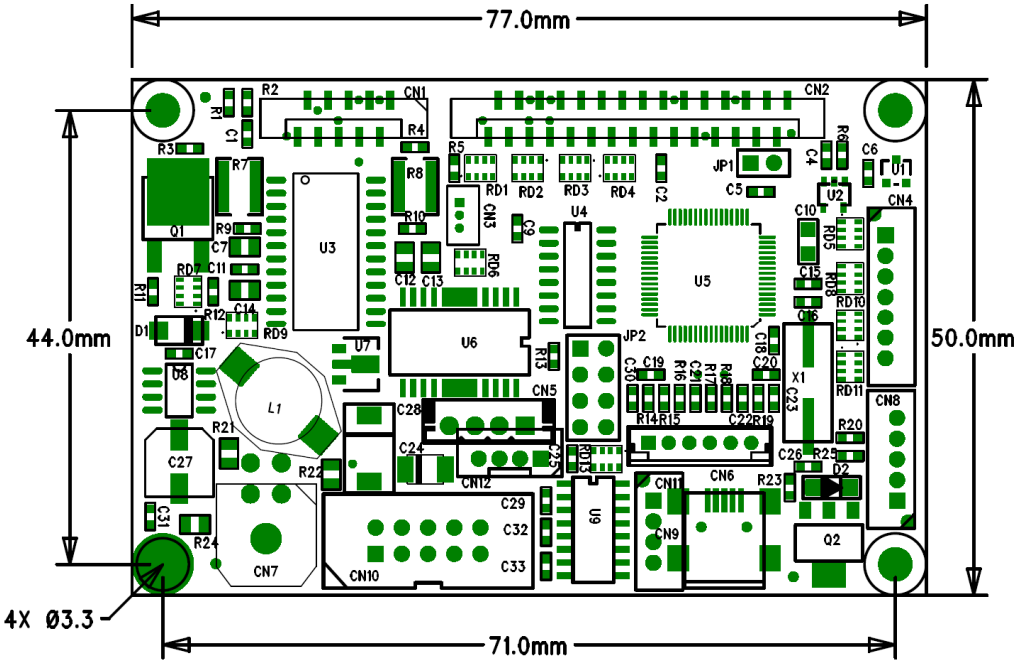
Users Manual

Thermal printer controller
PRN609-012R



FOR FUJITSU THERMAL PRINTERS

FTP-629MCL103
FTP-629MCL363
FTP-629MCL364
FTP-629MCL383

FTP-639MCL064
FTP-639MCL103
FTP-639MCL303
FTP-639MCL363
FTP-639MCL364
FTP-639MCL383
FTP-639MCL393

Version history

Version	Date	Init	Status	Description
2.0	141208	HBM	Closed	First release
2.1	141209	HBM	Closed	Paragraph 4.3 added

PRN609-012R is RoHS compliant.

Safety Precautions

- Please read and understand these specifications thoroughly before using the printer. Please keep the specifications carefully in a place where they may be easily consulted when the printer is used.
- Please do not modify or service this printer as this may cause unpredictable faults to occur.
- The product is not intended to be installed in devices such as those used in life-support medical equipment, undersea relays, and aerospace applications or for nuclear power control, in which extremely high reliability is required. If you are considering such applications, please consult our customer service department.
- There is a general possibility of component failure. Every effort has been made to improve product quality but such failures cannot be completely excluded. Please assume that such failure may occur before using this printer.

We would urge that these specifications should be thoroughly understood and the printer used safely in your company or associated organization. Please indicate or describe in your products and in the user manuals those items, which are related to the prevention or avoidance of danger and draw these to the attention of the eventual client (the user).

This manual may only be used as appendix to the product and may only be used, as a help to better understand the functionality of the product. Any approval of the product may only be done based upon sample of the product. Approval based upon the specification is not accepted by Trentino Systems ApS.

Table of contents

1 SYSTEM DESCRIPTION

This reference manual describes the specifications, function, and operating procedures for the PRN609-012R interface boards.

PRN609-012R is designed for the following Fujitsu printers:

FTP-629MCL103
FTP-629MCL363
FTP-629MCL364
FTP-629MCL383

FTP-639MCL064
FTP-639MCL103
FTP-639MCL303
FTP-639MCL363
FTP-639MCL364
FTP-639MCL383
FTP-639MCL393

PRN609-012R consists of an interface board.
The communication is USB or serial
PRN609-012R can print graphic data either compressed or non-compressed.
Burn time can be set to control the printing intensity

2 INSTALLATION

2.1 Unpacking

Remove the cover observing precautions for Electro Static Discharge (ESD). Make sure that board is handled with care with respect to Electrostatic environment.

2.2 Labels

PRN609-012R has 3 labels;
Label 1 on backside ex. Ifxxxxxx is a unique ID number. For service and question based upon 1 particular board please refer to this number. Label 2 on topside ex. PRN609-012R is part number. Please refer to this number upon reordering. Make sure that software revision is applied at same time.
Label 3 is an internal code. Please ignore

2.3 Installation

PRN609-012R is fastened in the product by 4 M3 screws. The cables (for the thermal head, the stepper-motor and detector) are placed in the thermal printer connector on the PCB. Mounting holes are grounded connected to electrical ground.

(a) To connect or remove the connector, always turn off the power in advance. If the connector is connected or removed while the power to the printer is on, errors may occur.

(b) The connector of each cable must be correctly locked and connected. The connector at the head side has no lock feature. Check that the connector at the head side is completely inserted.

(c) To install the interface, carefully check each cable so that excessive force is not applied to each cable. Especially, carefully check the head connection cable because it affects the head pressure force. If the print head connector is not completely connected, overheating or burning may occur in the print head.

(d) Be sure to add grounding cable from printer body to interface ground. Make sure that ground is present at any mechanical settings, like head up and paper out.

2.4 Power supply

Single power supplies for the PRN609-012R controller board. The nominal supply voltage is 24VDC, with ±10 % in tolerance. Make sure that voltages never exceed 26,5 VDC.

(a) The power supply unit that satisfies the specified specifications must be used. If a power supply unit that does not satisfy the specified specifications is used, normal operation is not assured and errors may occur.

(b) To turn on or off the power, a protective circuit must be mounted on the control board in advance. For safety, the following voltage change conditions must be satisfied.

3 SPECIFICATIONS

Interface	USB or RS232
Handshake	Hardware
Command set	Trentino Systems
Transmission to host	Requested status etc.
Printer supply	24VDC ± 10% tolerance.
Power on self test	Feed
Voltage compensation	Burn time
Current consumption	Operating 130mA, Printing up to 10A @ 24V (TBD)
Printing speed	Up to 200mm/sec (7,87"/sec)
Font set	Western Code 437 + € symbol (char 32 – 159) or russian
Character size	12x30, 24x30, 12x60, 24x60
Character type	Normal, Underline, Reverse (white on black)
Default font	12x30
Paper detect	Digital
Graphics	Normal
Auto load	50mm User settings
Form feed	50mm User settings
Line feed	LF
Maximum dimensions	Width 77mm, Depth 50mm, Connected height 15mm
Mounting holes	Width 71mm, Depth 44mm, Diameter 3.3mm
Connectors	CN1, Connector type: CF10101M0T0
	CN2, Connector type: CF10301M0T0
	CN3, Connector type: 53047-0410
	CN4, Connector type: 53324-0710
	CN5, Connector type: JS-1132-4
	CN6, Connector type: TBD
	CN7, Connector type: 43045-0400
	CN8, Connector type: 53324-0510
Weight	25g
Temperature	Storage -40ºC to +85ºC 0-90% RH Operating 0C to +70ºC 10-90%RH
Shock	100G XYZ
EMC	Emission: E-Field EN50081-1-1, Conducted EN50081-1-2
	Immunity: E-field EN50082-1-1, Conducted EN50082-1-2, Over voltage EN50082-1-3
Approvals	CE, UL
Accessories	Power cable: CBL-025

4 FUNCTION

4.1 Serial communication

It is possible to receive and send data (8 bit) via the serial port. The default baud rate is 115.200, and there are no parity bit and one stop bit.
Handshake signals are hardware. Other baud rates are available upon request.

4.2 USB communication

The USB port is fully compatible with USB 2.0. PRN609-012R interface board is 100% compatible with the printer class specification.

I/F-COM A/S (Trentino Systems) Vendor number: 5098

4.3 USB communication protocol

Auto status reply is always 4 bytes big.

For command requests they will follow this simple protocol

Command	Data	Description
Delimiter	<27><'d'><1><delimiter>	Return the delimiter value
Request version	<27><23><2><version><head size>	Return version number and head size
Request voltage	<27><25><1><"A/D value">	Voltage level
Request temperature	<27><26><1><"A/D value">	Temperature level

4.4 Auto detect printer

At power up the PRN609-012R, detects the printer size.

4.5 Auto form feed

When paper is out, it is possible to form feed new paper automatic. While the thermal head is down, place the paper at the roller.
After 2 seconds the paper will be pulled in automatically.

Form feed length can be set through menu.

4.6 Firmware upgrade

TBD

4.7 Serial protocol

4.7.1 USB.

The USB is set up for bidirectional function. The board will continually send status back to the host. Only the automatically status is send back to the host. If the host request other status these are only send on the serial line..

4.7.2 Serial

Data returned on the serial port.

4.7.3 Auto response

The automatically response consist of 4 bytes.

1) Status (msb is always 1)
2) head voltage / 2 (msb always 0)
3) Temperature voltage / 2 (msb always 0)
4) Ticket number (msb always 0) See paragraph **Error! Reference source not found.**

Status is as follow:

Bit	Status	0	1
0	Near end	Logic level is low	Logic level is high
1	Paper	Present	Absent
2	Temperature	Not too hot	Head too hot to print
3	Head	Closed	Open
4	Always 0		
5	Always 0		
6	Buffer	Not full.	Full (less than 16 bytes)
7	Always 1.		

4.8 Control and Escape sequences

The control of the PRN609-012R printer interface is performed by a command set of escape sequences. The following commands are used. All other commands are ignored.

4.8.1 Escape sequences, overview.

ESCAPE SEQUENCES,ASCII	FUNCTION
NUL	Small font
SOH	Low font
STX	Narrow font
ETX	Normal font
EOT	Wide font
ENQ	High font
ACK	Large font
BEL	X-large font
BS	Cut Paper
HT	Cut Paper
LF	Line feed
FF	Forward feed
SO	Reverse off
SI	Reverse on
DLE	Underline off
DC1	Underline on
SYN	Initialize printer
ETB	Request software version
CAN	Request status
EM	Request analogue voltage
SUB	Request temperature
ESC+e+m	Bar code width setting
ESC+h+n	Bar code height setting
ESC+R+<font>	Russian font enable
ESC+i	Cut Paper
ESC+k+m n+d1 to dn	Bar code printing
ESC+m	Cut Paper
ESC+d+<delimiter>	Delimiter command
ESC+205+length+cmd+data	Extended commands
FS+data	Set peak power limitation
GS+data	Feed paper
RS+data	Burn compensate
US+d1..dLast	Print graphic line

4.8.2 Normal font

[Name]	Normal font (12x30)	
[Format]	ASCII	ETX
	Hex	03
	Decimal	3
[Description]	Select normal font from the current print position. This is the default font after power up or reset.	

4.8.3 Wide font

[Name]	Wide font (24x30)	
[Format]	ASCII	EOT
	Hex	04
	Decimal	4
[Description]	Select wide font from the current print position.	

4.8.4 High font

[Name]	High font (12x60)	
[Format]	ASCII	ENQ
	Hex	05
	Decimal	5
[Description]	Select high font from the current print position.	

4.8.5 Large font

[Name]	Large font (24x60)	
[Format]	ASCII	ACK
	Hex	06
	Decimal	6
[Description]	Select large font from the current print position.	

[Description]	Select X-large font from the current print position.

4.8.6 Cut Paper

[Name]	Cut Paper	
[Format]	ASCII	BS
	Hex	08
	Decimal	8
[Description]	If a cutter is attached the paper will be cut	

4.8.7 Cut Paper

[Name]	Cut Paper	
[Format]	ASCII	HT

	Hex	09
	Decimal	9
[Description]	If a cutter is attached the paper will be cut	

4.8.8 Line feed

[Name]	Line feed	
[Format]	ASCII	LF
	Hex	0A
	Decimal	10
[Description]	The text data in the buffer will be printed	

4.8.9 Feed forward

[Name]	Feed forward	
[Format]	ASCII	FF
	Hex	0C
	Decimal	12
[Description]	The printer will feed forward until page end or black mark detected, whatever comes first.	

4.8.10 Reverse off

[Name]	Reverse off	
[Format]	ASCII	SO
	Hex	0E
	Decimal	14
[Description]	Switch off reverse printing	

4.8.11 Reverse on

[Name]	Reverse on	
[Format]	ASCII	SI
	Hex	0F
	Decimal	15
[Description]	Switch on reverse printing	

4.8.12 Underline off

[Name]	Underline off	
[Format]	ASCII	DLE
	Hex	10
	Decimal	16
[Description]	Switch off underline printing	

4.8.13 Underline on

[Name]	Underline on	
[Format]	ASCII	DC1
	Hex	11
	Decimal	17
[Description]	This command will switch on underline printing	

4.8.14 Initialize printer

[Name]	Initialize	
[Format]	ASCII	SYN
	Hex	16
	Decimal	22
[Description]	Reset of the printer will be initialized. This command can be treated even though buffer is full.	

4.8.15 Request software version and dot size

[Name]	Request software version and dot size	
[Format]	ASCII	ETB
	Hex	17
	Decimal	23
[Description]	The response from the printer will be <version><dot size>	

4.8.16 Request status

[Name]	Request status	
[Format]	ASCII	CAN
	Hex	18
	Decimal	24
[Description]	When the printer controller receives this byte a status byte will be transmitted. The response will be <CAN><status>. The bit definitions is as follows	

Bit	**Status**	**0**	**1**
0	Near end	Logic level is low	Logic level is high
1	Paper	Present	Absent
2	Temperature	Not too hot	Head too hot to print
3	Head	Closed	Open
4	Always 0		
5	Always 0		
6	Buffer	Not full.	Full (less than 16 bytes)
7	Always 1.		

4.8.17 Request analog voltage

[Name]	Analog voltage	
[Format]	ASCII	EM
	Hex	19
	Decimal	25
[Description]	The response from the command is <voltage>	

4.8.18 Request temperature

[Name]	Request temperature	
[Format]	ASCII	SUB
	Hex	1A
	Decimal	26
[Description]	The response from this command will be <temperature>	

4.8.19 Bar code width setting

[Name]	Bar code width setting			
[Format]	ASCII	ESC	e	m
	Hex	1B	65	m
	Decimal	27	101	m
[Range]	1<=m<=6			
[Default]	m=2			
[Description]	Parameter m is used to determine the dot width of the narrow and wide bar lines. The wide bar lines is equal to m * 2 dots and the narrow is equal to m dots.			

4.8.20 Bar code height setting

[Name]	Bar code height setting			
[Format]	ASCII	ESC	h	n
	Hex	1B	68	n
	Decimal	27	104	n
[Range]	1<=n<=255			
[Default]	n=216			
[Description]	Parameter n specifies the height of a bar code in dots.			

4.8.21 Cut Paper

[Name]	Cut Partial Paper		
[Format]	ASCII	ESC	i
	Hex	1B	69
	Decimal	27	105
[Description]	If a cutter is attached the paper will be cut		

4.8.22 Cut Paper

[Name]	Cut Paper		
[Format]	ASCII	ESC	m
	Hex	1B	6D
	Decimal	27	109
[Description]	If a cutter is attached the paper will be cut		

4.8.23 Delimiter

[Name]	Delimiter			
[Format]	ASCII	ESC	d	n
	Hex	1B	64	n
	Decimal	27	100	n
[Description]	When this command is received the delimiter d is returned			

4.8.24 Russian font enable

[Name]	Russian font			
[Format]	ASCII	ESC	R	n
	Hex	1B	52	n
	Decimal	27	82	n
[Default]	n=128			
[Description]	If n = 128 then Russian font is enabled			

4.8.25 Feed paper

[Name]	Feed paper		
[Format]	ASCII	GS	n
	Hex	1D	n
	Decimal	29	n
[Range]	n: [-128;127]		
[Description]	When the printer controller receives this command the paper will be fed n-dot lines. If the value is negative paper is reversed fed.		

4.8.26 Compensate burn time

[Name]	Compensate burn time		
[Format]	ASCII	RS	n
	Hex	1E	n
	Decimal	30	n
[Range]	n: [-128;127]		

[Description] When the printer controller receives this command the burn time will be compensated. If a negative value is send the printout intensity will be lighter and if a positive value is send the printout intensity will be darker.

4.8.27 Graphic line - not compressed

[Name] Graphic line
[Format] ASCII US d1,d2,..,dLast
Hex 1F d1,d2,..,dLast
Decimal 31 d1,d2,..,dLast
[Range] d: [0;255]
Last: Depend on printer size
[Description] Graphic bytes equal to the printer size will be printed in one dot line. The MSB in d1 is the left most dot and the LSB in dLast is the right most dot.

4.8.28 Bar code printing

[Name] Bar code printing
[Format] ASCII ESC k m n d1 to dn
Hex 1B 6B m n d1 to dn
Decimal 27 107 m n d1 to dn
[Description] Parameter m specifies the type of bar codes to be printed.l
Parameter n specifies no of barcode characters.

m(dec)	Type of Barcode	Number of barcode characters	Value of d
65	UPCA	11<=n<=12	48<=d<=57
67	EAN13	12<=n<=13	48<=d<=57
68	EAN8	7<=n<=8	48<=d<=57
69	Code39	Variable	Space , $, % , * , + , - , . , / , 0-9 , A-Z
72	Code128	Variable	0 to 105

UPCA: if n is 11 then the board calculate the checksum
EAN8: if n is 7 then the board calculate the checksum.
EAN13: if n is 12 then the board calculate the checksum

Code 39: The first and last character must be '*'. This is the syntax for Code 39.
Code128. There is three subset of Code128 (Code128A, Code128B and Code128C). The start character specifies which character set to be used. The start character must be either 103 (subset A), 104

(subset B), 105 (subset C).
The following table shows the value between data (d) and barcode.

4.8.29 Code128 barcode table

'd'	A	B	C	'd'	A	B	C
0	Space	Space	0	52	T	T	52
1	!	!	1	53	U	U	53
2	"	"	2	54	V	V	54
3	#	#	3	55	W	W	55
4	$	$	4	56	X	X	56
5	%	%	5	57	Y	Y	57
6	&	&	6	58	Z	Z	58
7	'	'	7	59	[	[	59
8	(	(	8	60	\	\	60
9	)	)	9	61	]	]	61
10	*	*	10	62	^	^	62
11	+	+	11	63			63
12	,	,	12	64	NUL	`	64
13	-	-	13	65	SOH	a	65
14	.	.	14	66	STX	b	66
15	/	/	15	67	ETX	c	67
16	0	0	16	68	EOT	d	68
17	1	1	17	69	ENQ	e	69
18	2	2	18	70	ACK	f	70
19	3	3	19	71	BEL	g	71
20	4	4	20	72	BS	h	72
21	5	5	21	73	HT	i	73
22	6	6	22	74	LF	j	74
23	7	7	23	75	VT	k	75
24	8	8	24	76	FF	l	76
25	9	9	25	77	CR	m	77
26	:	:	26	78	SO	n	78
27	;	;	27	79	SI	o	79
28	<	<	28	80	DLE	p	80
29	=	=	29	81	DC1	q	81
30	>	>	30	82	DC2	r	82
31	?	?	31	83	DC3	s	83
32	@	@	32	84	DC4	t	84
33	A	A	33	85	NAK	u	85
34	B	B	34	86	SYN	v	86
35	C	C	35	87	ETB	w	87
36	D	D	36	88	CAN	x	88
37	E	E	37	89	EM	y	89
38	F	F	38	90	SUB	z	90
39	G	G	39	91	ESC	{	91
40	H	H	40	92	FS	|	92
41	I	I	41	93	GS	}	93
42	J	J	42	94	RS	~	94
43	K	K	43	95	US	DEL	95
44	L	L	44	96	FNC3	FNC3	96
45	M	M	45	97	FNC2	FNC2	97
46	N	N	46	98	SHIFT	SHIFT	98
47	O	O	47	99	Code C	Code C	99
48	P	P	48	100	Code B	FNC 4	Code B
49	Q	Q	49	101	FNC 4	Code A	Code A
50	R	R	50	102	FNC 1	FNC 1	FNC1
51	S	S	51				

5 ADDITIONAL COMMAND DESCRIPTION

This paragraph describes the extended command set.

5.1 Extended command

[ESC][#205][Length][Command][Data][Data]

ESC + 205	Identifies Trentino command
Length	Number of bytes ***after*** command (data count)
Command	Trentino command
Data	Any data needed for the command

5.2 Graphical commands

Command	**Code**
Graphics	[ESC][205][length][0x00-0x0F]

Format
[ESC][205][Length][%0000abcd][..]..[..]

The Graphics command identifies a line of graphic data

A	0	: Do NOT add a linefeed after line
	1	: Add linefeed after line
bcd	000	: No compression
	001	: -
	010	: -
	011	: -
	100	: -
	101	: -

Data
The command supports the following compression formats

5.2.1 000 No compression

Data	After the command follows the uncompressed data

Ex
[ESC], 205, length, %00001000, data, data

Length	2 bytes of data
%00001000	Graphics, linefeed, no compression
Data	Length number of data byte

5.3 Other extended commands

5.3.1 Set max speed

Command	Code
Set max speed	[ESC][205][length][0x42]

Format
[ESC][205][Length=1][0x42][Speed]

Speed
Defines the max speed the board should use in mm/sec
Default is 200mm/sec

5.3.2 Black mark

[Name] Set black mark parameters

[Format]

ASCII	ESC+205+3+97+m+n+o
Hex	1B CD 03 61 m n o
Decimal	27 205 3 97 m n o

[Range]

m = Page length	1…255
n = Paper offset	1…255
o = Black mark length	1…255

[Description] At printer stop on black mark the paper will be forwarded the full length of the black mark. Paper out is detected if full length of the Black Mark is feed and sensor does not detect paper.
At no paper in printer and printing is requested, form feed of black Mark Length will be executed. At no paper detected the printer will stop.

FF=0xC Feed paper forward until next Black Mark or rest of page whatever comes first.

The following values can be set:
PAGE LENGTH (default 150mm) This value is the paper length
PAPER OFFSET (default 2mm) This value is the length between Black Mark and start of printing. Value must be between 2 mm. and Page length – 2mm.
BLACKMARK LENGTH (default 15mm). This is the length of the Black Marks.
The board can be set to transmit a 'B' whenever the paper is not detected at paper detect. This is typical when the sensor encounters a Black Mark.

The following commands is used for enabling Black Mark
Default:
PAGELENGHT=150mm
PAPEROFFSET=2mm

BLACKMARK=120 (120/8=15mm)

ESC+205+1+98+n
n: Bit 0: if set the board will transmit 'B' every time paper is not detected at the paper detector.
Bit 1: if set the Black Mark function is enable.
Default n = 0.

6 MAINTENANCE

6.1 Normal operation

The PRN609-012R boards must be turned off in idle mode.

6.2 Store/Transport

The product has to be stored under ESD safe conditions, and to be packed safely during transportation.

7 SPECIFICATIONS

7.1 Electrical data

Voltage:	Nominal:	24VDC
	Tolerance:	±10%
Current:	Max. head current:	Numbers of active dots * VHead TBD+/-15%
	Max. motor current:	1000mA

7.2 Mechanical data

Dimensions:	L * W * H:	77 mm* 50 mm * max. 15 mm including connectors.
Vibration:	XYZ	100G
Shock:	XYZ	100G

7.3 Environmental data

Operation:	Temperature:	0℃- +85℃
Humidity :		10%-99% RH, without condensing
Storage:	Temperature:	-40℃ - +85℃
	Humidity:	0%-99% RH, without condensing
Transport:	Temperature:	-40℃ - +85℃
	Humidity:	0%-99% RH, without condensing

7.4 EMC & ESC

The printer controller is tested according to:

Emission:	E-Field:	EN50081-1-1
	Conducted:	EN50081-1-2
Immunity:	E-field:	EN50082-1-1
	Conducted transients:	EN50082-1-2
	Over voltage:	EN50082-1-3
Medical equipment:		IEC601-1-2

7.5 Connector pin assignment

7.5.1 Motor/Sensor connector CN1

Connector type: CF10101M0T0

Pin	Function	Pin	Function
1	NC	2	GND
3	Thermistor	4	MA
5	/MA	6	MB
7	/MB	8	Cathode
9	Common anode/collector	10	Emitter

7.5.2 Thermal head connector CN2

Connector type: CF10301M0T0, Molex
Mating part: Flat Flex Cable

Pin	Function	Pin	Function
1	GND	2	SW
3	VH	4	VH
5	VH	6	VH
7	DI	8	/ST1
9	/ST1	10	VCC
11	Thermistor	12	GND
13	GND	14	GND
15	GND	16	GND
17	GND	18	GND
19	GND	20	GND
21	GND	22	/ST2
23	/ST2	24	LAT
25	CLK	26	DOP
27	VH	28	VH
29	VH	30	VH

7.5.3 Cutter connector CN5

Connector type: JS-1132-4, JST
Mating part: JST
Housing: HER-4
Contact: SEH-001T-P0.6

Pin	Function
1	Sense
2	GND
3	/Cut
4	Cut

7.5.4 USB connector CN6

Connector type: TBD
Mating cable, TBD

Pin	Function
1	NC
2	USB -
3	USB +
4	GND

7.5.5 Power connector CN7

Connector Type: 43045-0400, Molex
Mating part: Molex
Housing: 39-01-3042, Molex
Contact: 39-00-0038, Molex
Mating cable: CBL-025

Pin	Function
1	GND
2	+VCC
3	GND
4	+Vcc

7.6 Mechanical drawings