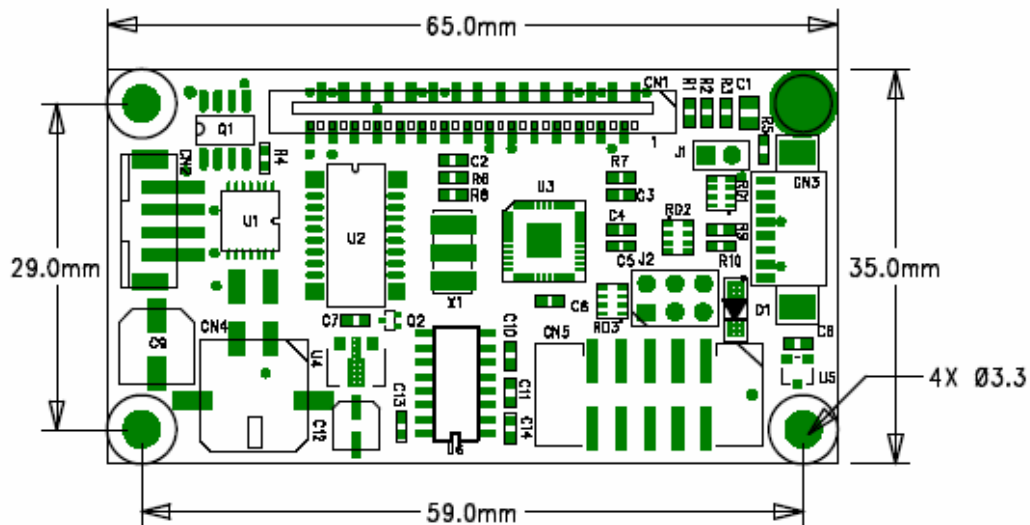# Users manual
Version 1.0

Thermal printer controller

PRN608-039

FOR FUJITSU THERMAL PRINTERS

FTP-628MCL1xx   FTP-638MCL1xx

FTP-628MCL3xx   FTP-638MCL3xx

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6 June 2006

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Version history

Version	Date	Init	Status	Description
1.0	060606	BB	Closed	First release

Fujitsu is a trade mark of Fujitsu Corporation.
Windows is registered trademark of Microsoft Corporation.

PRN608-039 is RoHS compliant

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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.

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1 SYSTEM DESCRIPTION

This reference manual describes the specifications, functions, and operating procedures for the PRN608-039 interface board.

PRN608-039 is designed for the following Fujitsu printers:

FTP-638MCL101/103   FTP-628MCL101/103

PRN608-039 consists of an interface board.
The communication is RS232,
115200 baud, 8 bit,
1 stop bit, no parity.
Handshake, hardware

PRN608-039 prints graphic data.
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 the board is handled with care with respect to Electrostatic environment.

2.2 Labels

PRN608-039 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. PRN608-039 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

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2.3 Installation

Due to (ESD) electrostatic discharged risk is it highly recommended that the
PRN608-039 is fastened in the application 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.
The cables for the power supply and serial communication are placed in the
serial/power connector.
**The mounting hole MT2 is decoupled electrical grounded by a 100nF
capacitor.**
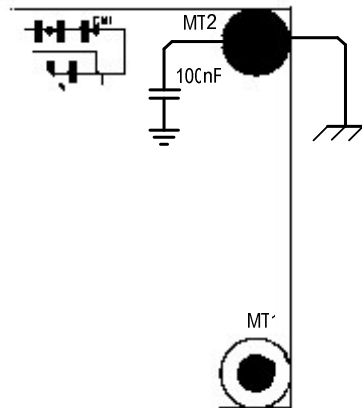
(a)   To connect or remove the connector, always turn off the power in advance. If
the connector is connected or removed while the power to the printer is on,
errors may occur.

(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.

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2.4 Power supply

The nominal supply voltage the PRN608-039 controller board is 4,2-8,5VDC, with ±10 % in tolerance. Make sure that voltages never exceed the specified tolerance.

(a) The power supply unit that satisfies the 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.

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3 SPECIFICATIONS

Interface	Serial RS232
Data format	115200 baud, 8 data bit, no parity, 1 stop bit
Handshake	RTS-CTS
Command set	Trentino Systems
Logic supply	None (internal switch supply)
Printer supply	4,2-8,5VDC
Power on self test	Feed 2mm
Voltage compensation	Burn time
Power down	Hardware
Current consumption	Standby up to 100mA
Current limit	Programmable
Printing speed	Average 40mm/sec, Max 60mm/sec
Character size	12x24,
Character type	Normal, Underline, Reverse (white on black)
Paper detect	Digital
Barcode	Code 39
Barcode height	20mm
Auto load	50mm
Form feed	20mm
Maximum dimensions	35*65mm
Mounting holes	4x Ø3.3
Weight	9g
Temperature	Storage -40°C to +85°C 0-90%RH, Operating 0°C to +70°C 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

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4 FUNCTION

4.1 General

Notice; when data is send from the external equipment to the printer controller, all data has to be sent. The data must be sent as a binary file. If the data are sent as a character file, and some data in the file is equal to EOF, the rest will not be received.

4.2 Auto form feed

When paper is out, it is possible to form feed new paper automatically. While the thermal head is down, place the paper at the roller.
After 0.5 seconds the paper will be pulled in automatically.
Form feed length is factory set.
The controller board cannot detect paper during Low current power down.

4.3 Auxiliary input

It is possible to connect an extra opto-sensor and switch to the board. Both levels can be read be requesting status.

4.4 Firmware upgrade

Firmware can be upgraded. In case firmware upgrade is needed Trentino Systems will provide windows utility and the firmware.
In order to upload new firmware to the PRN608-039 board, the jumper J1 must be shorten.
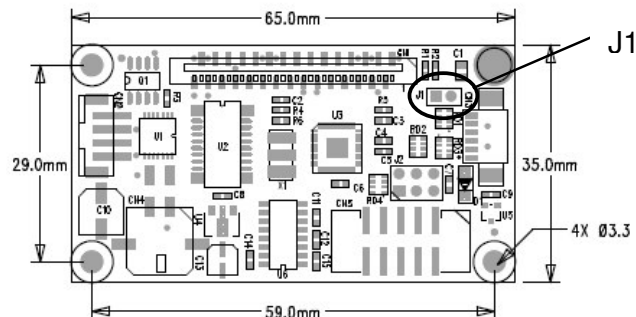
Further instruction concerning firmware upgrade comes along with the utility and the firmware from Trentino Systems.

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4.5 Printing characters

ASCII-characters (from 32 to 255) can be printed. A character line is 6-48 characters long (depending on font size and printer size). If LF (character 10) has been received, a carriage return will occur.
A line will be printed when character line buffer is full or when a LF are received.

Underline

The last line in character matrix will be marked when underline characters are printed.

Reverse

Character matrix will be negated when reverse characters are printed.

Font size

Font	Width	Height
Normal	Normal	Normal
Wide	Double	Normal
High	Normal	Double
Large	Double	Double
Xlarge	Quadruple	Quadruple

4.6 Font table

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00	NUL 0000	STX 0001	SOT 0002	ETX 0003	EOT 0004	ENQ 0005	ACK 0006	BEL 0007	BS 0008	HT 0009	LF 000A	VT 000B	FF 000C	CR 000D	SO 000E	SI 000F
10	DLE 0010	DC1 0011	DC2 0012	DC3 0013	DC4 0014	NAK 0015	SYN 0016	ETB 0017	CAN 0018	EM 0019	SUB 001A	ESC 001B	FS 001C	GS 001D	RS 001E	US 001F
20	SP 0020	! 0021	" 0022	# 0023	$ 0024	% 0025	& 0026	' 0027	(0028	) 0029	* 002A	+ 002B	, 002C	- 002D	. 002E	/ 002F
30	0 0030	1 0031	2 0032	3 0033	4 0034	5 0035	6 0036	7 0037	8 0038	9 0039	: 003A	; 003B	< 003C	= 003D	> 003E	? 003F
40	@ 0040	A 0041	B 0042	C 0043	D 0044	E 0045	F 0046	G 0047	H 0048	I 0049	J 004A	K 004B	L 004C	M 004D	N 004E	O 004F
50	P 0050	Q 0051	R 0052	S 0053	T 0054	U 0055	V 0056	W 0057	X 0058	Y 0059	Z 005A	[005B	\ 005C	] 005D	^ 005E	_ 005F
60	` 0060	a 0061	b 0062	c 0063	d 0064	e 0065	f 0066	g 0067	h 0068	i 0069	j 006A	k 006B	l 006C	m 006D	n 006E	o 006F
70	p 0070	q 0071	r 0072	s 0073	t 0074	u 0075	v 0076	w 0077	x 0078	y 0079	z 007A	{ 007B	| 007C	} 007D	~ 007E	DEL 007F
80	Ç 00C7	ü 00FC	é 00E9	â 00E2	ä 00E4	à 00E0	å 00E5	ç 00E7	ê 00EA	ë 00EB	è 00E8	ï 00EF	î 00EE	ì 00EC	Ä 00C4	Å 00C5
90	É 00C9	æ 00E6	Æ 00C6	ô 00F4	ö 00F6	ò 00F2	û 00FB	ù 00F9	ÿ 00FF	Ö 00D6	Ü 00DC	ø 00F8	£ 00A3	Ø 00D8	× 00D7	ƒ 0192
A0	á 00E1	í 00ED	ó 00F3	ú 00FA	ñ 00F1	Ñ 00D1	ª 00AA	º 00BA	¿ 00BF	® 00AE	¬ 00AC	½ 00BD	¼ 00BC	¡ 00A1	« 00AB	» 00BB
B0	░ 2591	▒ 2592	▓ 2593	│ 2502	┤ 2524	Á 00C1	Â 00C2	À 00C0	© 00A9	╣ 2563	║ 2551	╗ 2557	╝ 255D	¢ 00A2	¥ 00A5	┐ 2510
C0	└ 2514	┴ 2534	┬ 252C	├ 251C	─ 2500	┼ 253C	ã 00E3	Ã 00C3	╚ 255A	╔ 2554	╩ 2569	╦ 2566	╠ 2560	═ 2550	╬ 256C	¤ 00A4
D0	ð 00F0	Ð 00D0	Ê 00CA	Ë 00CB	È 00C8	€ 20AC	Í 00CD	Î 00CE	Ï 00CF	┘ 2518	┌ 250C	█ 2588	▄ 2584	¦ 00A6	Ì 00CC	▀ 2580
E0	Ó 00D3	ß 00DF	Ô 00D4	Ò 00D2	õ 00F5	Õ 00D5	µ 00B5	þ 00FE	Þ 00DE	Ú 00DA	Û 00DB	Ù 00D9	ý 00FD	Ý 00DD	¯ 00AF	´ 00B4
F0	00AD	± 00B1	‗ 2017	¾ 00BE	¶ 00B6	§ 00A7	÷ 00F7	¸ 00B8	° 00B0	¨ 00A8	· 00B7	¹ 00B9	³ 00B3	² 00B2	■ 25A0	NBSP 00A0

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4.7 Cyrillic font table

	*0	*1	*2	*3	*4	*5	*6	*7	*8	*9	*A	*B	*C	*D	*E	*F
80																
90																
A0									Ё		З					
B0									ё		з					
C0	А	Б	В	Г	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
D0	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э	Ю	Я
E0	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о	п
F0	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э	ю	я

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Control and Escape sequences
The control of the PRN608-039 printer interface is performed by a command set of escape sequences. The following commands are used. All other commands are ignored.

Escape sequences, overview

ESCAPE SEQUENCES, ASCII	FUNCTION
ETX	Normal Font
EOT	Wide Font
ENQ	High Font
ACK	Large Font
BEL	Xlarge Font
BS	Partial cut
LF	Line Feed
VT	Barcode on
FF	Forward feed
SO	Reverse off
SI	Reverse on
DLE	Underline off
DC1	Underline on
SYN	Reset printer
ETB	Request software version
CAN	Request status
EM	Request voltage
SUB	Request temperature
ESC+´q´+m+n	Set baudrate
FS + n	Set peaklimit
GS + n	Feed Paper
RS + n	Burn compensate
US + n	Print graphic line

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Normal font (12x24)

[Name]   Normal font (12x24 dots)
[Format]   ASCII   ETX
                  Hex   03
                  Decimal   3
[Description]   Select normal font from the current print position. This is the
default font from power on or reset

Wide font

[Name]   Wide font (24x24 dots)
[Format]   ASCII   EOT
                  Hex   04
                  Decimal   4
[Description]   Select the wide font from the current print position.

High font

[Name]   High font (12x48 dots)
[Format]   ASCII   ENQ
                  Hex   05
                  Decimal   5
[Description]   Select the high font from the current print position.

Large font

[Name]   Large font (24x48 dots)
[Format]   ASCII   ACK
                  Hex   06
                  Decimal   6
[Description]   Select the large font from the current print position

X-large font

[Name]   Xlarge font (48x96)
[Format]   ASCII   BEL
                  Hex   07
                  Decimal   7
[Description]   Select the X-large font from the current print position.

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Partial cut

[Name]   Partial cut
[Format]   ASCII   BS
                  Hex   08
                  Decimal   8
[Description]   This byte performs a partial cut is.

Line feed

[Name]   Line feed
[Format]   ASCII   LF
                  Hex   0A
                  Decimal   10
[Description]   Line feed.
[Notes]   Print the data from the buffer and feed the paper.

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Feed Forward

[Name]	Feed Forward	
[Format]	ASCII	FF
	Hex	0C
	Decimal	12
[Description]	Print data from buffer and feed forward 50mm	

Roff

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

Ron

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

Uoff

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

Uon

[Name]	Underline on	
[Format]	ASCII	DC1
	Hex	11
	Decimal	17
[Description]	Switch on the underline printing	

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Reset printer

[Name]   Reset printer
[Format]   ASCII   SYN
                Hex   16
                Decimal   22
[Description]   Reset the printer. The command is performed even though RTS
                is busy.

Request version

[Name]   Request version
[Format]   ASCII   ETB
                Hex   17
                Decimal   23
[Description]   Software version number will be transmitted. The command is
                performed even though the RTS is busy.

Request status

[Name]   Request status
[Format]   ASCII   CAN
                Hex   18
                Decimal   24
[Description]   Status byte will be transmitted. This command is treated even
                though RTS is busy. The bit definitions are as follows:

Bit	Status	0	1
0	Aux Opto	Low	High
1	Paper	Present	Absent
2	Temperature	Not too hot	Head too hot
3	Head	Closed	Open
4	Cutter	No error	Error
5	Rx error	None	Error
6	Aux Switch	Low	High
7	Always 1		

A request status will clear bit 5 if a RX error have set it.

Even though an RX error has set bit 5 the command request status will clear the bit.

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Request analog voltage

[Name]   Analog voltage
[Format]   ASCII   EM
                Hex   19
                Decimal   25
[Description]   Transmit the digital value of the head voltage. This command
                are treated even though RTS is busy.

Voltage	Returned Value
4.5	TBD
5.0	TBD
5.5	TBD

Request temperature

[Name]   Request temperature
[Format]   ASCII   SUB
                Hex   1A
                Decimal   26
[Description]   Transmit the digital value of the head temperature. This
                command is treated even though RTS is busy.

Temperature	Returned Value
0º	TBD
10º	TBD
20º	TBD
30º	TBD
40º	TBD
50º	TBD
60º	TBD
70º	TBD

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Peaklimit

[Name]	Will do a form feed of specified length		
[Format]	ASCII	FS	n
	Hex	1C	n
	Decimal	28	n
[Range]	1-255		
[Default]	n=128		
[Description]	This command set the number of dots that can be active at the same time. This is used to control the current drawn by the printer.		

Feed

[Name]	Will do a form feed of specified length		
[Format]	ASCII	GS	n
	Hex	1D	n
	Decimal	29	n
[Range]	-128<=n<=127		
[Description]	If n is negative the printer will make a reverse form feed. The unit of n is 1/8 mm.		

Burn

[Name]	Burn compensation		
[Format]	ASCII	RS	n
	Hex	1E	n
	Decimal	30	n
[Range]	-50<=n<=50		
[Description]	Compensate the burn time to obtain best quality. If the printout is to dark a negative value should be chosen.		

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Set baudrate

[Name]	Set baudrate			
[Format]	ASCII	ESC	´q`	m	n
	Hex	1B	71	m	n
	Decimal	27	113	m	n

[Range]   m:n = { 12, 24, 48, 96, 192, 384, 576, 1152 }
[Default]   1152
[Description] This command sets the baudrate. After this command has been received the board is will start in the new baudrate after next reset.
The baudrate is equal the m:n value times 100, meaning the minimum baudrate is 1200.
The board will only change baudrate is one of the above settings is used. m is the most significant byte and n is the least significant byte.

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5   MAINTENANCE

5.1 Daily use

The PRN608-039 board must be turned off in idle mode.

5.2 Store/Transport

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

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6   SPECIFICATIONS

6.1 Electrical data

Voltage:	Nominal	4,5V-8,5 DC
	Tolerance	±10%
Current:	Max. head current:	Numbers of active dots * VHead 180+/-15%
	Max. motor current:	500mA
	Max. low current in power down mode:	0.3mA (approx)

6.2 Mechanical data

Dimensions:	L * W * H:	65 mm* 35 mm* max.10 mm Including connectors
Vibration:	XYZ	100G
Shock:	XYZ	100G

6.3 Environmental data

Operation:	Temperature:	0℃- +70℃
Humidity:		10%-90% RH, without condensation
Storage:	Temperature:	-40℃ - +85℃
	Humidity:	0%-90% RH, without condensation
Transport:	Temperature:	-40℃ - +85℃
	Humidity:	0%-90% RH, without condensation

6.4 EMC & ESD

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

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6.5 Connector pin assignments

Head/motor/switch connector CN1:

Part number: CF16301M0T0, CviLux Corporation.
Mating part: Flex Flat cable

Pin	Function	Pin	Function
1	GND	16	TI
2	VDD	17	/ST2 / GND
3	P1	18	/ST1
4	GND	19	/ST1
5	SW	20	AOE
6	VH	21	GND
7	VH	22	GND
8	DI	23	/LAT
9	CLK	24	DO
10	GND	25	VH
11	GND	26	VH
12	/ST3	27	/MB
13	VH	28	MB
14	/ST1	29	/MA
15	VDD	30	MA

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Cutter connector CN2

Part number: B4B-PH-SM3-TB from JST
Mating part: Supplied with cutter

Pin	Function
1	+3.3V
2	Sense
3	CUT
4	/CUT

AUX input connector CN3

Part number: 53261-0690, Molex
Mating part
Part number:
Housing: 39-01-3042, Molex
Contact: 39-00-0038, Molex

Pin	Function
1	+3.3V
2	Input 1
3	150Ω resistor to ground
4	+3.3V
5	Input 2
6	150Ω resistor to ground

The schematic below show how the external opto-sensor and paper switch must be connected to the PRN608-039 board.

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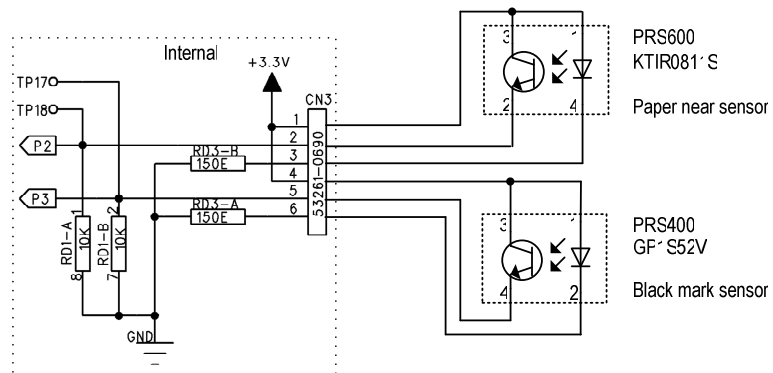
Power connector CN4:

Part number: 43045-0409, Molex
Mating part
Part number
Housing: 43025-0400, Molex
Contact: 43030-0007, Molex

Pin	Function
1	GND
2	+5V
3	GND
4	+5V

Serial Connector CN5:

Connector type: LPH10-SGN1-PAD
Mating connector part number: FC10AGN, Taitek

Pin	Function	Direction	Pin	Function	Direction
1	NC	-	2	DSR	output
3	TX	output	4	CTS	input
5	RX	Input	6	RTS	output
7	DTR	input	8	NC	-
9	GND	-	10	NC	-

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6.6 Mechanical drawing

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