ABB solar inverters

Modbus RTU Register Map – Version GT05
TRIO-20.0(27.6)-TL-OUTD

Power and productivity
for a better world™

General liability warnings concerning inverter use

Please refer to the TRIO-20.0(27.6)-TL-OUTD Product Manual for complete installation instructions and product use.

ABB accepts no liability for failure to comply with the instructions for correct installation and will not be held responsible for systems upstream or downstream the equipment it has supplied. It is absolutely forbidden to modify the equipment. Any modification, manipulation, or alteration not expressly agreed with the manufacturer, concerning either hardware or software, shall result in the immediate cancellation of the warranty.

The Customer is fully liable for any modifications made to the system.

Given the countless array of system configurations and installation environments possible, it is essential to check the following: sufficient space suitable for housing the equipment; airborne noise produced depending on the environment; potential flammability hazards.

ABB will NOT be held liable for defects or malfunctions arising from: improper use of the equipment; deterioration resulting from transportation or particular environmental conditions; performing maintenance incorrectly or not at all; tampering or unsafe repairs; use or installation by unqualified persons.

ABB will NOT be held responsible for the disposal of: displays, cables, batteries, accumulators etc. The Customer shall therefore arrange for the disposal of substances potentially harmful to the environment in accordance with the legislation in force in the country of installation.

Field of use, general conditions

ABB shall not be liable for any damages whatsoever that may result from incorrect or careless operations.

You may not use the equipment for a use that does not conform to that provided for in the field of use. The equipment MUST NOT be used by inexperienced staff, or even experienced staff if carrying out operations on the equipment that fail to comply with the indications in this manual and enclosed documentation.

Intended or allowed use

This equipment is a multi string inverter designed for:
transforming a continuous electrical current (DC)
supplied by a photovoltaic generator (FV)
in an alternating electrical current (AC)
suitable for feeding into the public distribution network.

Contents

Introduction

The main purpose of this document is to describe the Modbus RTU register map for the monitoring and control of the TRIO-20.0(27.6)-TL-OUTD over an RS-485 serial line.

Modbus Register Map Version

- **Version:** GT05
- **Minimum Inverter Update Version:** "1542C" for Europe version; "1542D" for USA and Japan version

Peripheral Settings

- **Interface:** RS-485 (half duplex);
- **Baud Rate:** 2400, 4800, 9600 (default value on USA and Japan version), 19200 (default value on Europe version), 38400, 57600 or 115200bps;
- **Start bit:** 1;
- **Stop bit:** 1;
- **Parity:** No parity;
- **Data bits:** 8;

Function codes supported

- 03 (0x03) Read holding registers;
- 04 (0x04) Read input registers;
- 06 (0x06) Write single register (broadcast mode is supported);
- 16 (0x10) Write multiple registers (broadcast mode is supported).

Exception codes supported

- 01 Illegal function;
- 02 Illegal data address;
- 03 Illegal data value;
- 04 Server device failure;
- 06 Server device busy.

Registers

Holding Registers

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
0180	1	Remote on/off	0 or 1	0		Unsigned Integer	0 = Remote on; 1 = Remote off NOTE: This register can be written only if the "Remote on/off" function is enabled in the inverter.
0181	1	Reset by-hand	0 or 1	0		Unsigned Integer	Set to 1 to reset the alarms manually. After the reset, this register is reset to 0. NOTE: This register can be written only if the "Reset by-hand" function is enabled in the inverter.
0181 to 0189	9	RESERVED					
0190	1	Permanent and dynamic mode - Power ramping interval -Holds time interval used by Inverter when write commands to registers *0200*, *0202*, *0210*, *0212*, *0220*, *0222*, *0225* or *0227* are received	See Note 12	See Note 12	See Note 12	Unsigned Integer	
0191	1	Dynamic mode – Timeout – Holds initial value of countdown timer used by Inverter to time out a Dynamic Mode command of Active or Reactive Power. It is read when new values of PF or Active Power are written to registers *0200*, *0210*, *0220* or *0225* respectively.	0 to 250	2	min	Unsigned Integer	
0192 to 0197	6	RESERVED					
0198	1	Set transient options	See Note 13	See Note 13	See Note 13	Unsigned Integer	
0199	1	RESERVED					
0200	2	Dynamic Mode – Reactive Power management by fixed PF	-1.0 to -0.8 OR 0.8 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0191*, *0198* and *0299*
0202	2	Permanent Mode – Reactive Power management by fixed PF	-1.0 to -0.8 OR 0.8 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0198* and *0299*
0204	1	RESERVED					
0205	1	Permanent Mode – Reset PF to 1	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets PF setting from current value to 1 and the register value resets to 0

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
0206 to 0209	4	RESERVED					
0210	1	Dynamic Mode – Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	0 to 100	100	%	Unsigned Integer	Must be used with registers 0190, 0191, 0198 and 0299
0211	1	RESERVED					
0212	1	Permanent Mode – Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	0 to 100	100	%	Unsigned Integer	Must be used with registers 0190, 0198 and 0299
0213 to 0214	2	RESERVED					
0215	1	Permanent Mode – Reset Active Power to 100% of Nominal Power (P_{NOM})	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets Active Power setting from current value to 100% of P_{NOM} and the register value resets to 0
0216 to 0219	4	RESERVED					
0220	2	Dynamic Mode – Reactive power management; set fixed Q by conventional PF	-0.8 to 0.8	0	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0191*, *0198* and *0299*
0222	2	Permanent Mode – Reactive power management; set fixed Q by conventional PF	-0.8 to 0.8	0	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0198* and *0299*
0224	1	RESERVED					
0225	1	Dynamic Mode – Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-80 to 80	0	%	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0191*, *0198* and *0299*
0226	1	RESERVED					
0227	1	Permanent Mode – Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-80 to 80	0	%	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0190*, *0198* and *0299*
0299	1	Transient options configurable	0 to 1	0	Decimal	Unsigned Integer	Read-only register. 0 = The transient options are not configurable (holding registers *0198* and *0505*); 1 = The transient options are configurable (holding registers *0198* and *0505*)
0300	1	Heartbeat counter	0 to 65535	0	Decimal	Unsigned Integer	Increments every second. Resets to 0 automatically when reaches 65535
0301	2	Inverter – Grid Reactive Power	-	-	VAR	IEEE 32 Float	Read-only register. If the read of the Reactive Power is not supported by the inverter, returns 0xFFFFFFFF
0303	2	Inverter – Grid Voltage	-	-	V	IEEE 32 Float	Read-only register

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
0305	2	Inverter – Grid Power	-	-	W	IEEE 32 Float	Read-only register
0307	2	Inverter – Grid Current	-	-	A	IEEE 32 Float	Read-only register
0501	1	Set unit of registers 0507, 0508, 0511 and 0512 (% or ‰).	0 to 1	0	Decimal	Unsigned Integer	0 = ‰; 1 = %
0502	1	Set active mode (permanent or dynamic)	0 to 1	0	Decimal	Unsigned Integer	0 = Dynamic mode; 1 = Permanent mode
0503	1	Permanent and dynamic mode – Power ramping interval –Holds time interval used by Inverter when write commands to registers *0507*, *0508*, *0509*, *0511*, *0512* or *0513* are received	See Note 12	See Note 12	See Note 12	Unsigned Integer	
0504	1	Dynamic mode – Timeout – Holds initial value of countdown timer used by Inverter to time out a Dynamic Mode command of Active or Reactive Power. It is read when new values of PF or Active Power are written to registers *0507*, *0508* or *0509*, respectively.	0 to 250	2	min	Unsigned Integer	
0505	1	Set transient options	See Note 13	See Note 13	See Note 13	Unsigned Integer	
0506	1	Set reactive power control mode (Q fixed or PF fixed)	0 to 1	0	Decimal	Unsigned Integer	0 = PF fixed mode ; 1 = Q fixed mode
0507	1	Dynamic Mode – Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-80 to 80 OR -800 to 800	0	% OR ‰	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0299*, *0501*, *0502*, *0503*, *0504, 0505* and *0506*
0508	1	Dynamic Mode – Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	0 to 100 OR 0 to 1000	100 OR 1000	% OR ‰	Unsigned Integer	Must be used with registers 0299, 0501, 0502, 0503, 0504 and 0505
0509	2	Dynamic Mode – Reactive Power management by fixed PF	-1.0 to -0.8 OR 0.8 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with registers *0299*, *0502*, *0503*, *0504*, *0505* and *0506*
0511	1	Permanent Mode – Reactive Power management; set fixed Q by percentage of Nominal Power (P_{NOM}) in 1% steps	-80 to 80 OR -800 to 800	0	% OR ‰	Signed Integer	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with register *0299*, *0501*, *0502*, *0503*, *0505* and *0506*
0512	1	Permanent Mode – Active Power management; set Active Power expressed as percentage of Nominal Power (P_{NOM}) in 1% steps	0 to 100 OR 0 to 1000	100 OR 1000	% OR ‰	Unsigned Integer	Must be used with register 0299, 0501, 0502, 0503 and 0505
0513	2	Permanent Mode – Reactive Power management by fixed PF	-1.0 to -0.8 OR 0.8 to 1.0	1	N/A	IEEE 32 Float	Set a negative value for over-excited (capacitive injection) or a positive value for under-excited (inductive injection). Must be used with

Register address [1]	Number of registers	Register content description	Range	Default value	Unit	Data type	Notes
							register *0299*, *0502*, *0503*, *0505* and *0506*
0515	1	Reset Active Power management	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets Active Power setting from current value to 100% of P_{NOM} and the register value resets to 0
0516	1	Reset Reactive Power management	0 or 1 (Toggle bit)	0	Decimal	Unsigned Integer	When the register is written to 1, the Inverter resets PF setting from current value to 1 or Q setting from current value to 0 and the register value resets to 0

Input Registers

Inverter

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0100	1	Inverter – Start register	Decimal	Unsigned Integer	Fixed Value: **4370**
0101	1	Inverter – Map size	Decimal	Unsigned Integer	Fixed Value: **72**
0102	1	Inverter – Map Version – Major and minor version in numerical format	Decimal	Unsigned Integer	Fixed Value: **02**
0103	1	Inverter address	Decimal	Unsigned Integer	
0104	1	Inverter – Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0105	1	Inverter – Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0106	1	Inverter – Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0107	1	Inverter – Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0108	1	Inverter – Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0109	1	Inverter – Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0110	1	Inverter – Part number (PN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB PN0 | PN1 | PN2 | PN3 | PN4 | PN5
0111	1	Inverter – Part number (PN1)	Decimal (ASCII)	Unsigned Integer	
0112	1	Inverter – Part number (PN2)	Decimal (ASCII)	Unsigned Integer	
0113	1	Inverter – Part number (PN3)	Decimal (ASCII)	Unsigned Integer	
0114	1	Inverter – Part number (PN4)	Decimal (ASCII)	Unsigned Integer	
0115	1	Inverter – Part number (PN5)	Decimal (ASCII)	Unsigned Integer	
0116	1	Inverter – Model identifier	Decimal	Unsigned Integer	See Note 2
0117	1	Inverter – Country/Grid standard	Decimal	Unsigned Integer	See Note 3
0118	1	Inverter –Transformer type	Decimal	Unsigned Integer	See Note 4
0119	1	Inverter – Inverter type	Decimal	Unsigned Integer	See Note 5
0120	1	Inverter – Week production – High byte	Decimal (ASCII)	Unsigned Integer	
0121	1	Inverter – Week production – Low byte	Decimal (ASCII)	Unsigned Integer	
0122	1	Inverter – Year production – High byte	Decimal (ASCII)	Unsigned Integer	
0123	1	Inverter – Year production – Low byte	Decimal (ASCII)	Unsigned Integer	
0124	1	Inverter – States (Byte 0) – Global state	Decimal	Unsigned Integer	See Note 6

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0125	1	Inverter – States (Byte 1) – Inverter state	Decimal	Unsigned Integer	See Note 7
0126	1	Inverter – States (Byte 2) – DC/DC Channel 1 state	Decimal	Unsigned Integer	See Note 8
0127	1	Inverter – States (Byte 3) – DC/DC Channel 2 state	Decimal	Unsigned Integer	See Note 8
0128	1	Inverter – States (Byte 4) – Alarm state	Decimal	Unsigned Integer	See Note 9
0129	1	Display Board – Presence – Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0130	1	Communication Board – Presence – Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present
0131	1	Fuse Control Board – Presence – Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present Not used in –US model
0132	2	Inverter – Daily Energy	Wh	IEEE 32 Float	
0134	2	Inverter – Total Energy	kWh	IEEE 32 Float	
0136	2	Inverter – Partial Energy	kWh	IEEE 32 Float	
0138	2	Inverter – Week Energy	kWh	IEEE 32 Float	
0140	2	Inverter – Monthly Energy	kWh	IEEE 32 Float	
0142	2	Inverter – Yearly Energy	kWh	IEEE 32 Float	
0144	2	Inverter – Grid Voltage	V	IEEE 32 Float	Vgrid phase-neutral (phase R)
0146	2	Inverter – Grid Current	A	IEEE 32 Float	
0148	2	Inverter – Grid Power	W	IEEE 32 Float	
0150	2	Inverter – Frequency	Hz	IEEE 32 Float	
0152	2	Inverter – Input 1 Power	W	IEEE 32 Float	
0154	2	Inverter – Input 1 Voltage	V	IEEE 32 Float	
0156	2	Inverter – Input 1 Current	A	IEEE 32 Float	
0158	2	Inverter – Input 2 Power	W	IEEE 32 Float	
0160	2	Inverter – Input 2 Voltage	V	IEEE 32 Float	
0162	2	Inverter – Input 2 Current	A	IEEE 32 Float	
0164	2	Inverter – Inverter Temperature	°C	IEEE 32 Float	
0166	2	Inverter – Booster Temperature	°C	IEEE 32 Float	
0168	2	Inverter – Isolation Resistance	MΩ	IEEE 32 Float	
0170	2	Inverter – Wind Generator Frequency	Hz	IEEE 32 Float	

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0172	2	Inverter – Cos(φ)	N/A	IEEE 32 Float	
0174	1	Inverter – Presence – Indicates status of board to inverter	Decimal	Unsigned Integer	0= Not Present; 1= Present

Auxiliary Boards

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0250	1	Auxiliary Boards – Start register	Decimal	Unsigned Integer	Fixed Value: **8739**
0251	1	Auxiliary Board – Map size	Decimal	Unsigned Integer	Fixed Value: **117**
0252	1	Auxiliary Board – Map Version – Major and minor version in numerical format	Decimal	Unsigned Integer	Fixed Value: **02**
0253	1	RESERVED			
0254	1	Inverter – Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0255	1	Inverter – Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0256	1	Inverter – Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0257	1	Inverter – Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0258	1	Inverter – Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0259	1	Inverter – Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0260 to 0275	16	RESERVED			
0276	1	Communication Board – Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5
0277	1	Communication Board – Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0278	1	Communication Board – Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0279	1	Communication Board – Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0280	1	Communication Board – Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0281	1	Communication Board – Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0282	1	Communication Board – Part number (PN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB PN0 | PN1 | PN2 | PN3 | PN4 | PN5
0283	1	Communication Board – Part number (PN1)	Decimal (ASCII)	Unsigned Integer	
0284	1	Communication Board – Part number (PN2)	Decimal (ASCII)	Unsigned Integer	
0285	1	Communication Board – Part number (PN3)	Decimal (ASCII)	Unsigned Integer	
0286	1	Communication Board – Part number (PN4)	Decimal (ASCII)	Unsigned Integer	
0287	1	Communication Board – Part number (PN5)	Decimal (ASCII)	Unsigned Integer	
0288	1	Communication Board – Week production – High byte	Decimal (ASCII)	Unsigned Integer	
0289	1	Communication Board – Week production – Low byte	Decimal (ASCII)	Unsigned Integer	
0290	1	Communication Board – Year production – High byte	Decimal (ASCII)	Unsigned Integer	
0291	1	Communication Board – Year production – Low byte	Decimal (ASCII)	Unsigned Integer	

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0292	1	Fuse Control Board – Serial number (SN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB SN0 | SN1 | SN2 | SN3 | SN4 | SN5 Not used in –US model
0293	1	Fuse Control Board – Serial number (SN1)	Decimal (ASCII)	Unsigned Integer	
0294	1	Fuse Control Board – Serial number (SN2)	Decimal (ASCII)	Unsigned Integer	
0295	1	Fuse Control Board – Serial number (SN3)	Decimal (ASCII)	Unsigned Integer	
0296	1	Fuse Control Board – Serial number (SN4)	Decimal (ASCII)	Unsigned Integer	
0297	1	Fuse Control Board – Serial number (SN5)	Decimal (ASCII)	Unsigned Integer	
0298	1	Fuse Control Board – Part number (PN0)	Decimal (ASCII)	Unsigned Integer	Six bytes in write order: MSB.....LSB PN0 | PN1 | PN2 | PN3 | PN4 | PN5 Not used in –US model
0299	1	Fuse Control Board – Part number (PN1)	Decimal (ASCII)	Unsigned Integer	
0300	1	Fuse Control Board – Part number (PN2)	Decimal (ASCII)	Unsigned Integer	
0301	1	Fuse Control Board – Part number (PN3)	Decimal (ASCII)	Unsigned Integer	
0302	1	Fuse Control Board – Part number (PN4)	Decimal (ASCII)	Unsigned Integer	
0303	1	Fuse Control Board – Part number (PN5)	Decimal (ASCII)	Unsigned Integer	
0304	1	Fuse Control Board – Week production – High byte	Decimal (ASCII)	Unsigned Integer	Not used in –US model
0305	1	Fuse Control Board – Week production – Low byte	Decimal (ASCII)	Unsigned Integer	Not used in –US model
0306	1	Fuse Control Board – Year production – High byte	Decimal (ASCII)	Unsigned Integer	Not used in –US model
0307	1	Fuse Control Board – Year production – Low byte	Decimal (ASCII)	Unsigned Integer	Not used in –US model
0308	1	Communication Board – States (Byte 4)	Binary	Unsigned Integer	See Note 10
0309	1	Communication Board – States (Byte 5)	Binary	Unsigned Integer	
0310	1	Fuse Control Board – States (Byte 0)	Binary	Unsigned Integer	See Note 11 Not used in –US model
0311	1	Fuse Control Board – States (Byte 1)	Binary	Unsigned Integer	
0312	1	Fuse Control Board – States (Byte 2)	Binary	Unsigned Integer	
0313	1	Fuse Control Board – States (Byte 3)	Binary	Unsigned Integer	
0314	1	Fuse Control Board – States (Byte 4)	Binary	Unsigned Integer	
0315	2	Communication Board – PT100	°C	IEEE 32 Float	
0317	2	Communication Board – PT1000	°C	IEEE 32 Float	
0319	2	Communication Board – Analog Input 1	V OR mA	IEEE 32 Float	
0321	2	Communication Board – Analog Input 2	V OR mA	IEEE 32 Float	
0323	2	Communication Board – NTC	°C	IEEE 32 Float	

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
0325	2	Fuse Control Board – Voltage 1A	V	IEEE 32 Float	Not used in –US model
0327	2	Fuse Control Board – Voltage 1B	V	IEEE 32 Float	Not used in –US model
0329	2	Fuse Control Board – Voltage 1C	V	IEEE 32 Float	Not used in –US model
0331	2	Fuse Control Board – Voltage 1D	V	IEEE 32 Float	Not used in –US model
0333	2	Fuse Control Board – Voltage 1E	V	IEEE 32 Float	Not used in –US model
0335	2	Fuse Control Board – Voltage 2A	V	IEEE 32 Float	Not used in –US model
0337	2	Fuse Control Board – Voltage 2B	V	IEEE 32 Float	Not used in –US model
0339	2	Fuse Control Board – Voltage 2C	V	IEEE 32 Float	Not used in –US model
0341	2	Fuse Control Board – Voltage 2D	V	IEEE 32 Float	Not used in –US model
0343	2	Fuse Control Board – Voltage 2E	V	IEEE 32 Float	Not used in –US model
0345	2	Fuse Control Board – Voltage Ch1	V	IEEE 32 Float	Not used in –US model
0347	2	Fuse Control Board – Voltage Ch2	V	IEEE 32 Float	Not used in –US model
0349	2	Fuse Control Board – Current 1A	A	IEEE 32 Float	Not used in –US model
0351	2	Fuse Control Board – Current 1B	A	IEEE 32 Float	Not used in –US model
0353	2	Fuse Control Board – Current 1C	A	IEEE 32 Float	Not used in –US model
0355	2	Fuse Control Board – Current 1D	A	IEEE 32 Float	Not used in –US model
0357	2	Fuse Control Board – Current 1E	A	IEEE 32 Float	Not used in –US model
0359	2	Fuse Control Board – Current 2A	A	IEEE 32 Float	Not used in –US model
0361	2	Fuse Control Board – Current 2B	A	IEEE 32 Float	Not used in –US model
0363	2	Fuse Control Board – Current 2C	A	IEEE 32 Float	Not used in –US model
0365	2	Fuse Control Board – Current 2D	A	IEEE 32 Float	Not used in –US model
0367	2	Fuse Control Board – Current 2E	A	IEEE 32 Float	Not used in –US model
0369	1	Fuse Control Board – States (Byte 5)	Binary	Unsigned Integer	See Note 11 Not used in –US model

Registers Map Version

Register address [1]	Number of registers	Register content description	Unit	Data type	Notes
3650	1	Registers Map – Type	Decimal (ASCII)	Unsigned Integer	Fixed Value: **71 ('G')**
3651	1	Registers Map – Inverter family supported	Decimal (ASCII)	Unsigned Integer	Fixed Value: **84 ('T')**
3652	1	Registers Map – Major Version	Decimal (ASCII)	Unsigned Integer	
3653	1	Registers Map – Minor Version	Decimal (ASCII)	Unsigned Integer	

Notes

1. Register address range is from 1 to 65536 (PLC addresses).

2. Model identifier:

Model identifier	
Value	**Description**
89 ('Y')	TRIO-27.6-TL-OUTD-400
121 ('y')	TRIO-20-TL-OUTD-400
70 ('F')	TRIO-27.6-TL-OUTD-480
102 ('f')	TRIO-20-TL-OUTD-480

3. Country/Grid standard:

Country/Grid standard	
Value	**Description**
65 ('A')	UL1741
66 ('B')	NETHERLAND
67 ('C')	CZECH
68 ('D')	CANADA
69 ('E')	VDE 0126
70 ('F')	FRANCE LL 2013
71 ('G')	GREECE
72 ('H')	HUNGARY
73 ('I')	ENEL GUIDA
74 ('J')	CEI-016
75 ('K')	AS 4777
76 ('L')	THAILAND PEA
77 ('M')	BG C10-11 110%
78 ('N')	ROMANIA
79 ('O')	KOREA
80 ('P')	PORTUGAL
81 ('Q')	CHINA HV
82 ('R')	IRELAND
83 ('S')	SPAIN RD 1699
84 ('T')	TAIWAN
87 ('W')	BDEW
88 ('X')	DEBUG FF
89 ('Y')	TURKEY HV
90 ('Z')	BRAZIL
100 ('d')	FRANCE LL 2014
101 ('e')	VDE 4105
103 ('g')	JP 50Hz 400V
104 ('h')	JP 60Hz 400V
106 ('j')	CEI021 EX
107 ('k')	ISRAEL
108 ('l')	SINGAPORE
109 ('m')	BG C10-11 100%
110 ('n')	EN 50438
111 ('o')	CORSICA
112 ('p')	SPAIN RD 1565
113 ('q')	CHINA LV
114 ('r')	SOUTH AFRICA
115 ('s')	SLOVENIA
116 ('t')	TURKEY LV
117 ('u')	UK G59
119 ('w')	VDE 0126 3W
120 ('x')	DEBUG 88

Country/Grid standard	
Value	**Description**
121 ('y')	THAILAND MEA

4. Transformer type:

Transformer type	
Value	**Description**
78 ('N')	Transformerless version

5. Inverter type:

Inverter type	
Value	**Description**
80 ('P')	Photovoltaic version
87 ('W')	Eolic version
120 ('x')	Dummy inverter type

6. Global state:

Global state	
Value	**Description**
0	Sending Parameters
1	Wait Sun/Grid
2	Checking Grid
3	Measuring Riso
4	DC/DC Start
5	Inverter Start
6	Run
7	Recovery
8	Pause
9	Ground Fault
10	OTH Fault
11	Address Setting
12	Self-Test
13	Self-Test Fail
14	Sensor Test + Meas.Riso
15	Leak Fault
16	Waiting for manual reset
17	Internal Error E026
18	Internal Error E027
19	Internal Error E028
20	Internal Error E029
21	Internal Error E030
22	Sending Wind Table
23	Failed Sending table
24	UTH Fault
25	Remote OFF
26	Interlock Fail
27	Executing Autotest
30	Waiting Sun
31	Temperature Fault
32	Fan Staucked
33	Int. Com. Fault
34	Slave Insertion
35	DC Switch Open
36	TRAS Switch Open
37	MASTER Exclusion
38	Auto Exclusion
51	Arc fault

Global state	
Value	**Description**
53	Arc fault self-test fail
98	Erasing Internal Eeprom
99	Erasing External Eeprom
100	Counting Eeprom
101	Freeze
115	Communication loss with Communication Board
118	Arc fault wrong configuration
200	Dsp Programming

7. Inverter state:

Inverter state	
Value	**Description**
0	Stand By
1	Checking Grid
2	Run
3	Bulk OV
4	Out OC
5	IGBT Sat
6	Bulk UV
7	Degauss Error
8	No Parameters
9	Bulk Low
10	Grid OV
11	Communication Error
12	Degaussing
13	Starting
14	Bulk Cap Fail
15	Leak Fail
16	DC/DC Fail
17	Ileak Sensor Fail
18	Self-Test: relay inverter
19	Self-Test: wait for sensor test
20	Self-Test: test relay DC/DC + sensor
21	Self-Test: relay inverter fail
22	Self-Test timeout fail
23	Self-Test: relay DC/DC fail
24	Self-Test 1
25	Waiting Self-Test start
26	Dc Injection
27	Self-Test 2
28	Self-Test 3
29	Self-Test 4
30	Internal Error
31	Internal Error
40	Forbidden State
41	Input UC
42	Zero Power
43	Grid Not Present
44	Waiting Start
45	MPPT
46	Grid Fail
47	Input OC
…	…
255	Inverter DSP not programmed

8. DC/DC state:

DC/DC Channel X state	
Value	**Description**
0	DC/DC OFF
1	Ramp Start
2	MPPT
3	Not Used
4	Input OC
5	Input UV
6	Input OV
7	Input Low
8	No Parameters
9	Bulk OV
10	Communication Error
11	Ramp Fail
12	Internal Error
13	Input mode Error
14	Ground Fault
15	Inverter Fail
16	DC/DC IGBT Sat
17	DC/DC ILEAK Fail
18	DC/DC Grid Fail
19	DC/DC Comm. Error
…	…
255	DC/DC DSP not programmed

9. Alarm state:

Alarm state		
Value	**Description**	**Code**
0	No Alarm	
1	Sun Low	W001
2	Input OC	E001
3	Input UV	W002
4	Input OV	E002
5	Sun Low	W001
6	No Parameters	E003
7	Bulk OV	E004
8	Comm. Error	E005
9	Output OC	E006
10	IGBT Sat	E007
11	Bulk UV	W011
12	Internal error	E009
13	Grid Fail	W003
14	Bulk Low	E010
15	Ramp Fail	E011
16	Dc/Dc Fail	E012
17	Wrong Mode	E013
18	Ground Fault	---
19	Over Temp.	E014
20	Bulk Cap Fail	E015
21	Inverter Fail	E016
22	Start Timeout	E017
23	Ground Fault	E018
24	Degauss error	---
25	Ileak sens. Fail	E019
26	DC/DC Fail	E012
27	Self-Test Error 1	E020
28	Self-Test Error 2	E021
29	Self-Test Error 3	E019
30	Self-Test Error 4	E022

Alarm state		
Value	**Description**	**Code**
31	DC inj error	E023
32	Grid OV	W004
33	Grid UV	W005
34	Grid OF	W006
35	Grid UF	W007
36	Z grid Hi	W008
37	Internal error	E024
38	Riso Low	E025
39	Vref Error	E026
40	Error Meas V	E027
41	Error Meas F	E028
42	Error Meas Z	E029
43	Error Meas Ileak	E030
44	Error Read V	E031
45	Error Read I	E032
46	Table fail	W009
47	Fan Fail	W010
48	UTH	E033
49	Interlock fail	E034
50	Remote Off	E035
51	Vout Avg error	E036
52	Battery low	W012
53	Clk fail	W013
54	Input UC	E037
55	Zero Power	W014
56	Fan Stuck	E038
57	DC Switch Open	E039
58	Tras Switch Open	E040
59	AC Switch Open	E041
60	Bulk UV	E042
61	Autoexclusion	E043
62	Grid df/dt	W015
63	Den switch Open	W016
64	Jbox fail	W017
65	DC Door Open	E044
66	AC Door Open	E045
79	Arc fault	E050
82	Arc fault self-test fail	E053
83	Communication loss with Communication Board	E054
84	Arc fault reset by user	W026
85	Arc fault wrong configuration	E055

10. Communication Board states:

Communication Board states	
Byte	**Description**
0	NONE
1	NONE
2	NONE
3	NONE
4	- Bit 0: 0 = OTH not active; 1= OTH is active - Bit 1: 0 = Arc fault is absent; 1 = Arc fault is present - Bit 2: 0 = Arc detector failure is absent; 1 = Arc detector failure is present … - Bit 7: NONE
5	- Bit 0: 0 = SD card is absent; 1 = SD card is present - Bit 1: 0 = SD card fault; 1 = SD card is ok - Bit 2: 0 = Exp. board is absent; 1 = Exp. board is present - Bit 3: 0 = Wi-Fi board is absent; 1 = Wi-Fi board is present

Communication Board states	
Byte	**Description**
	- Bit 4: RESERVED - Bit 5: 0 = SPD DC 1 fault; 1 = SPD DC 1 card is ok - Bit 6: 0 = SPD DC 2 fault; 1 = SPD DC 2 is ok - Bit 7: 0 = SPD AC fault; 1 = SPD AC is ok

11. Fuse Control Board states:

Fuse Control Board states (Not used in -US model)	
Byte	**Description**
0	- Bit 0 : 0 = All strings are ok; 1 = One or more strings are in fault - Bit 1 : 0 = Overvoltage not active; 1 = Overvoltage is active - Bit 2 : 0 = All currents are balanced; 1 = One or more unbalanced currents - Bit 3 : 0 = Overcurrent not active; 1 = Overcurrent is active - Bit 4 : 0 = Calibration is ok; 1 = Calibration not ok - Bit 5 : 0 = EEPROM (location 1) is ok; 1 = EEPROM (location 1) not ok - Bit 6 : 0 = EEPROM (location 2) is ok; 1 = EEPROM (location 2) not ok - Bit 7 : 0 = String self-test passed; 1 = String self-test not passed
1	- Bit 0 : 0 = String 2C ok; 1 = String 2C fault - Bit 1 : 0 = String 2B ok; 1 = String 2B fault - Bit 2 : 0 = String 2A ok; 1 = String 2A fault - Bit 3 : 0 = String 1E ok; 1 = String 1E fault - Bit 4 : 0 = String 1D ok; 1 = String 1D fault - Bit 5 : 0 = String 1C ok; 1 = String 1C fault - Bit 6 : 0 = String 1B ok; 1 = String 1B fault - Bit 7 : 0 = String 1A ok; 1 = String 1A fault
2	… - Bit 6 : 0 = String 2E ok; 1 = String 2E fault - Bit 7 : 0 = String 2D ok; 1 = String 2D fault
3	- Bit 0 : 0 = Current 2C balanced; 1 = Current 2C unbalanced - Bit 1 : 0 = Current 2B balanced; 1 = Current 2B unbalanced - Bit 2 : 0 = Current 2A balanced; 1 = Current 2A unbalanced - Bit 3 : 0 = Current 1E balanced; 1 = Current 1E unbalanced - Bit 4 : 0 = Current 1D balanced; 1 = Current 1D unbalanced - Bit 5 : 0 = Current 1C balanced; 1 = Current 1C unbalanced - Bit 6 : 0 = Current 1B balanced; 1 = Current 1B unbalanced - Bit 7 : 0 = Current 1A balanced; 1 = Current 1A unbalanced
4	- Bit 0 : 0 = String 1B self-test passed; 1 = String 1B self-test not passed - Bit 1 : 0 = String 1A self-test passed; 1 = String 1A self-test not passed … - Bit 6 : 0 = Current 2E balanced; 1 = Current 2E unbalanced - Bit 7 : 0 = Current 2D balanced; 1 = Current 2D unbalanced
5	- Bit 0 : 0 = String 2E self-test passed; 1 = String 2E self-test not passed - Bit 1 : 0 = String 2D self-test passed; 1 = String 2D self-test not passed - Bit 2 : 0 = String 2C self-test passed; 1 = String 2C self-test not passed - Bit 3 : 0 = String 2B self-test passed; 1 = String 2B self-test not passed - Bit 4 : 0 = String 2A self-test passed; 1 = String 2A self-test not passed - Bit 5 : 0 = String 1E self-test passed; 1 = String 1E self-test not passed - Bit 6 : 0 = String 1D self-test passed; 1 = String 1D self-test not passed - Bit 7 : 0 = String 1C self-test passed; 1 = String 1C self-test not passed

12. Holding registers 0190 and 0503 (Power ramping interval):

    Time reference for manage the transient when a new set-point is applied.

    If 1s step is selected in the holding register *0198 or 0505*, the global value is composed by the following formula:

    (Nx1sec) + (Mx10ms)

    where N and M are the lower and higher byte:

M (10ms step) = MSB; range 0 to 99 [0s to 990ms]
N (1s step) = LSB; range 0 to 250 [0s to 250s]

If 4s step is selected in the holding register *0198 or 0505*, the global value is composed by the following formula:

(Nx4sec) + (Mx10ms)

where N and M are the lower and higher byte:

M (10ms step) = MSB; range 0 to 99 [0s to 990ms]
N (4s step) = LSB; range 0 to 62 [0s to 248s]

It defines transient duration or transient slope depending on the transient mode selected (register *0198 or 0505*).
If it is defined as duration, it represents the real duration of the transient (any variation is applied with variable slope to have a fixed duration for each delta).
If it is defined as slope, it represents the time duration of the rail to rail transient (any transient is applied with constant slope and duration related to the delta).

The default value is 15 (N=15;M=0) [60s].

13. Holding registers 0198 and 0505 (Set transient options):

    The global value is composed as follows:

    Transient step = MSB; range 0 to 1 [0 = 4s step; 1 = 1s step]
    Transient mode = LSB; range 0 or 128 [0 = Slope mode; 128 = Duration mode]

    The default value is 0 [Slope mode;4s step].

    Duration mode and 1s step may be set only if register *0299* is set to 1 (transient options configurable).

References

1. Power management: “Inv_All_ActiveReactivePowerManagement_public_rev2014-04-16.pdf”, 16/04/2014;
2. Modbus Organization: “Modbus Application Protocol Specification v1.1b3”, 26/04/2012;
3. Modbus Organization: “Modbus over Serial Line - Specification and Implementation Guide v1.02”, 20/12/2006.

Firmware versions

Modbus RTU Register Map version	Communication Board Firmware Version (First version released)	Inverter Update Version (First version released)	
		TRIO-27.6(20.0)-TL-OUTD-EU400	TRIO-27.6(20.0)-TL-OUTD-US480-JP400
GT02	E077	31213*	35313*,**
GT03	E106	1337E	-
GT04	E10A	1351A	1404B **
GT05	E10D	1542C	1542D

* Old type
** Only for USA version

Document revisions

Author	Comment	Date	Revision
Davide Pagliai	Preliminary revision.	11/12/2012	0.0
Davide Pagliai	Added the input registers from *0104* to *0109*, from *0110* to *0115*, *0116*, *0117*, *0118*, *0119*, from *0120* to *0121*, from *0122* to *0123*, *0129*, *0130*, *0131*, from *0172* to *0173*, *0174*, from *0254* to *0259*, from *0292* to *0297*, from *0298* to *0303*, from *0304* to *0305* and from *0306* to *0307*; Added the support for baud rates: 2400, 4800, 19200, 38400, 57600 and 115200 bps.	14/12/2012	0.1
Davide Pagliai	Added the holding registers *0190*, *0191*, *0200*, *0202*, *0205*, *0210*, *0212* and *0215*.	20/12/2012	0.2
Davide Pagliai	Modified the unit of input registers *0319* and *0321*; Removed in note 2 all Aurora types unsupported.	21/01/2013	0.3
Davide Pagliai	Added the holding registers from *0216* to *0227*, *0300*, from *0303* to *0307* and from *0501* to *0516*; Modified the registers map version from *GT02* to *GT03*; Modified the description of input registers 0190 and 0191; Modified the range of holding registers *0190*, *0191*, *0210* and *0212*; Modified the description of input registers *0102*, *0252* and from *3650* to *3653*; Modified the notes 6, 9 and 10.	02/07/2013	0.4
Davide Pagliai	Added the holding register 0198, 0299, 0301 and 0505; Added the notes 12 and 13; Modified the registers map version from *GT03* to *GT04*; Modified the range, the default value and the unit of holding registers *0190* and *0503*; Modified the notes of holding registers *0200*, *0202*, *0210*, *0212*, *0220*, *0222*, *0225*, *0227*, from *0507* to *0509* and from *0511* to *0513*.	30/09/2013	0.5
Davide Pagliai	Modified the range and the default value of holding registers *0508* and *0512*.	30/09/2013	0.6
Neil Christopherson	Convert to ABB Style Remove Aurora terminology Added Modbus map and firmware version information	25/7/2014	1.0
Davide Pagliai	Added the holding *register 0180*; Modified the registers map version from *GT04* to *GT05*; Modified the notes of input register *0144*; Modified the chapters *Function codes supported* and *References*.	14/10/2014	1.1
Davide Pagliai	Added the holding *register 0181*.	22/10/2014	1.2
Davide Pagliai	Modified the chapters *Modbus Register Map Version* and *Firmware versions*; Modified the notes *1*, *2*, *3* and *4*.	04/11/2014	1.3
Davide Pagliai	Modified the note *3*.	04/11/2014	1.4
Davide Pagliai	Modified the range of holding registers *0210*, *0212*, *0508* and *0512* from 5÷100 to 0÷100.	08/10/2015	1.5
Davide Pagliai	Modified the chapters *Modbus Register Map Version*, *Peripheral Settings* and *Firmware versions*.	11/02/2016	1.6

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