 4 DO)



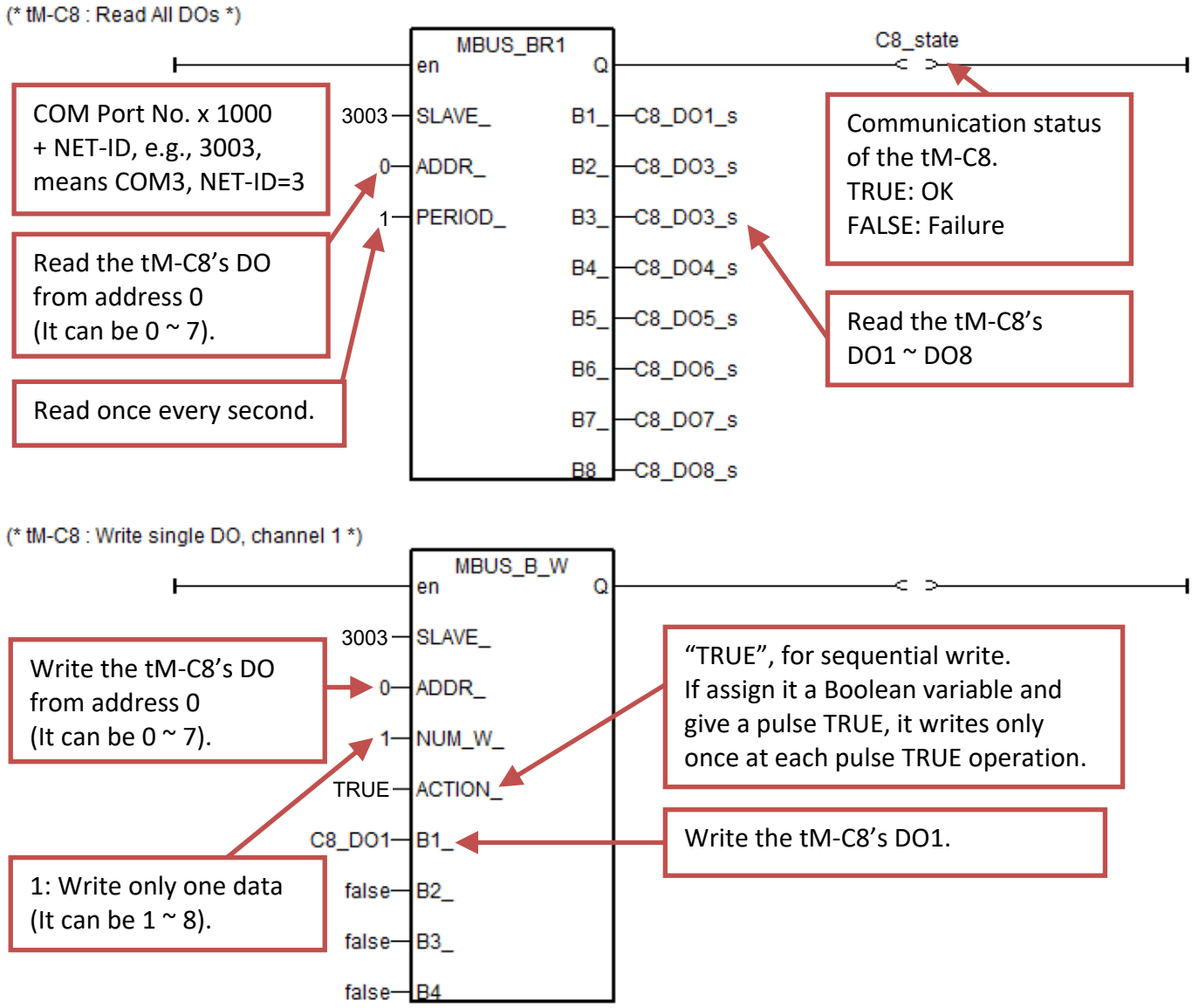
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_P4C4 (4 DI, 4 DO)



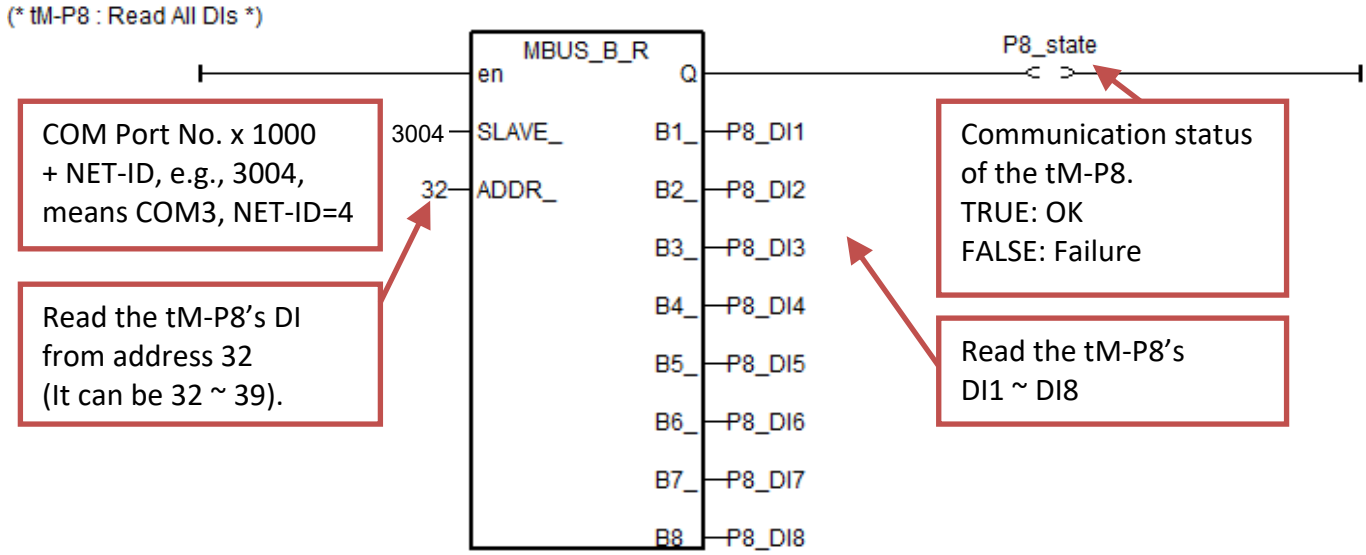
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_C8 (8 DO)



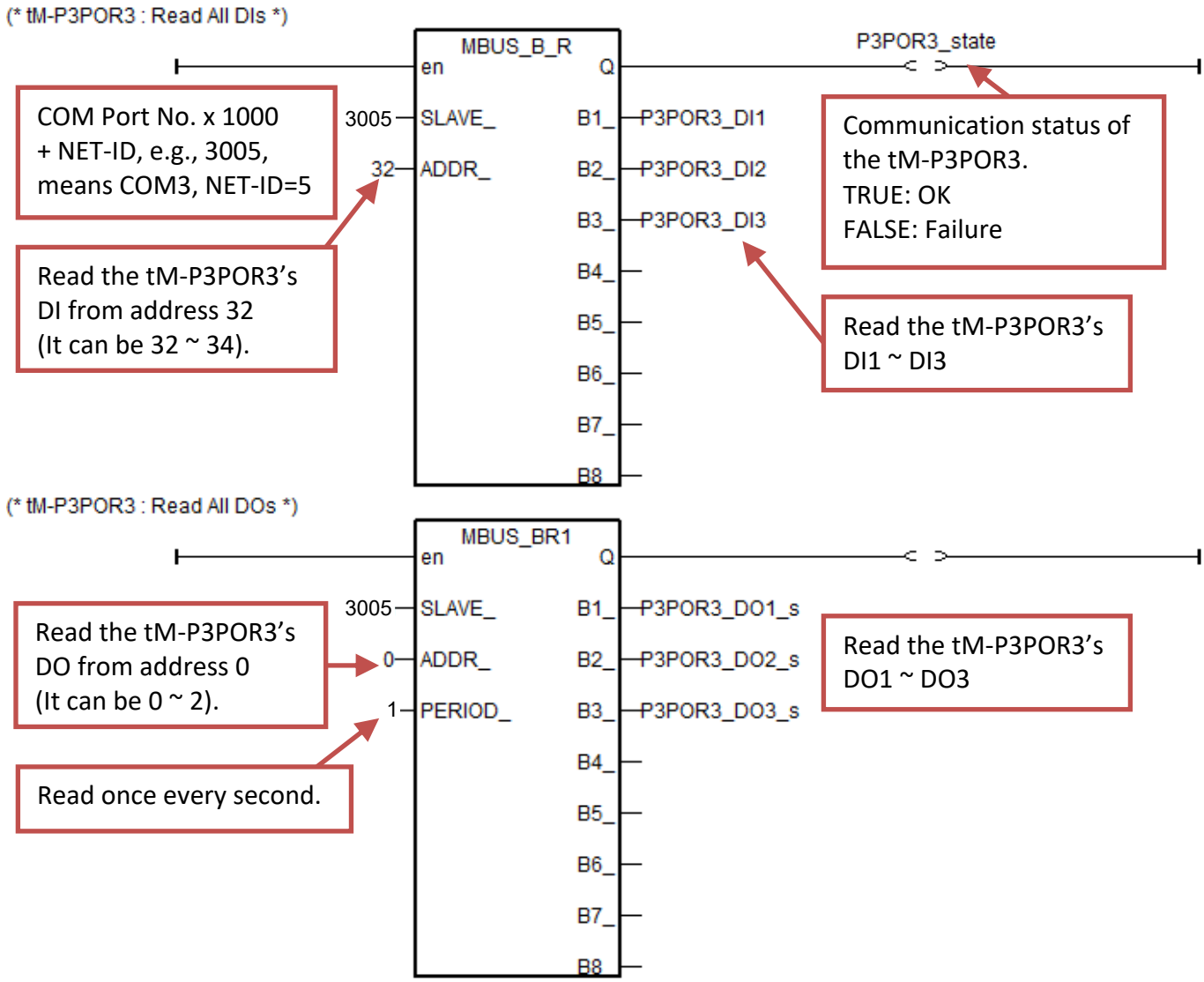
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_P8 (8 DI)

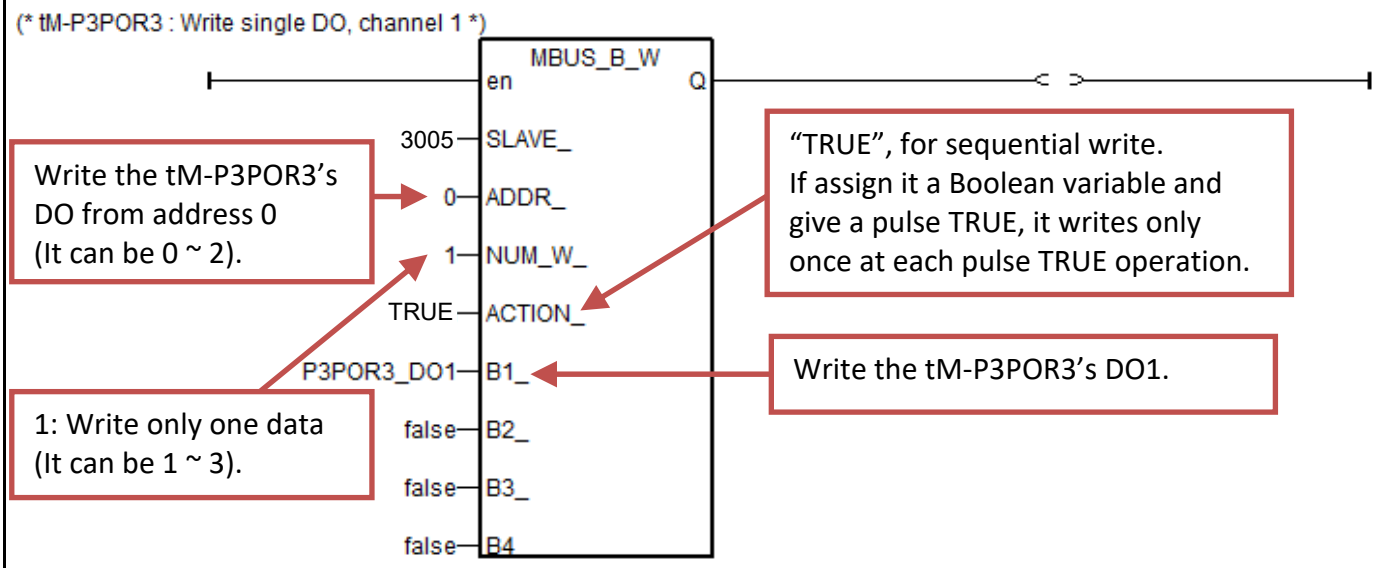


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

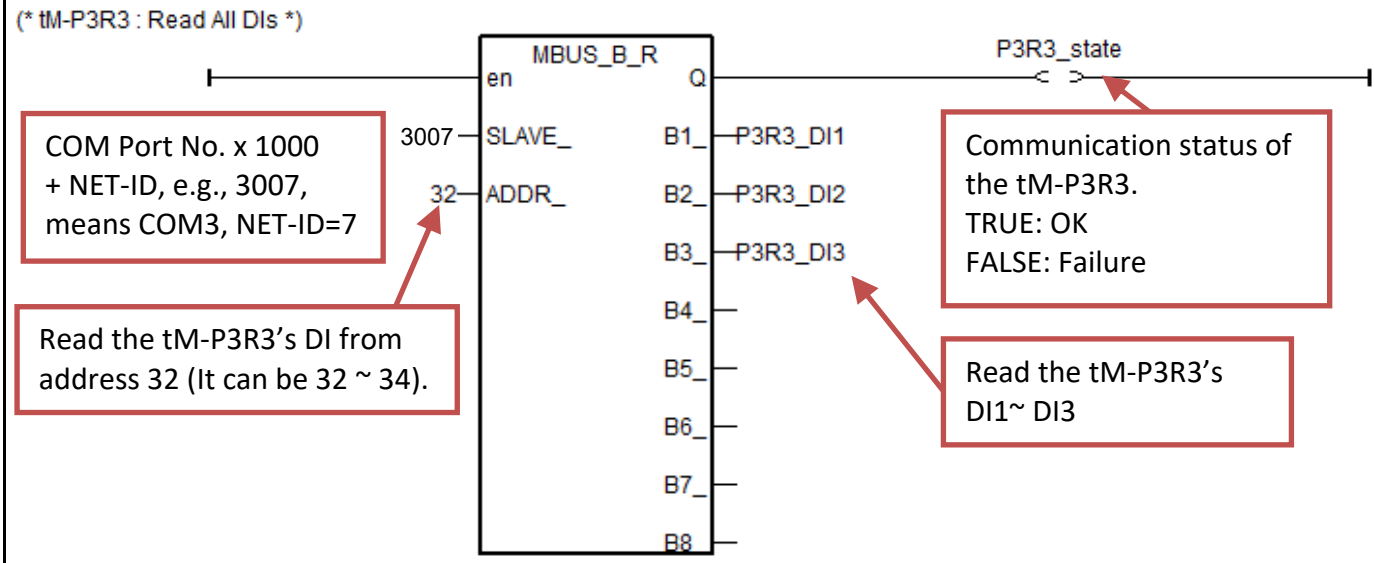
tM_P3POR3 (3 DI, 3 Relay Output)

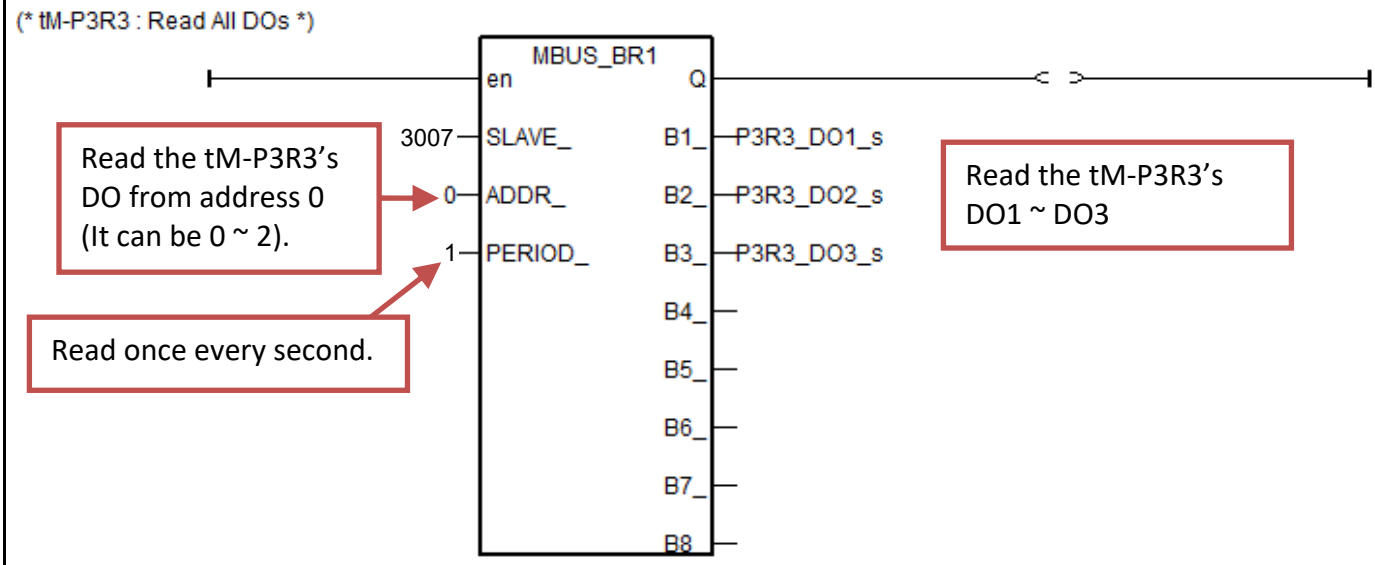


Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

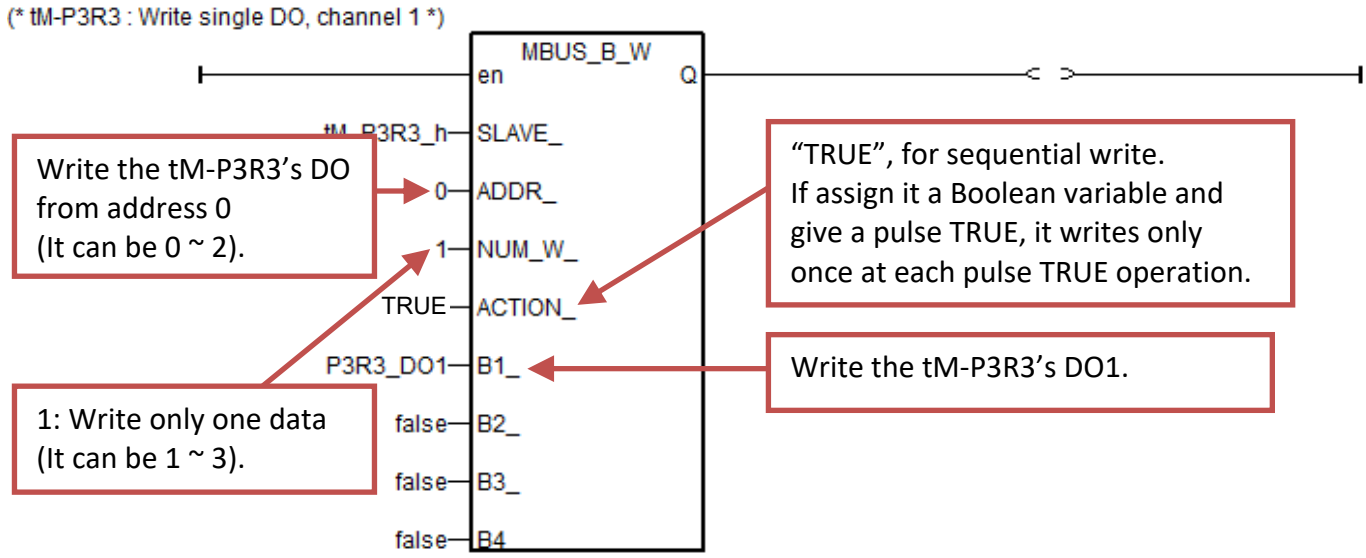


tM_P3R3 (3 DI, 3 Relay Output)

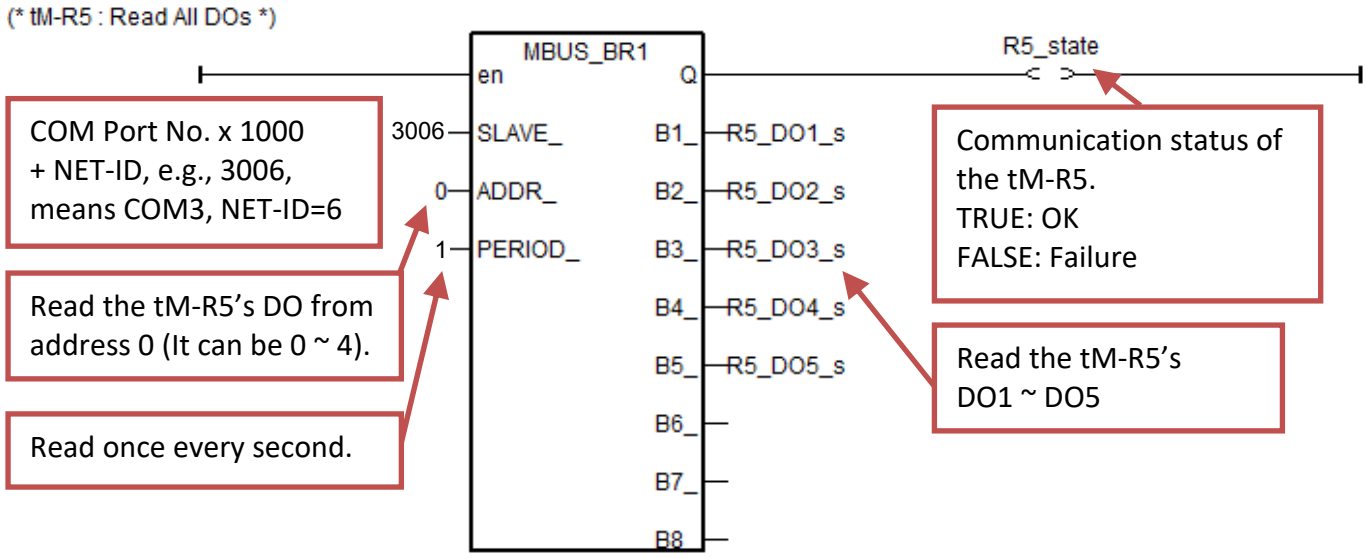




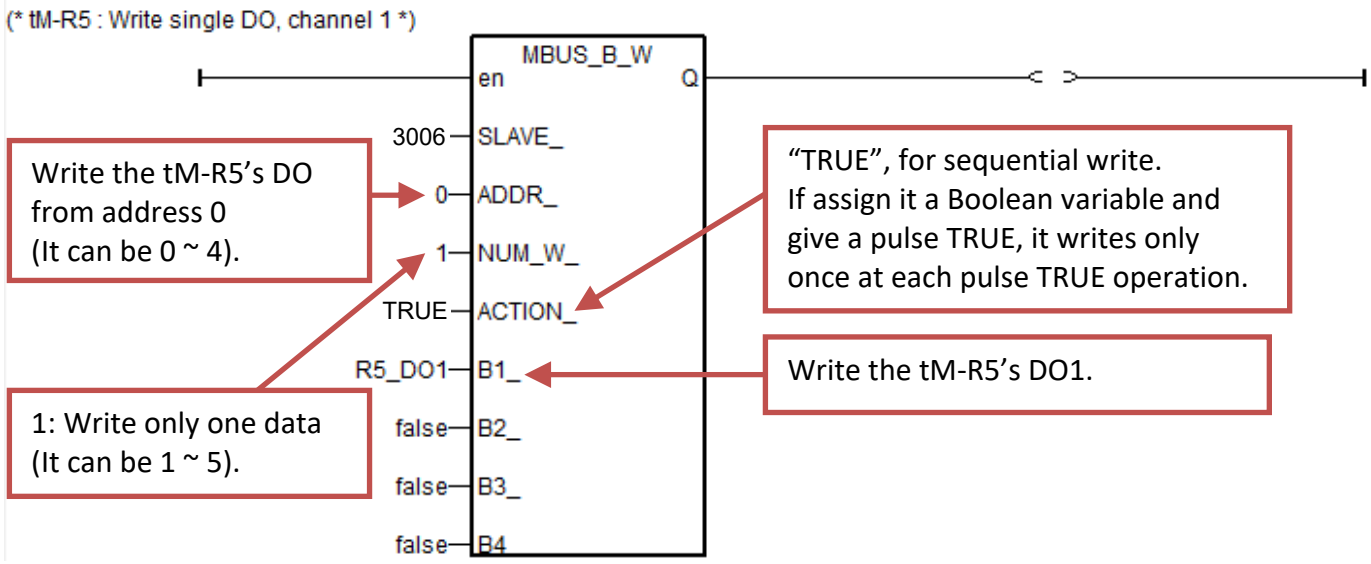
Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



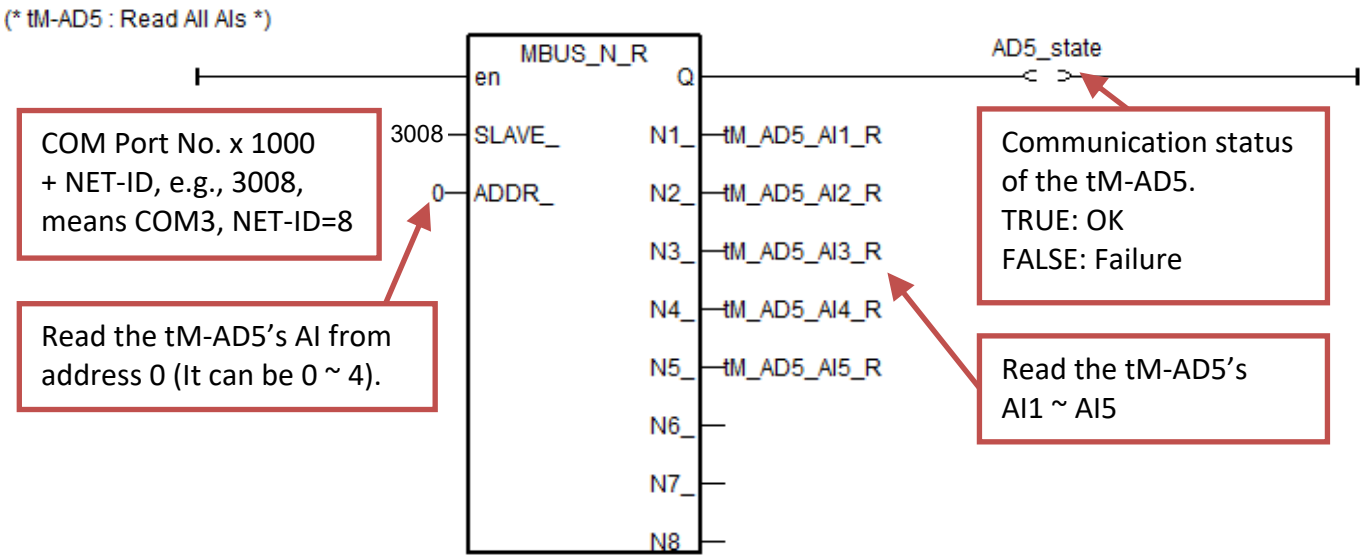
tM_R5 (5 Relay Output)



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000



tM_AD5 (5 AI)

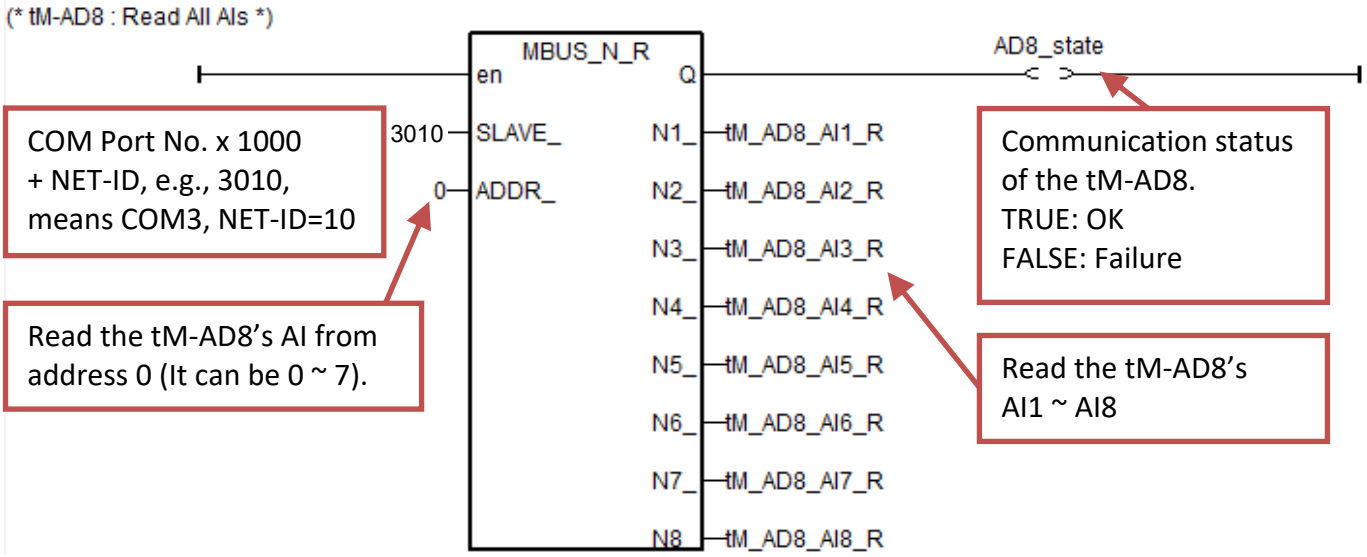


The AI values read from the tM-AD5 is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

For example, if users set the tM-AD5's "Type Code" as "8" and set the data format as "Engineering", the AI values on the right side of the "MBUS_N_R" is -10000 ~ 10000 (means "-10 V ~ +10 V").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_AD8 (8 AI)

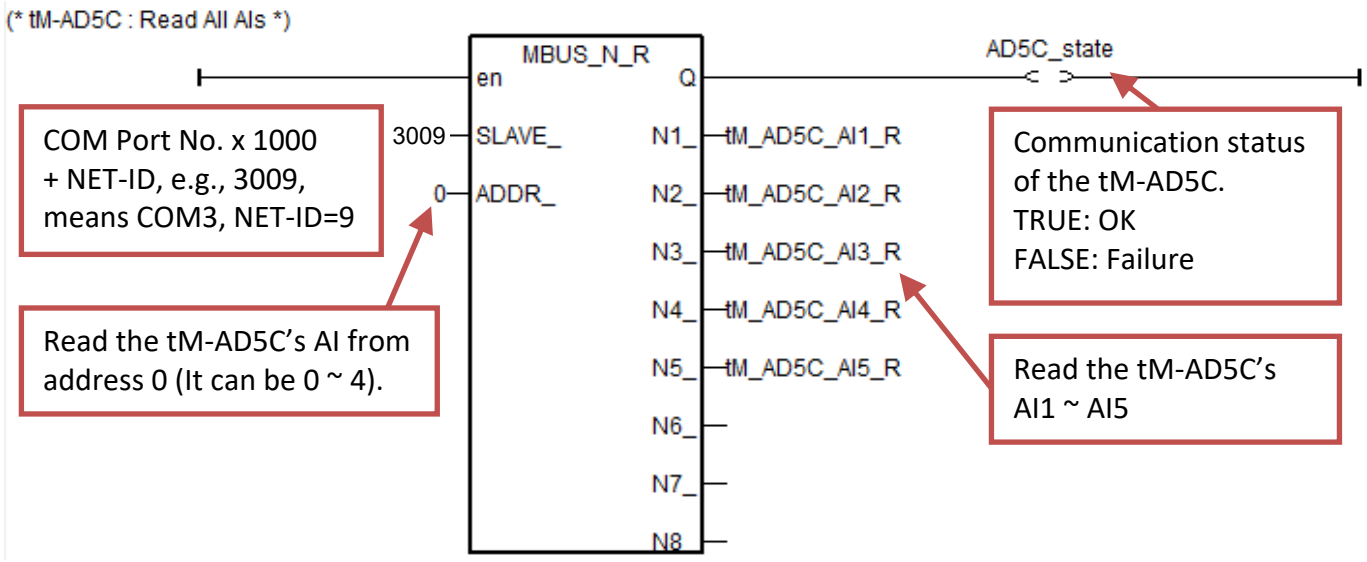


The AI values read from the tM-AD8 is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

For example, if users set the tM-AD8's "Type Code" as "8" and set the data format as "Engineering", the AI values on the right side of the "MBUS_N_R" is -10000 ~ 10000 (means "-10 V ~ +10 V").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_AD5C (5 AI)

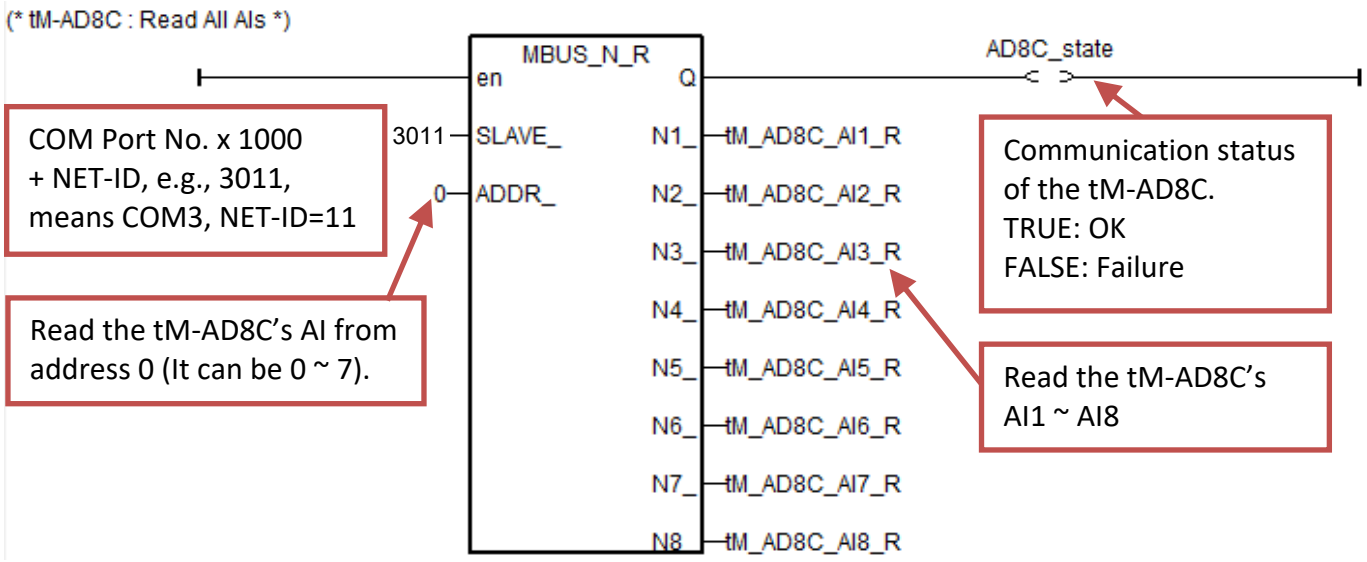


The AI values read from the tM-AD5C is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

For example, if users set the tM-AD5C's "Type Code" as "26" (Hex. = 1A) and set the data format as "Engineering", the AI values on the right side of the "MBUS_N_R" is 0 ~ 20000 (means "0 ~ +20 mA").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_AD8C (8 AI)

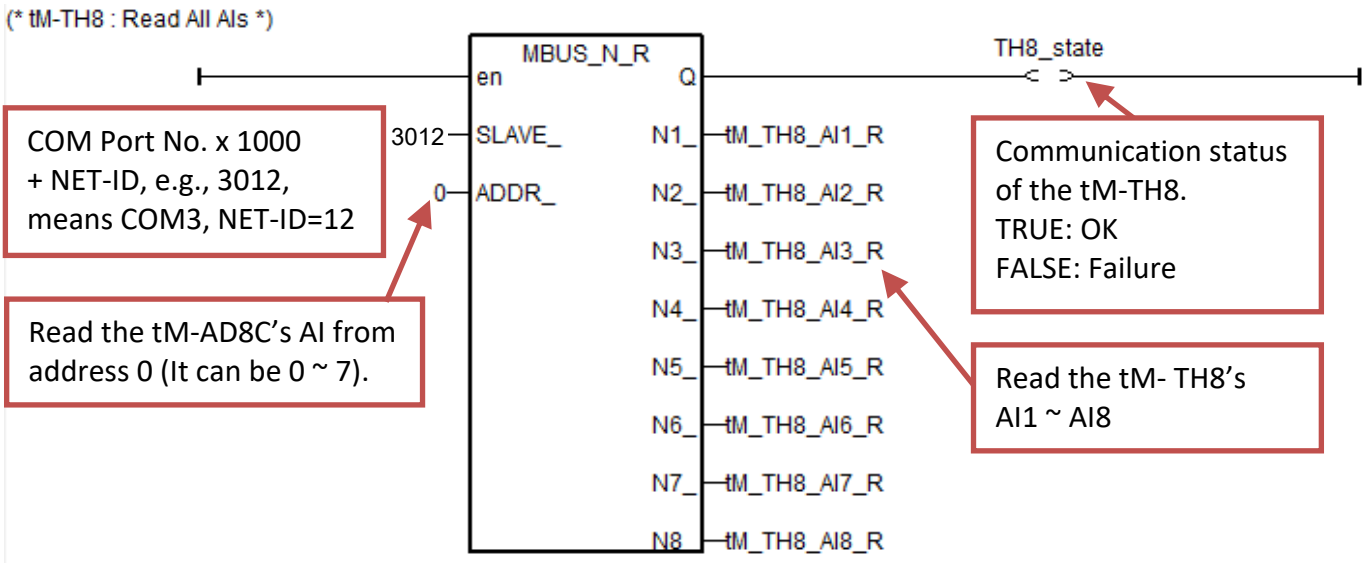


The AI values read from the tM-AD8C is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

For example, if users set the tM-AD8C's "Type Code" as "13" (Hex. = 0D) and set the data format as "Engineering", the AI values on the right side of the "MBUS_N_R" is -20000 ~ 20000 (means "-20 mA ~ +20 mA").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM_TH8 (8 AI)

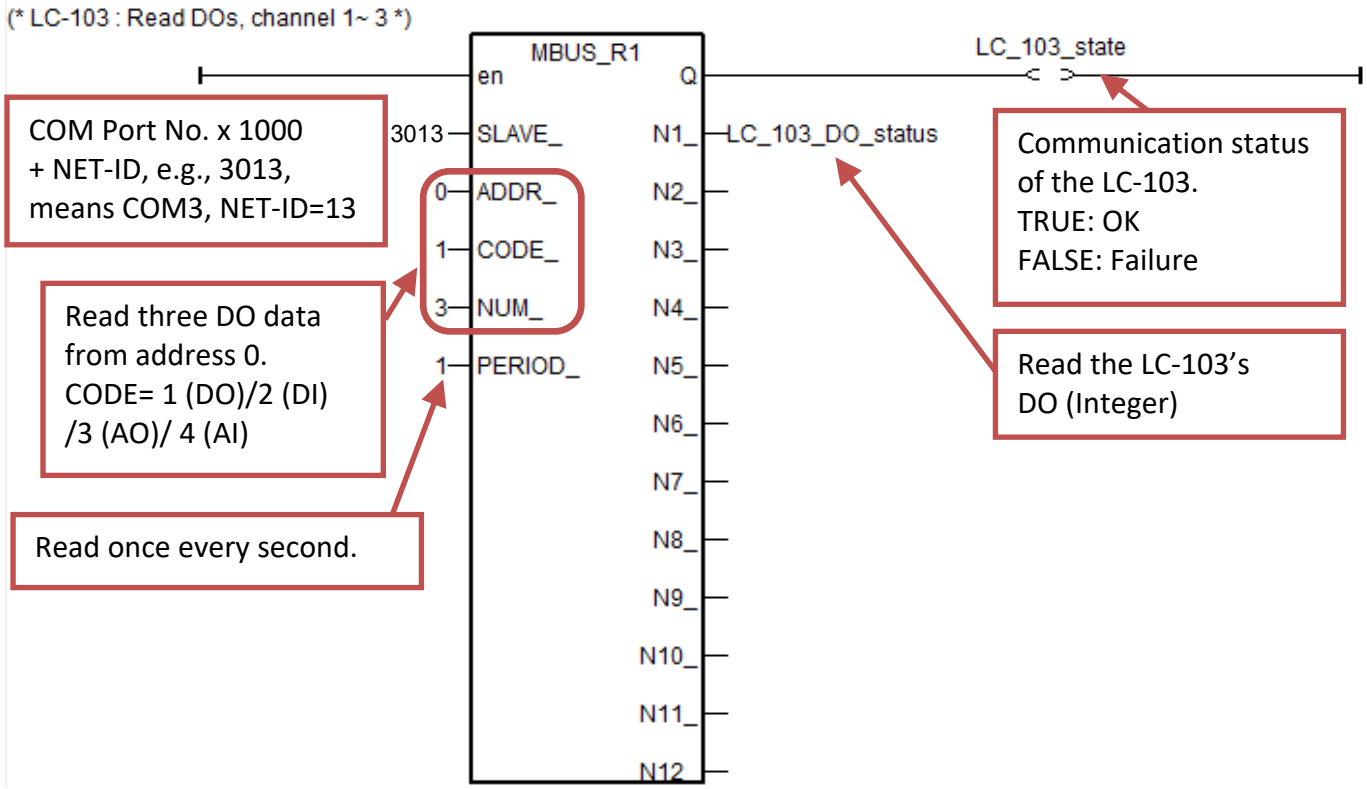


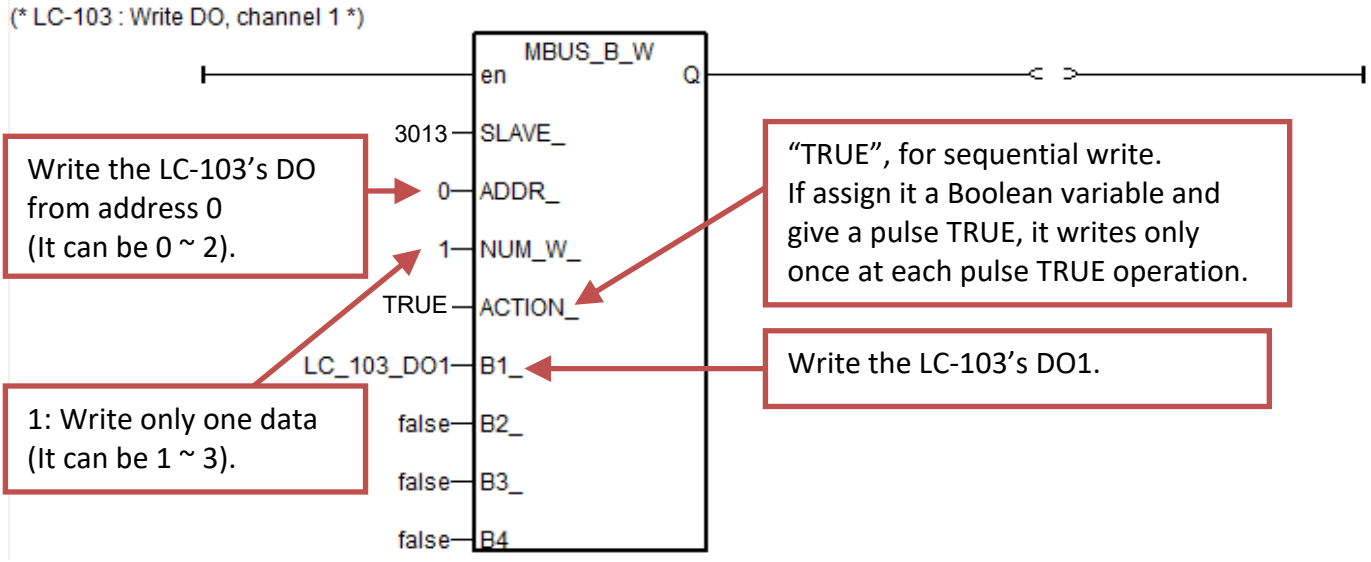
The AI values read from the tM-TH8 is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

For example, if users set the tM- TH8's "Type Code" as "96" (Hex. = 60) and set the data format as "Engineering", the AI values on the right side of the "MBUS_N_R" is -3000 ~ +24000 (means "-30 ~ 240 °F ").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

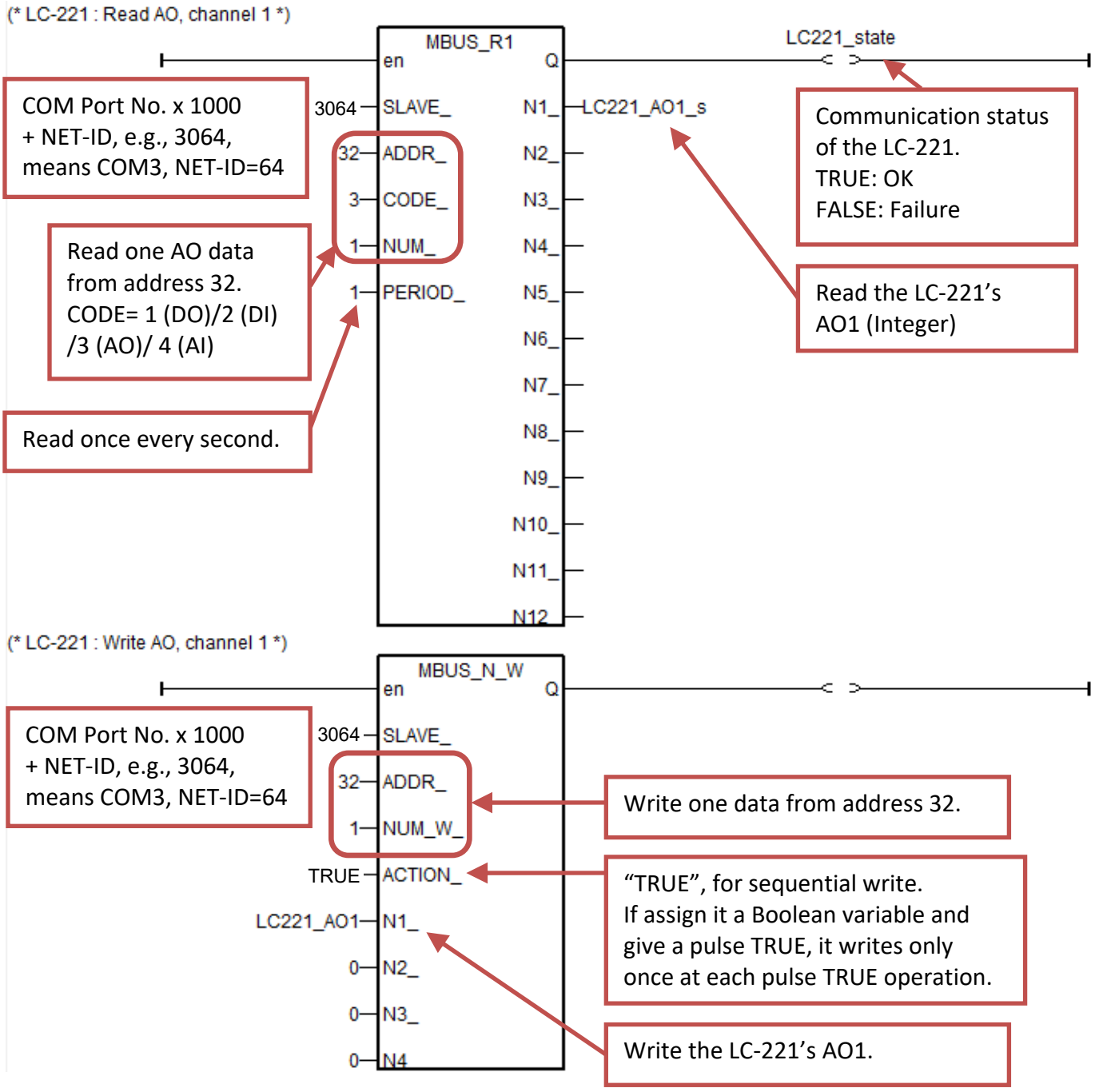
LC_103 (1 DI, 3 Relay Output)





Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

LC_221 (1 AO, 1 DI, 1 Relay Output)

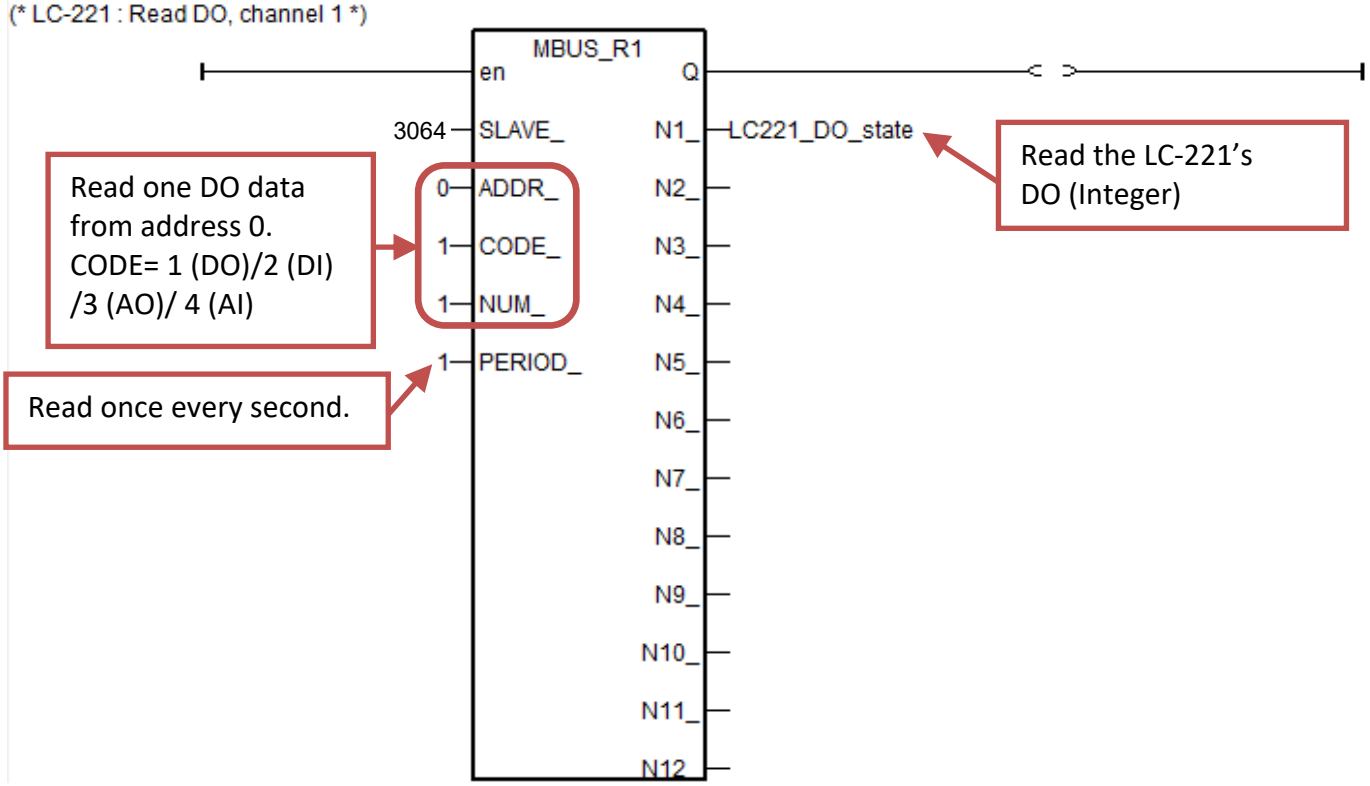


The read/write AO values of the LC-221 is associated with the "Type Code" and "Data Format" ("Engineering or 2's Complement") settings, please refer to section 1.4 Configure Information.

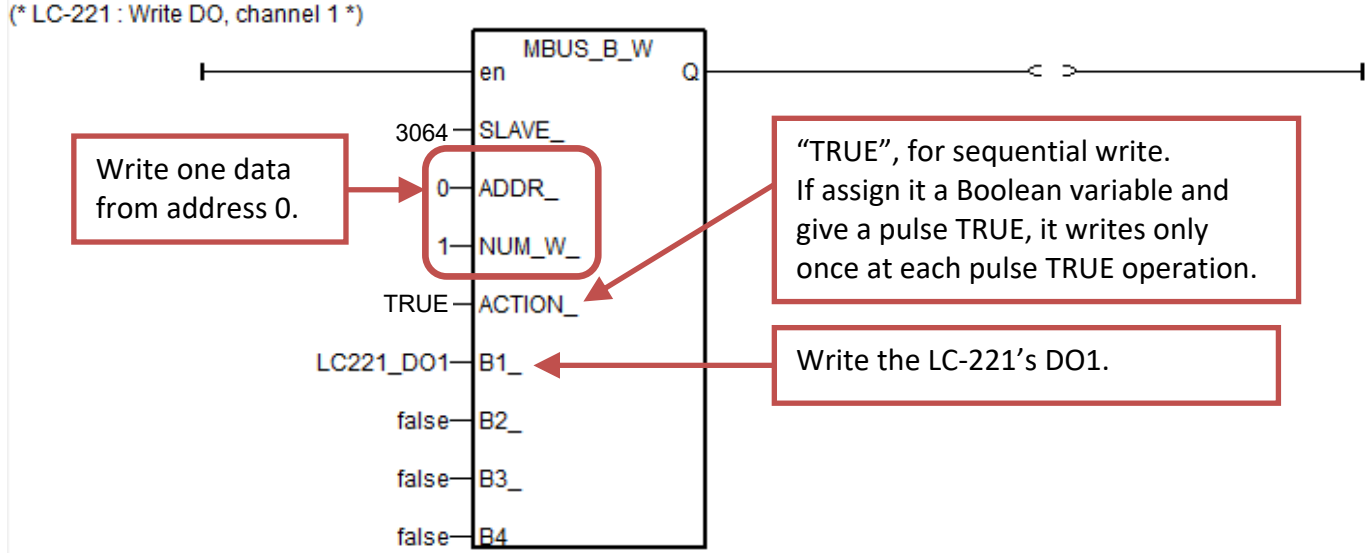
For example, if users set the LC-221's "Type Code" as "2" and set the data format as "Engineering", the AO values on the right side of the "MBUS_N_R", or on the left side of the "MBUS_N_W" is 0 ~ 10000 (means "0 ~ 10 V ").

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

(* LC-221 : Read DO, channel 1 *)



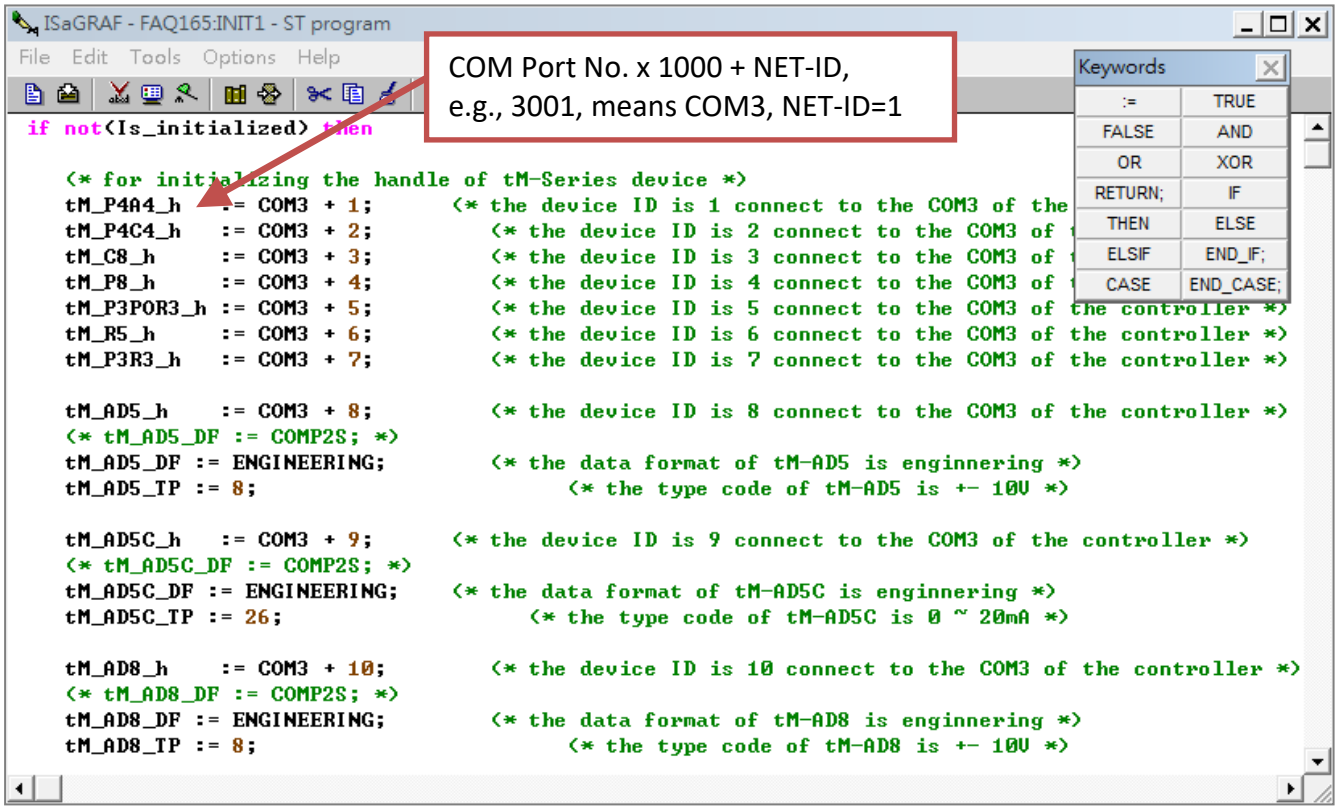
(* LC-221 : Write DO, channel 1 *)



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

ST program:

The “INIT1” program defines all the initialization conditions of the tM-series and LC-series I/O modules.



Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.4. Configuration Information

LC Series I/O

Please refer to LC-103 or LC-223 User Manual for more configuration information.
http://www.icpdas.com/en/download/show.php?num=596&nation=US&kind1=6&kind2=8&model=&kw=LC-103 LC-103 User Manual
http://www.icpdas.com/en/download/show.php?num=614&model=LC-223H LC-223 User Manual

Type Code	Output Range	Data Format	
		Engineering	2's comp (Hex.)
0	0 ~ 20 mA	0 ~ 20000	0000 ~ FFFF
1	4 ~ 20 mA	4000 ~ 20000	0000 ~ FFFF
2	0 ~ 10 V	0 ~ 10000	0000 ~ FFFF
4	0 ~ 5 V	0 ~ 5000	0000 ~ FFFF

tM Series I/O

Please refer to them-AD or TM-DIO series manual for more configuration information.
http://www.icpdas.com/en/download/show.php?num=1866&nation=US&kind1=6&kind2=8&model=&kw=tM

Type Code (Hex.)	Input Type	Data Format	
		Engineering	2's comp (Hex.)
05*1	-2.5 V ~ +2.5 V	-25000 ~ 25000	8000 ~ 7FFF
06*3	-20 mA ~ +20 mA	-20000 ~ 20000	8000 ~ 7FFF
07*3	+4 mA ~ +20 mA	4000 ~ 20000	0000 ~ FFFF
08*1	-10 V ~ +10 V	-10000 ~ 10000	8000 ~ 7FFF
09*1	-5 V ~ +5 V	-5000 ~ 5000	8000 ~ 7FFF
0A*1	-1 V ~ +1 V	-10000 ~ 10000	8000 ~ 7FFF
0B*2	-500 mV ~ +500 mV	-5000 ~ 5000	8000 ~ 7FFF
0D*3	-20 mA ~ +20 mA	-20000 ~ 20000	8000 ~ 7FFF
1A*3	0 ~ +20 mA	0 ~ 20000	0000 ~ FFFF

*1: only available with the tM-AD5 and tM-AD8
*2: only available with the tM-AD8
*3: only available with the tM-AD5C and tM-AD8C.

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

tM Series Thermistor AI

Please refer to the website for more configuration information on tM-TH8.
http://www.icpdas.com/en/product/tM-TH8

Type Code (Hex.)	Thermistor Type	Data Format	
		Engineering	2's comp (Hex.)
60	-30 ~ 240°F PreCon Type III, 10K @ 25°C ;	-3000 ~ +24000	F000 ~ 7FFF
61	-50 ~ 150°C Fenwell U, 2K @ 25°C ;	-5000 ~ +15000	D556 ~ 7FFF
62	0 ~ 150°C Fenwell U, 2K @ 25°C	0 ~ +15000	0000 ~ 7FFF
63	-80 ~ 100°C YSI L Mix, 100 @ 25°C	-8000 ~ +10000	999A ~ 7FFF
64	-80 ~ 100°C YSI L Mix, 300 @ 25°C ;	-8000 ~ +10000	999A ~ 7FFF
65	-70 ~ 100°C YSI L Mix, 1000 @ 25°C	-7000 ~ +10000	A667 ~ 7FFF
66	-50 ~ 150°C YSI B Mix, 2252 @ 25°C	-5000 ~ +15000	D556 ~ 7FFF
67	-40 ~ 150°C YSI B Mix, 3000 @ 25°C	-4000 ~ +15000	DDDE ~ 7FFF
68	-40 ~ 150°C YSI B Mix, 5000 @ 25°C	-4000 ~ +15000	DDDE ~ 7FFF
69	-30 ~ 150°C YSI B Mix, 6000 @ 25°C	-3000 ~ +15000	E667 ~ 7FFF
6A	-30 ~ 150°C YSI B Mix, 10K @ 25°C	-3000 ~ +15000	E667 ~ 7FFF
6B	-30 ~ 150°C YSI H Mix, 10K @ 25°C	-3000 ~ +15000	E667 ~ 7FFF
6C	-10 ~ 200°C YSI H Mix, 30K @ 25°C	-1000 ~ +20000	F99A ~ 7FFF
70 ~ 77	-50 ~ 150°C User-defined	-5000 ~ +15000	D556 ~ 7FFF

Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000