



ELETRONICA PROFESSIONALE
PROFESSIONAL ELECTRONICS



CPS & TPS PROTOCOL ELETTRATEST

EN

USER MANUAL

**READ AND SAVE
THESE INSTRUCTIONS**

**LEGGI E CONSERVA
QUESTE ISTRUZIONI**

CPS & TPS Models covered in this manual:

Model	Code
TPS/M 1500	99111103
TPS/M 3000	99111253
TPS/M 6000	99111503
TPS/M 9000	99111653
TPS/T 10KW	99110547
TPS/T 20KW	99110557
TPS/T 40KW	99110585
TPS/T 90KW	99110600
TPS/T 60KW 50K120S	99116523
HPS HIGH POWER SUPPLY 60KVA	99116553
HPS HIGH POWER SUPPLY 100KVA	99116803
HPS HIGH POWER SUPPLY 200KVA	99116953
HPS HIGH POWER 200KVA PAR	99116963
CPS/M 1000VA	99112103
CPS/M 2.5 KW	99112153
CPS/M 5KW	99110751
CPS/M 10KVA	99110755
CPS/T 5KVA	99110770
CPS/T 10KVA	99110780
CPS/T 20KVA	99110790
CPS/T 40KVA	99110800

This manual is written from CPSx firmware revision 014_ and TPSx firmware version 014_.

Please check the latest manual version at www.elettrotestspa.it

To consult older manual versions, please contact our support at service@elettrotestspa.it

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1. INTRODUCTION

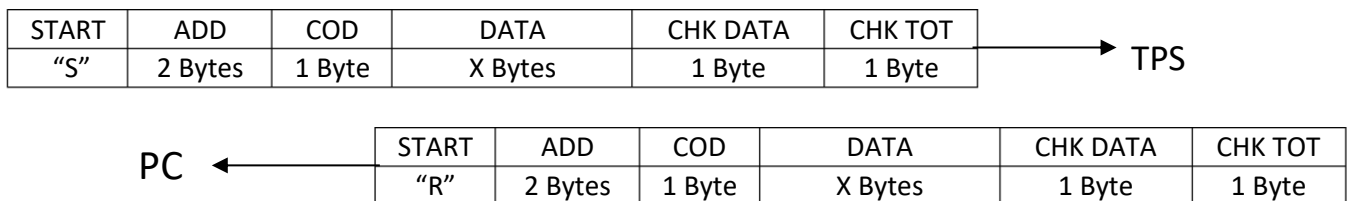
This manual is written for **CPS firmware version CPSX 014_** and **TPS firmware version TPSX 014_** and higher.

To consult older manual versions, please contact our support at service@elettrotestspa.it

This manual is written for both single-phase and three-phase generators. For machines that have only the single-phase version, or when using a three-phase machine in single-phase mode, consider only phase R and ignore the parts of this document that concern phases S and T.

1.1. TPS SERIAL PROTOCOL

The structure of the protocol is a typical master slave system



2. COMMUNICATION PACKET

Down you can find the structure of the communication packet

START	ADD	COD	DATA	CHK DATA	CK TOT
1 Byte	2 Byte	1 Byte	X Byte	1 Byte	1 Byte

START: Start byte of the packet and it can be:

- "S" when the packet is sent to the TPS.
- "R" when the packet is received from the TPS.

ADD: Two address bytes, at the moment those bytes are *not used*.

COD: It is the code of the packet

DATA Data part of the packet.

CHK DATA: It is the CHKSUM of the data part and It is the least significant byte of the sum of data bytes.

CHK TOT: It is the CHKSUM of all packet and it is the least significant byte of the sum of all bytes of the packet.

3. LIST OF PACKETS OF THE PC

3.1. INIT (1) (7 bytes)

With this packet it is possible to read the current state of your CPS/TPS. The CPS/TPS sends back the [ECHO packet](#) or, in case of some problems, the [ACK packet](#).

The Init packet is:

INIT PACKET					
START (1 Byte)	ADD (2 Bytes)	COD (1 Byte)	DATA (1 Byte)	CHK DATA (1 Byte)	CHK TOT (1 Byte)
"S"	00	1	0	0	1 Byte

3.2. ACQ (2) (9 bytes)

With this packet is possible to acquire some data from your CPS/TPS. The CPS/TPS sends back the [RISP packet](#) or, in case of some problems, the [ACK packet](#).

The ACQ packet is:

INIT PACKET					
START (1 Byte)	ADD (2 Bytes)	COD (1 Byte)	DATA (1 Byte)	CHK DATA (1 Byte)	CHK TOT (1 Byte)
"S"	00	2	A B C	X	1 Byte

Bytes B and C for future use

Byte A:

- 0: Nothing.
- 1: Request of setting voltage.
- 2: Request of output voltage.
- 3: Request of output current (when the TPS can measure it).
- 4: Request of phase.
- 5: Request of frequency.
- 6: Request of alarms.
- 7: Request of mode.
- 8: Request of revision and code of the machine.
- 9: Request of options installed
- 10: Request of the range.
- 11: Request of the waveform.
- 12: Request of instantaneous alarms
- 13: Request busy state of the machine
- 14: Output current in [A/1000]
- 20: Serial Number

3.3. SET_MD (3) (8 bytes)

With this command it is possible to set the functional mode of your CPS/TPS. The power supply sends back the [ACK packet](#).

SET_MD PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (2B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	3	A B	X	1 Byte

A BYTE							
7	6	5	4	3	2	1	0
Range	Sense	Mono	Sink	DC	Remote	OUT	INRSH

Mode	0	1
RANGE ¹	Low	High
SENSE	2-Wire	4-Wire
MONO ²	Single Phase	Three Phase
SYNC ³	Line	Internal
DC ⁴	AC	DC
REMOTE	Local	Remote
OUT ⁵	Out Relay Off	Out Relay On
INRUSH ⁶	Continuous	Inrush

The commands with "x" are not enabled in the TPS/M/D or TPS/T/D power supply series.

Byte B: for future use.

- *) DC setting is allowed if Sync=Internal and Range=High.
- *) In DC, it is not allowed to set Sync=Line and Range=Low.

¹ Only with the double range machine

² Only with three-phase machine with single-phase option

³ Only with sync option enabled

⁴ Only with DC option machines

⁵ Only with output relay option machines

⁶ Only with Inrush option machines

3.4. RAMP_VF (4) (24 bytes)

With this command it is possible to perform a voltage and frequency ramp in a specified time. This ramp will go from the setted value to the value set in the **RAMP_VF** packet.

The machine will check the coherency of the data and, if the set values in the packet are not correct, the machine will send back the [ACK packet](#) with 4 on the data bytes.

If the ramp values are correct, the ramp will start and the machine will reply "Busy" for every other command sent during the voltage and frequency Ramp.

Notes:

1) In case of machines with output relay option, the voltage and frequency ramp could be done only with output **ON**.

2) In case of machines with Sync option, the **RAMP_VF** command will not be accepted.

3) The frequency ramp is the same for all the phases because it is not possible to have different frequencies for different phases.

RAMP_VF PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (18B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	4	X	X	1 Byte

	DATA																	
	Phase L1						Phase L2						Phase L3					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	V _{MSB}	V _{LSB}	F _{MSB}	F _{LSB}	T _{MSB}	T _{LSB}	V _{MSB}	V _{LSB}	-	-	-	-	V _{MSB}	V _{LSB}	-	-	-	-
1-phase machines	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
3-phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗

The parameters with "✗" are all 0s.

How to calculate values to insert in DATA:

V_{MSB} : V_{LSB}⁷

To obtain the value to insert on the racket you must use this formula:

$$V = \frac{V_{set} * 4095}{Range}$$

Example If you are in the 300V range and you want to set 200V

$$V = \frac{200 * 4095}{300} = 2730$$

F_{MSB} : F_{LSB}

It is the frequency multiply for 100 (example 50Hz = 5000)

$T_{MSB} : T_{LSB}$

The time is expressed in hundredths of a second. (example 1s = 100)

The precision depends on the quantization of the time and the voltage inside the machine.

3.5. RAMP_PAR (5) (19 bytes)

RAMP_PAR PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA (13)		CHK DATA (1B)	CHK TOT (1B)
			Type (1B)	DATA (12B)		
"S"	00	5	T	X	X	1 Byte

Type

- 0 Voltage ramp
- 1 Frequency ramp
- 2 Phase ramp

0: Voltage ramp

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}	V_{MSB}	V_{LSB}	T_{MSB}	T_{LSB}
1-phase machines	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
3-phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

$V_{MSB} : V_{LSB}$ ⁸

To obtain the value to insert on the racket you must use this formula:

$$V = \frac{V_{set} * 4095}{Range}$$

1: Frequency ramp

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	F_{MSB}	F_{LSB}	T_{MSB}	T_{LSB}	-	-	-	-	-	-	-	-
1-phase machines	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
3-phase machines	✓	✓	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗

$F_{MSB} : F_{LSB}$

It is the frequency multiply for 100 (example 50Hz = 5000)

⁸ For the HPS series only fase R data are used
06/03/2024

2: Phase ramp: (The phase is instantly set without any ramp)

	DATA											
	PHASE R				PHASE S				PHASE T			
	1	2	3	4	5	6	7	8	9	10	11	12
	PH _{MSB}	PH _{LSB}	-	-	PH _{MSB}	PH _{LSB}	-	-	PH _{MSB}	PH _{LSB}	-	-
1-phase machines	x	x	x	x	x	x	x	x	x	x	x	x
3-phase machines	✓	✓	x	x	✓	✓	x	x	✓	✓	x	x

PH_{MSB} : PH_{LSB}

To obtain the value to insert on the packet you must use this formula:

$$DATO = \frac{PH * 4095}{360}$$

3.6. COM (6) (8 bytes)

COM PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA(2)		CHK DATA (1)	CHK TOT (1)
			Type (1B)	Data (1B)		
"S"	00	6	T	X	X	1 Byte

With this command it is possible to change a single operating mode of the machine.
The machine sends back the [ACK packet](#).

Type	Description	Data	
0	Remote	0 = Local	1 = Remote
1	Out relay	0 = Off	1 = On
2	Range	0 = Low	1 = High
3	Sense	0 = 2wire	1 = 4-wire
4	Mono	0 = 1-Phase	1 = 3-Phase
5	Sync	0 = Line	1 = Internal
6	DC	0 = AC	1 = DC
7	Inrush	0 = Countinous	1 = Inrush
8	Waveform	0 = 10Hz-80Hz 1 = 20Hz – 160Hz 2 = 30Hz – 240Hz 3 = 40Hz – 320Hz 4 = DC ¹ 5 = DC+ ² 6 = DC- ²	

- 1) Only for machines with Vdc option
- 2) Only for machines with ±425Vdc option

3.7. RESET (7) (7 bytes)

This command resets the CPS/TPS.

RESET PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (1B)	CHK DATA (1B)	CHK TOT (1B)
"S"	00	7	X	X	1 Byte

With this command it is possible to reset the machine. This command does not reset the display board.

4. LIST OF PACKET OF THE TPS

4.1. ECHO (101) (42 byte)

The command ECHO carries the current state of the CPS/TPS. It is the reply after a [INIT packet](#) sent to the generator.

ECHO PACKET					
START (1B)	ADD (2B)	COD (1B)	DATA (36B)	CHK DATA (1B)	CK TOT (1B)
"R"	00	101	X	X	1 Byte

Data has 36 bytes, twelve for each phase.

Phase L1

	DATA											
	1	2	3	4	5	6	7	8	9	10	11	12
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
1-Phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3-Phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Phase L2

	DATA											
	13	14	15	16	17	18	19	20	21	22	23	24
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
1-Phase machines	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Phase L3

	DATA											
	25	26	27	28	29	30	31	32	33	34	35	36
	Vset _{MSB}	Vset _{LSB}	Vout _{MSB}	Vout _{LSB}	Iout _{MSB}	Iout _{LSB}	PH _{MSB}	PH _{LSB}	F _{MSB}	F _{LSB}	Mode	Alarms
1-phase machines	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
3-phase machines	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

How to calculate values found in ECHO packet DATA:

Vset

It is the setting voltage with 12bit expression, to guarantee the maximum precision. Down you can find the formula

$$V_{set} = \frac{V_{set_{12bit}} * Range}{4095}$$

If range 300

$$V_{set} = \frac{V_{set_{12bit}} * 300}{4095}$$

Vout

It is the output reading voltage. As the setting voltage it is represented with 12 bit expression.

$$V_{out} = \frac{V_{out_{12bit}} * V_{out_{max}}}{4095}$$

if range 300

$$V_{out} = \frac{V_{out_{12bit}} * 315}{4095}$$

Vout max is the maximum setting voltage plus the 5%. (due to slow compensation)

Iout

It is the reading output current, this value has a number after the dot. (XXX.X)

PH

It is the setting phase always with 12bit expression.

$$PH = \frac{PH_{12bit} * 360}{4095}$$

Fset

It is the setting frequency with two numbers after the dot (XX.XX).

Mode

It is the byte for the configurations of each phase

Bit	Description	Data	
1	Remote	0: Local	1: Remote
2	3 phase	0: 1 phase	1: 3 phase
3	DC	0: AC	1: DC
4	Range	0: Low	1: High
5	Output Relay	0: Off	1 : On
6	Inrush	0: Disab.	1: Enable
7	Sync	0: Line	1: Internal
8	Sense	0: 2 wire	1: 4 wire

Alarm

Alarms byte on relative phase

Bit	Alarms
1	Over voltage on the bus
2	Under voltage on the bus
3	Overtemperature
4	Inverter alarm
5	Eeprom data error
6	Error on the output voltage
7	Limitation of output current
8	NU

Attention: In single-phase mode only the phase R alarm is significant.

4.2. RISP (102) (13byte)

The command RISP carries some data of the CPS/TPS. It is the reply after a [ACQ packet](#) sent to the generator

RISP PACKET						
START (1B)	ADD (2B)	COD (1B)	DATA(4)		CHK DATA (1B)	CK TOT (1B)
			Type (1B)	Data(6B)		
"R"	00	102	T	X	1 Byte	1 Byte

Type:

- 0: Nothing.
- 1: Request of setting voltage.
- 2: Request of output voltage.
- 3: Request of output current (when the TPS can measure it).
- 4: Request of phase
- 5: Request of frequency.
- 6: Request of alarms.
- 7: Request of mode.
- 8: Request of revision and code of the machine.
- 9: Request of options installed in the machine.
- 10: Request of the range.
- 11: Request of the waveform.
- 12: Request of instantaneous alarms.
- 13: Request of busy state of the machine
- 14: Output current in [mA] (3 decimal digits)
- 20: Serial Number

4.2.1. Values description

1: Setting voltage

Displays the setting voltage for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Vset _{MSB}	Vset _{LSB}	Vset _{MSB}	Vset _{LSB}	Vset _{MSB}	Vset _{MSB}
1-Phase machines	✓	✓	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓

2: Reading output voltage

Displays the output voltage for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Vout _{MSB}	Vout _{LSB}	Vout _{MSB}	Vout _{LSB}	Vout _{MSB}	Vout _{MSB}
1-Phase machines	✓	✓	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓

3: Output current

Displays the output current. In single-phase mode or in single-phase machine it shows only the phase R output.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	$I_{out_{MSB}}$	$I_{out_{LSB}}$	$I_{out_{MSB}}$	$I_{out_{LSB}}$	$I_{out_{MSB}}$	$I_{out_{MSB}}$
1-Phase machines	✓	✓	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓

4: Setting phase

Displays the setting Phase of all the three phases.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	PH_{MSB}	PH_{LSB}	PH_{MSB}	$I_{out_{LSB}}$	PH_{MSB}	PH_{MSB}
1-Phase machines	✓	✓	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓

5: Frequency

Displays the setting frequency for each phase. It will show the same value for all the phases because it is not possible to set different frequencies from a phase to another.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	FR _{MSB}	FR _{LSB}	FS _{MSB}	FS _{LSB}	FT _{MSB}	FT _{MSB}
1-Phase machines	✓	✓	✗	✗	✗	✗
3-Phase machines	✓	✓	✓	✓	✓	✓

6: Alarms

It display the alarms for each phase.

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Not used	Alm L1	Not used	Alm L2	Not used	Alm L3
1-Phase machines	✗	✓	✗	✗	✗	✗
3-Phase machines	✗	✓	✗	✓	✗	✓

Bit	Alarms
1	Overvoltage on the bus
2	Undervoltage on the bus
3	Overtemperature
4	Inverter alarm
5	Eeprom data error
6	Error on the output voltage
7	Limitation of output current
8	Not used

• 7: Mode

	DATA					
	Phase L1		Phase L2		Phase L3	
	1	2	3	4	5	6
	Not used	MDr	Not used	MDs	Not used	MDt
1-Phase machines	✗	✓	✗	✗	✗	✗
3-Phase machines	✗	✓	✗	✓	✗	✓

Bit	Description	Data	
1	Remote	0: Local	1: Remote
2	3 phase	0: 1 phase	1: 3 phase
3	DC	0:AC	1: DC
4	Range	0: Low	1: High
5	Output Relay	0: Off	1 : On
6	Inrush	0: Disab.	1: Enable
7	Sync	0: Line	1: Internal
8	Sense	0: 2 wire	1: 4 wire

• 8: Revision and machine code

It displays the machine code and the power code of your CPS/TPS.

DATA					
1	2	3	4	5	6
Fw Revision	Machine Code	Power Code	0	0	0

The power code depends on which power size your CPS/TPS has.

Machine Code	
0	Serie Millenium trifase / <i>Millenium series threephase</i>
1	Serie compatta trifase / <i>Compact series threephase</i>
2	Serie alta potenza / <i>High power series threephase</i>
6	Serie New / <i>New series</i>
7	Serie compatta monofase / <i>Compact series singlephase</i>

• 9: Installed options

It display the installed options of your machine for each phase.

DATA	
1	OP_R_MSB
2	OP_R_LSB
3	OP_S_MSB
4	OP_S_LSB
5	OP_T_MSB
6	OP_T_LSB

OP_R_LSB	
BIT	Description
0	<i>Inrush - countinous</i>
1	<i>Out switching</i>
2	<i>AC-DC</i>
3	<i>Threephase -Singlephase</i>
4	<i>Double Range</i>
5	<i>Fast switch range</i>
6	<i>Reset enable</i>
7	<i>External commands</i>

OP_R_MSB	
BIT	Description
0	<i>Sync internal external</i>
1	<i>±425Vdc option</i>
2	NU
3	NU
4	NU
5	NU
6	NU
7	NU

- **10: Full Range value (value x 10)**

It displays the full range values of your machine.

DATA					
1	2	3	4	5	6
H _{MSB}	H _{LSB}	L _{MSB}	L _{LSB}	0	0

- **11: Selected Waveform**

DATA					
1	2	3	4	5	6
0	Banco	0	0	0	0

<i>Selected waveform</i>	
0	Frequency 10-80Hz
1	Frequency 20-160Hz
2	Frequency 30-240Hz
3	Frequency 40-320Hz
4	DC
5	DC+
6	DC-

- **12: Instantaneous alarms:**

DATA					
<i>Phase R</i>		<i>Phase S</i>		<i>Phase T</i>	
1	2	3	4	5	6
0	ALr inst	0	ALs inst	0	ALt inst

- **13: Request of busy state of the machine**

DATA					
1	2	3	4	5	6
BUSY	0	0	0	0	0

BUSY=1 means machine busy

- **14: Output current in [mA] (3 decimal digits)**

<i>DATA</i>					
<i>Fase/Phase R</i>		<i>Fase/Phase S</i>		<i>Fase/Phase T</i>	
1	2	3	4	5	6
$I_{out_{MSB}}$	$I_{out_{LSB}}$	$I_{out_{MSB}}$	$I_{out_{LSB}}$	$I_{out_{MSB}}$	$I_{out_{LSB}}$

20: Serial Number:

<i>DATO/DATA</i>					
1	2	3	4	5	6
SN A	SN B	SN C	SN D	0	0

SN A: serial number MSB

SN B: serial number LSB

SN C: month

SN D: year

4.3. ACK (103) (7 bytes)

This packet contains the informations of the machine reply to a require command. Below you can see the correspondence between the sent packet to the received packet:

ACK PACKET					
START (1)	ADD (2)	COD (1)	DATA (1)	CHK DATA (1)	CHK TOT (1)
"R"	00	103	X	X	1 Byte

DATA:

- 0: Command accepted.
- 1: Error on the packet.
- 2: Command is not enabled.
- 3: CPS/TPS busy.
- 4: Values are not correct.

4.3.1. CORRESPONDENCE TABLE OF PACKET

PC	TPS
INIT (1)	ECHO (101) o ACK(103)
ACQ (2)	RISP (102) o ACK(103)
SET_MD (3)	ACK (103)
RAMP_VF (4)	ACK (103)
RAMP_PAR (5)	ACK (103)
COM (6)	ACK (103)
RESET (7)	-
MEM (9)	ALARMS (104) o ACK (103)

5. REVISION INDEX

07_	Option $\pm 425\text{Vdc}$ added – PM008.24	06/03/24	A.Ferro	A.Ferro	R.Veronese
06A	Errata corridge of ACQ/RISP(8) "Machine & Power code"	26/07/23	A.Ferro	A.Ferro	R.Veronese
06_	New Design and General Review	10/02/22	A.Ferro	M.Rigobello	R.Veronese
05_	Added and changed commands	09/12/14	FTO	FTO	FTO
04_	New Serial Settings	11/04/11	FTO	FTO	FTO
03_	Update packets	02/02/11	FTO	FTO	FTO
02_	Update Machine Code	06/10/10	FTO	FTO	FTO
01_	Update Note	16/07/10	FTO	FTO	FTO
00_	First Emission	05/07/10	FTO	FTO	FTO
Rev.	Description	Date	Author	Verified	Approved