



**FAMILIA DE INVERSORES FOTOVOLTAICOS TRIFÁSICOS TL PARA
CONEXIÓN DIRECTA A REDES DE DISTRIBUCIÓN**

REVISION SOFTWARE DESCRIPTION

ABI1000IPB02_K

DSP SOFTWARE APPLICATION FOR 3PLAY TL M

Author:	J.N.C.
Date:	10/12/2014
Reviewed by:	A.P.L.
Review date:	26/02/20
Approved by:	F.J.A.
Approval date:	26/02/2020
File:	ABI1000IPB02_K.DOC

INDEX

1. VER._A. IMPLEMENTATION DATE: 08/07/2014 SVN:163	5
1.1 PHI VERSUS PAC AND QAC VERSUS VAC ALGORITHMS HAVE BEEN IMPROVED TO GET MORE ACCURACY.	5
1.2 LVRT (LOW VOLTAGE RIDE THROUGH) FUNCTIONALITY HAS BEEN IMPLEMENTED.....	5
1.3 NEW COUNTRIES AND NEW STANDARDS HAVE BEEN ADDED.....	5
1.4 PAC CONSUMPTION PROTECTION HAS BEEN IMPROVED TO AVOID WRONG 119 STOP EVENT GENERATION.	5
2. VER._B. IMPLEMENTATION DATE: 22/07/2014 SVN: 168	6
2.1 THE SYNCHRONIZATION WITH GRID VOLTAGE HAS BEEN IMPROVED TO ALLOW SOFT GRID CONNECTION.	6
2.2 LVRT DETECTION HAS BEEN IMPROVED.....	6
2.3 HVRT (HIGH VOLTAGE RIDE THROUGH) FUNCTIONALITY HAS BEEN IMPLEMENTED.....	6
2.4 MORE SD CARD TYPES ARE SUPPORTED.	6
3. VER._C. IMPLEMENTATION DATE: 11/12/2014 SVN: 208	7
3.1 NEW FUNCTIONS HAVE BEEN ADDED TO FACTORY PROCESS.	7
3.2 READING ERROR ON RTC HAS BEEN FIXED.	7
3.3 DC CURRENT CONTROLS HAVE BEEN IMPROVED TO GET MORE ACCURACY WHEN INPUT VOLTAGES ARE HIGH.	7
3.4 DC VOLTAGE CONTROLS HAVE BEEN CHANGED TO GET MORE STABILITY DURING AND AFTER LVRT EVENT.	7
3.5 NEW COUNTRIES AND NEW STANDARDS HAVE BEEN ADDED.....	7
3.6 NEW SLAVE ID SPECIFICATION HAS BEEN IMPLEMENTED.....	7
3.7 SOFTWARE UPDATE FUNCTIONALITY HAS BEEN IMPROVED.	8
3.8 ISOLATION RESISTANT CALCULATION HAS BEEN IMPROVED.	8
3.9 MORE SD CARD TYPES ARE SUPPORTED.	8
4. VER._D. IMPLEMENTATION DATE: 19/01/2015 SVN: 208 MODIFIED.....	9
4.1 RESET ERROR WITH CEI016 AND CEI021 HAS BEEN FIXED.	9
5. VER._E. IMPLEMENTATION DATE: 30/04/2015 SVN: 238.	10
5.1 SELF CONSUMPTION RATIO MEASUREMENT HAS BEEN ADDED TO ONLINE DATA VALUES.....	10
5.2 ERROR IN SLAVE ID COMMAND HAS BEEN FIXED.	10
5.3 3PLAY TLM U INVERTER HAS BEEN ADDED TO ABI1000 FIRMWARE.....	10
5.4 ISOLATION RESISTANT CALCULATION HAS BEEN IMPROVED.	10
5.5 AC CURRENT CONTROL HAS BEEN IMPROVED.....	10
5.6 POWER CONSUMPTION STOP EVENT HAS BEEN IMPROVED FOR SELF-CONSUMPTION MODE.	10

5.7	NEW PARAMETERS CAN BE CHANGED BY DISPLAY: V/F LIMITS, COSPHI AND SINPHI SIGN VALUES.	10
5.8	V/F LIMITS INITIALIZATION HAS BEEN FIXED.	11
5.9	MODBUS INPUTS AND HOLDINGS ARE CHANGED TO ANSWER TO ANY REGISTER SIZE FILLING WITH FF REST OF BUFFER.	11
5.10	NEW FUNCTIONALITY HAS BEEN ADDED TO ALLOW DISPLAY LOCKING AND UNLOCKING.	11
5.11	NEW DATALOGGER VERSION AND PROTOCOL FOR INCREASING TRANSMISSION SPEED.	11
5.12	GRID STANDARDS HAVE BEEN ACTUALIZED.	11
6.	VER._F. IMPLEMENTATION DATE: 02/06/2015 SVN: 245.....	13
6.1	SAVING CONFIGURATION ERROR HAS BEEN FIXED.	13
6.2	COMMUNICATION ERROR HAS BEEN FIXED.	13
7.	VER._G. IMPLEMENTATION DATE: 11/11/2015 SVN:275.....	14
7.1	DATALOGGER WRITING AND READING HAVE BEEN IMPROVED.....	14
7.2	POWER REDUCTION REASON INDICATION HAS BEEN FIXED.	14
7.3	DC OVER-CURRENT LIMITATION HAS BEEN IMPROVED	14
7.4	ACCIDENTAL STRING KIT ACTIVATION HAS BEEN FIXED.	14
7.5	SD COMMUNICATION ERROR HAS BEEN FIXED.	14
7.6	WARNING INDICATION HAS BEEN ADDED WHEN THE INVERTER HAS A TEMPERATURE POWER REDUCTION.	15
7.7	POWER RELAYS TEST HAS BEEN IMPROVED TO GIVE MORE INFORMATION.	15
7.8	MORE SD CARD TYPES ARE SUPPORTED.	15
7.9	PHI COSINE AND PHI TANGENT VALUES HAVE BEEN INCREASED.	15
7.10	ID SELECTION FOR THE SECOND SERIAL COMMUNICATION PORT HAS BEEN ADDED.	15
7.11	GRID STANDARDS HAVE BEEN ACTUALIZED.	15
8.	VER._H. IMPLEMENTATION DATE: 29/12/2015 SVN:277	16
8.1	THE INVERTER ON EMS WORKING MODE COULDN'T INJECT ACTIVE POWER.....	16
9.	VER._I. IMPLEMENTATION DATE: 23/02/2016 SVN:282.....	17
9.1	TEMPERATURE POWER REDUCTION HAS BEEN IMPROVED.	17
9.2	OPTIMAL BUS VOLTAGE CALCULATION HAS BEEN IMPROVED.....	17
9.3	REACTIVE POWER CONTROL HAS BEEN IMPROVED TO GET MORE ACCURATE.....	17
9.4	I2C COMMUNICATION HAS BEEN IMPROVED.	17
9.5	RESET TO DEFAULT HAS BEEN FIXED.	17
9.6	SCOPE MODBUS COMMUNICATION HAS BEEN UPDATED TO RTU STANDARD.....	17
9.7	NOMINAL VAC WRITING HAS BEEN PROTECTED THROUGH MODBUS COMMUNICATION.	17
9.8	GRID STANDARDS HAVE BEEN ACTUALIZED.	18

10.	VER._J. IMPLEMENTATION DATE: 13/05/2016 SVN:287	19
10.1	NEW 33-40 kW FAMILY COMPATIBILITY.	19
11.	VER._K. IMPLEMENTATION DATE: 10/10/2016 SVN:294	20
11.1	PAC VS VAC ALGORITHM HAS BEEN ADDED.	20
11.2	AUXILIARY DIGITAL INPUT CONFIGURATION HAS BEEN ADDED TO ALLOW ON/OFF PURPOSE.	20
11.3	3 COUNTRIES HAVE BEEN ADDED TO DISPLAY MENU.	20
11.4	GRID STANDARDS HAVE BEEN ACTUALIZED.	20
12.	VER._L. IMPLEMENTATION DATE: 04/01/2018 SVN:303.....	21
12.1	VIN WORKING MODE HAS BEEN ADDED.	21
12.2	1 AND 2 DIGITAL INPUTS CONFIGURATION HAS BEEN ADDED TO ALLOW ON/OFF PURPOSE.	21
12.3	NEGATIVE STRING CURRENT MONITORING HAS BEEN FIXED.	21
12.4	IDC GRID INJECTION DETECTION HAS BEEN IMPROVED.	21
12.5	GRID STANDARDS HAVE BEEN ACTUALIZED.	21
13.	VER._M. IMPLEMENTATION DATE: 13/03/2019 SVN:325.....	22
13.1	H3 AND L3 VAC/FAC LEVELS HAVE BEEN ADDED.....	22
13.2	POWER FACTOR TRAKING HAS BEEN IMPROVED.	22
13.3	EMS PLANT CONTROLLER FUNCTIONALITY HAS BEEN ADDED.	22
13.4	51 SE WITH PV LOW POWER HAS BEEN FIXED.	22
13.5	STANDARD NRS097 UPDATED.....	22
13.6	STANDARD ALLEGATO A68 ADDED	22
14.	VER._N. IMPLEMENTATION DATE: 26/02/2020 SVN:332	23
14.1	NEW STANDARDS ADDED	23

1. VER._A. IMPLEMENTATION DATE: 08/07/2014 SVN:163

- 1.1 Phi versus Pac and Qac versus Vac algorithms have been improved to get more accuracy.
- 1.2 LVRT (Low Voltage Ride Through) functionality has been implemented.
- 1.3 New countries and new standards have been added
- 1.4 PAC consumption protection has been improved to avoid wrong 119 stop event generation.

2. VER._B. IMPLEMENTATION DATE: 22/07/2014 SVN: 168

2.1 **The synchronization with grid voltage has been improved to allow soft grid connection.**

2.2 **LVRT detection has been improved.**

Unstable grids caused wrong LVRT detections. This detection has been hardened to avoid that situation.

2.3 **HVRT (High Voltage Ride Through) functionality has been implemented**

2.4 **More SD card types are supported.**

3. VER._C. IMPLEMENTATION DATE: 11/12/2014 SVN: 208

3.1 New functions have been added to factory process.

3.2 Reading error on RTC has been fixed.

When SD card was inserted, RTC communications were stopped for a short time. If the inverter tried to read the RTC during that situation we could see wrong time on the screen.

3.3 DC current controls have been improved to get more accuracy when input voltages are high.

3.4 DC voltage controls have been changed to get more stability during and after LVRT event.

3.5 New countries and new standards have been added.

UL, DIESEL GRID, STUDER, MEA, G59_3...

3.6 New SLAVE ID specification has been implemented.

Information available on Slave ID command:

- BYTE COUNT.
- SLAVE ID.
- RUN INDICATOR STATUS.
- SERIAL NUMBER.
- FW VERSION.
- STRING KIT CODE.
- UNIT FLAGS 1.
- FW BOOT VERSION.
- DISPLAY FW VERSION.
- DISPLAY FW BOOT VERSION.

3.7 Software update functionality has been improved.

New functions and display screenshots have been added to inform about the final estate of the update process.

3.8 Isolation resistant calculation has been improved.

When the stray capacitance of PV field was too big the measurement process could not end. The result was that the inverter never connected to grid. That situation has been fixed.

3.9 More SD card types are supported.

4. VER._D. IMPLEMENTATION DATE: 19/01/2015 SVN: 208 MODIFIED

4.1 Reset error with CEI016 and CEI021 has been fixed.

Continuous inverter reset has been fixed when we try to update to ABI1000_C with CEI016 or CEI021 selected.

5. VER._E. IMPLEMENTATION DATE: 30/04/2015 SVN: 238.

5.1 Self consumption ratio measurement has been added to onlineData values.

5.2 Error in SLAVE ID command has been fixed.

Sometimes the answer to SLAVE ID command had no value for DISPLAY FW VERSION and DISPLAY FW BOOT VERSION fields. All fields in SLAVE ID answer are correct now.

5.3 3Play TLM U inverter has been added to ABI1000 firmware.

Now ABI1000 firmware can recognize 3Play TLM U serial numbers and works properly with these inverters.

5.4 Isolation resistant calculation has been improved.

New method for isolation resistant calculation has been implemented. This method allows faster connection.

5.5 AC current control has been improved.

Now the firmware recognizes all inverter models and adjusts the AC current control parameters for each of them.

5.6 Power consumption stop event has been improved for self-consumption mode.

This improvement avoids continuous disconnections when the inverter limits to values close to zero.

5.7 New parameters can be changed by display: V/F limits, cosPhi and sinPhi sign values.

These values are located in advanced settings menu.

5.8 V/F limits initialization has been fixed.

There are some grid standards that have more restricted V/F limits when a grid failure occurs. The inverter started with restricted V/F limits when it turned on and no grid failure was occurred. This initialization has been fixed in this version.

5.9 ModBus Inputs and Holdings are changed to answer to any register size filling with FF rest of buffer.

Before this change, the inverter rejected all frames that requested more data than the ones that were defined.

5.10 New functionality has been added to allow display locking and unlocking.

When the inverter display is locked only main screen and graphs are available.

5.11 New DATALOGGER version and protocol for increasing transmission speed.

These new features have been described on AAA0030IMB01_E.

All stored data is deleted when datalogger version changes. You have to download the datalogger before the firmware upgrading to avoid losing it.

Downgrading is not allowed. Datalogger will stop working if downgrading is done from _E to any older version.

5.12 Grid Standards have been actualized.**5.12.1 CEI_021 is deleted and CEI_021_SPI_INTERNO and CEI_021_SPI_ESTERNO have been created.**

When inverters with CEI_021 selected are updated CEI_021_SPI_INTERNO are automatically selected. New command "Comando locale" has been created.

5.12.2 VacL1 value for BHARAT standard has been fixed.

It has to be 90% but it was 9%.

5.12.3 PvsF algorithm has been configured correctly for all standards.

VDE4105_13800S, VDE4105_UP13800S, CEI_021_SPI_INTERNO, CEI_021_SPI_ESTERNO, CEI_016, ABNT_16149_6KW, ABNT_16149_UP6KW ACLINK and STUDER.

5.12.4 LVRT is disabled for UL1741 standard.**5.12.5 VacH1 value for CEI_021_SPI_ESTERNO has been changed.**

The value is changed from 200% to 140%.

5.12.6 UNE standard is deleted and RD+UNE standard has been created.

When inverters with UNE selected are updated RD+UNE are automatically selected.

6. VER._F. IMPLEMENTATION DATE: 02/06/2015 SVN: 245.**6.1 Saving configuration error has been fixed.**

If the inverter had a date prior to 2014 it did not keep configuration changes. Now any date is valid to store the configuration.

6.2 Communication error has been fixed.

Ver_E has a buffer overflow on the second RS-485 communication. The overflow happens only with specific frames. Nowadays, this communication line is used to communicate with the wattmeter on self consumption mode, but it can be used as normal communication. It is highly recommended to upgrade to this revision.

7. VER._G. IMPLEMENTATION DATE: 11/11/2015 SVN:275

7.1 Datalogger writing and reading have been improved.

Some records were wrong when the inverter tried to store data at the same time the minute changed. Also communication protocol has been improved to avoid Ingecon Sun Manager errors (TX_ENDED, Total data mismatch, ...) during the data download.

7.2 Power reduction reason indication has been fixed.

In online data there are two fields to communicate the power reduction ratio and reason. Some reason indications were wrong. When the reason was reduction by communications, the inverter showed manual reduction. And when the inverter was in EMS self consumption mode the reason was self consumption reason. But self consumption reason is only for self-limited mode. The indication for EMS mode is communication reason.

7.3 DC over-current limitation has been improved

The inverter calculates a minimum input voltage to limit input current. This limitation worked very well when the inverter was connected to a solar panel. But when the inverter is connected to a power supply there are situations in which the inverter does not limit correctly. The current limitation has been improved to avoid it.

7.4 Accidental string kit activation has been fixed.

When the user has an inverter without string kit and enters in string kit display menu the configuration options are filled by default values. Default values activate the kit. If the user navigates through the screens and he changes nothing (very normal situation) default values are sent. Now default values deactivate the kit.

7.5 SD communication error has been fixed.

Ver_F has a buffer overflow on SD communication. The overflow happens only with specific files and in specific situations. It is highly recommended to upgrade to this revision.

7.6 **Warning indication has been added when the inverter has a temperature power reduction.**

7.7 **Power relays test has been improved to give more information.**

7.8 **More SD card types are supported.**

7.9 **Phi cosine and phi tangent values have been increased.**

On previous versions the phi cosine value was limited to:

$$1.0 \leq \cos\Phi \leq 0.8, \quad -0.8 \leq \cos\Phi \leq -1.0$$

The new values are:

$$1.0 \leq \cos\Phi \leq 0.001, \quad -0.001 \leq \cos\Phi \leq -1.0$$

On previous versions the phi tangent value was limited to:

$$0.75 \leq \tan\Phi \leq -0.75.$$

The new values are:

$$1.0 \leq \tan\Phi \leq -1.0.$$

7.10 **ID selection for the second serial communication port has been added.**

There is a new option on display menu to allow ID selection for second serial port. Also there is the old option to do this selection by serial communication.

7.11 **Grid Standards have been actualized.**

- CEI021 INTERNAL SPI, CEI021 EXTERNAL SPI, CEI016 has been updated.
- DEWA INTEGRATED IPS and DEWA EXTERNAL IPS regulations have been added.
- UNITED ARAB EMIRATES country has been added.
- STUDER label has been deleted. STUDER on country selection has been changed to EXTERNAL and STUDER on regulation selection has been changed to STAND ALONE.

8. VER._H. IMPLEMENTATION DATE: 29/12/2015 SVN:277**8.1 The inverter on EMS working mode couldn't inject active power.**

When the inverter lost the communication with EMS the active power limitation was set to zero. But when the inverter recovered the communication, the active power limitation continued being zero.

This error has been fixed and now, when the inverter recovers the communication, the active power limitation has the EMS reference value.

9. VER._I. IMPLEMENTATION DATE: 23/02/2016 SVN:282

9.1 Temperature power reduction has been improved.

Temperature reduction actions are more accurate to avoid output power oscillations.

9.2 Optimal bus voltage calculation has been improved.

The function that calculates optimal bus voltage has been improved to allow working with grids with significant harmonics.

9.3 Reactive power control has been improved to get more accurate.

When the output current was rounded the maximum value, reactive power control was a little bit imprecise. The control has been improved to avoid this situation.

9.4 I2C communication has been improved.

Error detection and error handling has been changed to allow higher speed communication.

9.5 Reset to default has been fixed.

When a reset to default was executed, standard grid configuration still had the previous values. This is meant that the inverter could connect without any regulation selected. Now the inverter sets the standard grid configuration to not connected values.

9.6 SCOPE modBus communication has been updated to RTU standard.

Now SCOPE configuration and buffers can be reading and writing using modbus RTU frames. This change allows using SCOPE functions with Ingecon Sun Manager.

9.7 Nominal VAC writing has been protected through modbus communication.

If the new nominal Vac value is out of range the value is discarded.

9.8 Grid Standards have been actualized.

- NETBILLING has been added.
- NT has been updated to 30 September 2015.
- Default current value during LVRT has been updated to inject exactly what each regulation sets.

10. VER._J. IMPLEMENTATION DATE: 13/05/2016 SVN:287**10.1 New 33-40 kW family compatibility.**

The FW is compatible with the new 33-40 kW hardware family.

11. VER._K. IMPLEMENTATION DATE: 10/10/2016 SVN:294**11.1 Pac vs Vac algorithm has been added.**

Pac vs Vac algorithm reduces active power injection when grid voltage is increasing. The power reduction ratios and the grid voltage values are configurable.

11.2 Auxiliary digital input configuration has been added to allow on/off purpose.

Auxiliary digital input can be configured to start and to stop the inverter. This input can be used, for example, to fulfill with Australian regulation, working as DRMO command.

11.3 3 countries have been added to display menu.

New Zealand, El Salvador and Egypt have been added to “country regulation” display menu.

11.4 Grid Standards have been actualized.

- BDEW has been added in WORLDWIDE menu.
- FRANCE HV has been added in WORLDWIDE menu.
- PANAMA GRID CODE has been added in WORLDWIDE menu.
- N20 has been added in WORLDWIDE menu.
- AS4777 has been updated to 2015 revision.
- AS4777 NEW ZEALAND has been added.
- EL SALVADOR has been added.
- EGYPTERA has been added.

12. VER._L. IMPLEMENTATION DATE: 04/01/2018 SVN:303**12.1 VIN working mode has been added.**

VIN working mode can be selected by operation configuration register.

12.2 1 and 2 digital inputs configuration has been added to allow on/off purpose.

1 and 2 digital input can be configured to start and to stop the inverter.

12.3 Negative string current monitoring has been fixed.

Now the string kit only can measure positive currents.

12.4 IDC grid injection detection has been improved.

Idc grid injection detection has been improved to avoid wrong stops.

12.5 Grid Standards have been actualized.

CEI021: 2016-07 + V1:2017-07.

CEI016: 2014 + V1:2014 + V2:2016 + V3:2017.

13. VER._M. IMPLEMENTATION DATE: 13/03/2019 SVN:325**13.1 H3 and L3 VAC/FAC levels have been added.**

Levels H3 and L3 for VAC and FAC limits disconnection have been added. From now there are 3 levels for high limit checking and 3 levels for low limit checking.

13.2 Power factor tracking has been improved.

PHI cosine control is more precise getting the target. Some power oscillations have been solved.

13.3 EMS plant controller functionality has been added.

Now the inverter is able to receive EMS plant controller holding register values describing in AAA003IMB10 document.

13.4 51 SE with PV low power has been fixed.

The inverter tried to connect to grid with any VDC voltage. In this situation the electronic could have unknown behavior. Now the inverter checks all time the input voltage and do nothing if the value is under stop limit.

13.5 Standard NRS097 updated

The configuration values of the standard NRS097 have been updated to revision of 2017.

13.6 Standard Allegato A68 added

Now the Italian standard Allegato A68 is available.

14. VER._N. IMPLEMENTATION DATE: 26/02/2020 SVN:332**14.1 New standards added**

- RD1699_CANARIAS.
- RD1699_CANARIAS_PO12_3.