

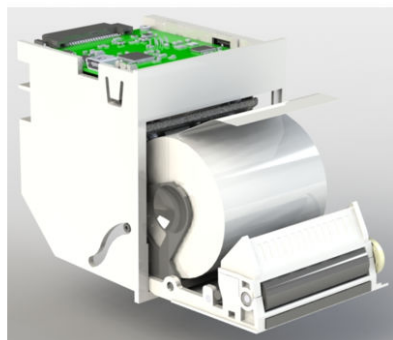
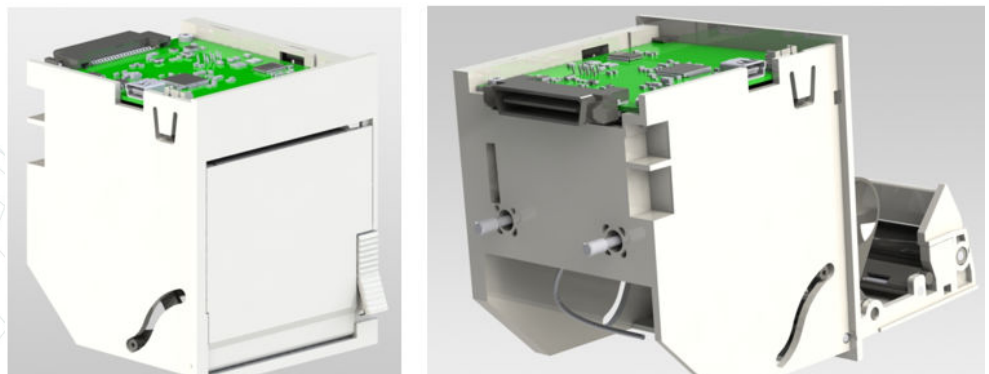


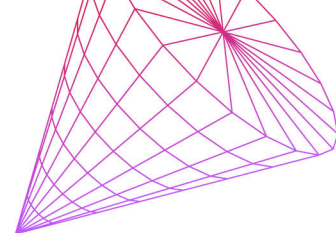
PRODUCT SPOTLIGHT

GPR212-M0

Graphic **P**rinter **R**ecorder

Technical **M**anual





Preface

- This manual provides complete technical information for the GPR212-M0 "Easy Loading Printing Module".
- For customized mechanisms, A.P.S. supplies documentation in addition to the present specification.
- The present specification is valid also for customized types, where the different condition has no effects on common data (e.g.: different colour of case parts).
- A.P.S. reserves the rights to make changes to the product, without notice, to improve the reliability, functions or design.
- A.P.S. does not assume any liability arising from the application or the use of product or circuits described.
- The warranty terms of the product are described in a separate document, please contact A.P.S. to obtain this document.

Revision History

Rev. Index	Date	Page/Sec.	Description	Author
Prel. 1	27-Dec-17	-	Preliminary Revision	PS
Prel. 2	03-Jan-19	-	Adjustments for connection description	PS
Prel. 3	19-Mar-19	-	Precision for ordering code and labelling	PS
A	01-May-19	-	Issuing document	PS
B	20-April-21	-	Control codes list updated Paper reference label added	PS
C	18-Oct-22	-	Add Glink protocol version	PS

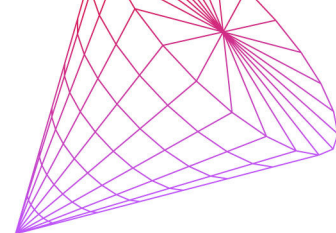
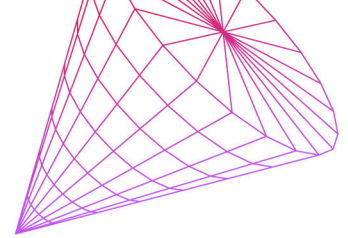


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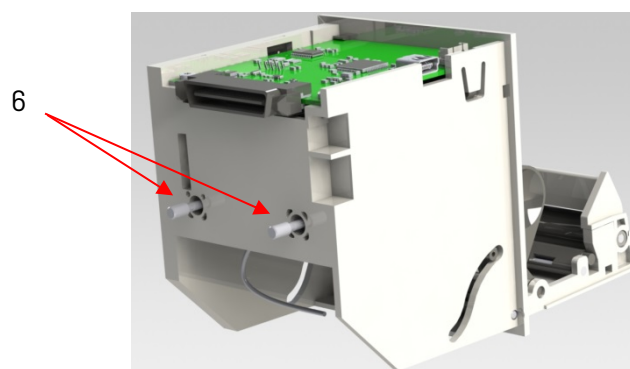
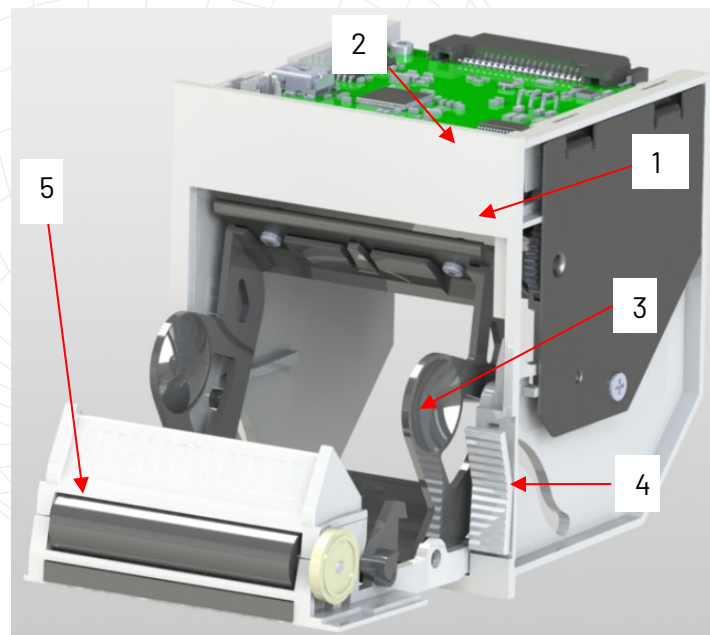
1. INTRODUCTION

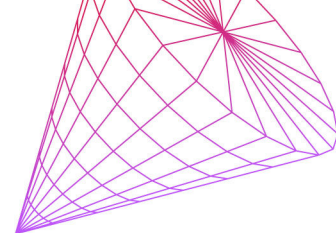
The GPR (Graphic Printer Recorder) 212-M0 is a 2 inches, 12V, Easy Loading Printing Module with an integrated control board using standard serial TTL communication protocol, (USB communication optional with micro USB connector).

This printer is designed for easy integration by medical and laboratory instrument manufacturers. The GPR212 module consists of a set of mechanical and electronic parts.

The sections that form the GPR212 module are described below:

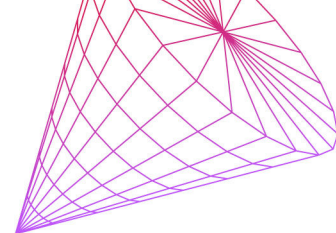
1. Printer mechanism, easy loading type;
2. Electronic control board with Main connector and USB connector;
3. Bucket with paper roll support;
4. Button for door opening
5. Door (for easy opening) with latch and platen roller;
6. Two fixation screws;





1.1 GPR212-M0 MAIN FEATURES

- **Fully hot plug printer**
- **50 mm paper width and roll diameter**
- **Full easy opening (latched cover)**
- **Low consumption**
Standby mode: ≤ 0.2 W, printing mode: ≤ 16 W (maximum)
- **Power supplies**
Print voltage: 12 Volts ± 10 %
Logic voltage: 5 Volts ± 5 %
- **2 Communication ports**
UART – TTL levels (speed up to 115200 Bds).
& USB Rev. 2.0 (optional)
- **Software programmable consumption**
Dynamic division and high speed (up to 50 mm/s)
- **Chart print speed selectable**
0.5, 1, 5, 6.25, 10, 12.5, 25, 50 (mm/s)
- **Recording Mode**
Waveform (up to 4 traces), text, Graphics
- **Programmable Grids**
- **Print resolution**
Vertical (paper width): 8 dots/mm
Horizontal (paper feeding): print waveform mode 24 dots/mm @ 25mm/s and below,
16 dots/mm @ higher than 25 mm/s
- **Full control over printing quality/speed**
- **Two fonts size (8 points and 10 points)**
The cell size of the 8-point font is 12 pixels by 26 pixels. The cell size of the 10-point font is 16 pixels by 34 pixels.
- **Powerful text printing modes**
Horizontal, vertical, invert. Horizontal, invert. vertical
- **Powerful graphic modes**
Variable width and offset
Double and quadruple width and height
- **11 barcodes**
Normal and 90 degree
- **Printer setup parameters can be saved in flash**
- **Windows, Linux and Android drivers available**
- **GRAPH LINK (GLINK) protocol compliant version**
- **Easy firmware upgrades**

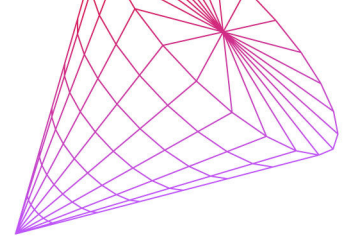


2. GENERAL SPECIFICATIONS

NO.	Specifications	
1	Printing method	Thermal
2	Number of dots	384
3	Resolution (dots/mm)	8
4	Printing width (mm)	48 (centered on paper)
5	Paper width (mm)	50 +0/-1
6	Max. paper thickness (u)	80
7	Maximum paper roll diameter (mm)	50
8	Recommended paper	JUJO-AF50KS-E (standard grade) JUJO-AF50KS-E3 (high sensitivity) Equivalent types can be used
9	Paper loading	Easy loading
10	Max Printing speed (mm/s)	50
11	Paper detection	Opto sensor
12	Temperature detection	Thermistor
13	Cover-open detection	Mechanical switch
14	Voltage range	Print voltage: 12 Volts \pm 10 % Logic voltage: 5 Volts \pm 5 %
15	Power consumption (A) -printing ** (average, 64 dots on / 12 V / 25mm/s / 16 dots/mm resolution) -stand by	1.0 A 0.04 A
16	Weight (g)	~ 190
17	Life/Reliability	50km/100M pulses
18	Door opening/closure operations	5 K
19	Paper roll insertion/extraction	5 K
20	Dimensions (WxDxH mm)	71,7 x 74,9 x 84,1
21	Mount Size (WxD mm)	80 x 67,25
22	Interfaces	TTL, USB
23	Memory buffer size	1024 B
24	RAM memory	16 KB (+ 128 KB ext)
25	FLASH memory	128 KB (+ 4 MB ext)
26	Character fonts	YES
27	Graphics	YES
28	Barcodes	YES
29	Drivers	YES

(*Beyond the range of operating temperature from +5° C to +40° C TPH's printing quality may be affected.)

(**power consumption can be adjusted / limited through control sequences)

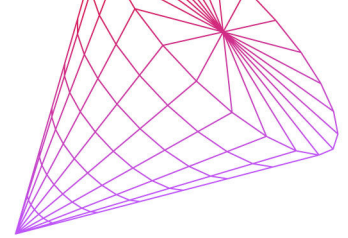


2.1 ENVIRONMENTAL SPECIFICATIONS

Operating temperature *(°C)	0 to 65 non cond.
Operating relative humidity (%)	10 to 90 non cond.
Storage temperature	-20 to +60 non cond.
Storage relative humidity	10 to 90 non cond.
Shock test	- 25G, 11mSec, ½ Sine pulse Status of UUT: no printing
Vibration test	- 5~500Hz sweep @ +/- 4 mm amplitude X, Y, Z, direction, 20 times each. Status of UUT: printing
Randomized Vibration test	- 10~2000Hz ASD-Level : 1(m/s ²) ² /Hz, 10 ...100 Hz Final slope: -3 dB/Octave, 100...200 Hz; 0.5(m/s ²) ² /Hz 200...2000 Duration: 10 min / direction Status of UUT: printing

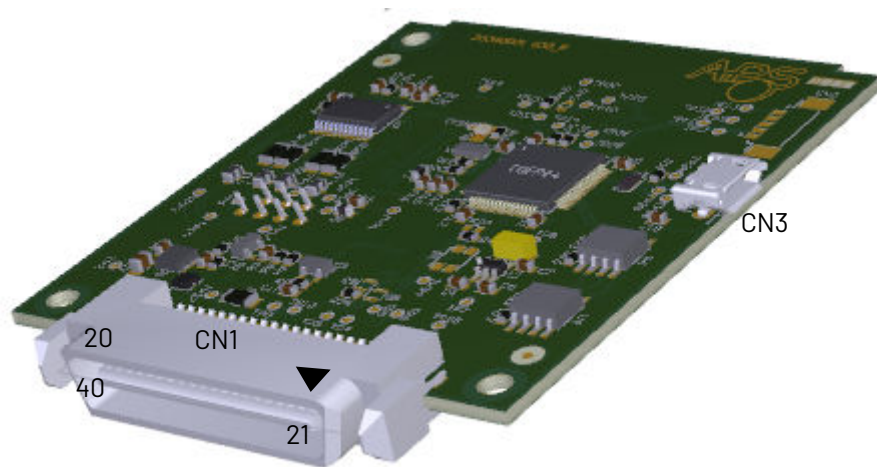
2.2 ESD SPECIFICATIONS

ESD test	EN60601-1-2 Part 2 (2014)
	IEC60601-1-2:2001/A1:2004
	-15KV Air discharge on non-conductive planes
	- 8KV Contact discharge



3. PRINTER DEVICE INTERCONNECTION

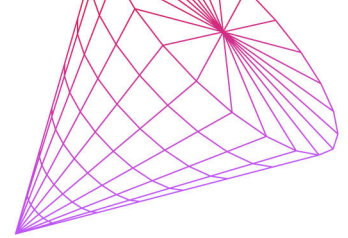
This device is connected through a single 40 pins connector located at the rear side. With USB option, the micro USB connector is on the left side of the driver board.



▲ : Position pin number 1



Reference	Description
CN1	Main connector
CN3	Micro USB connector



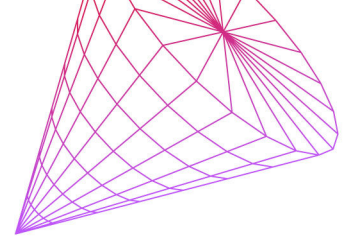
3.1 MAIN CONNECTOR

GPR212-M0 device connector CN1	User side matching connector
<i>FCI-71292-002 (40pins male)</i>	<i>Ex.: TE-1734100-4</i>

Pin number	Signal name	Pin number	Signal name
1	VCC (5V)	21	VCC(5V)
2	VSS (Power return)	22	VSS
3	NC	23	NC
4	GND	24	PTR-SIN
5	GND	25	PTR-SOUT
6	NC	26	NC
7	GND	27	PTR-SOUTEN
8	GND	28	PTR-SINEN
9	NC	29	NC
10	GND	30	PTR-RDY
11	GND	31	PTR-RES
12	VSS	32	VSS
13	VSS	33	VSS
14	VDD (12V)	34	VDD (12V)
15	VDD (12V)	35	VDD (12V)
16	VDD (12V)	36	VDD (12V)
17	VDD (12V)	37	VDD (12V)
18	VDD (12V)	38	VDD (12V)
19	VSS	39	VSS
20	VSS	40	VSS

IMPORTANT NOTE:

Wires AWG24 (or lower) must be used in order to avoid current losses.



Interface signals definitions

For proper operation, a pull up resistor (470K recommended) should be connected to each of the host input signals: SOUT, -SINEN, -RDY.

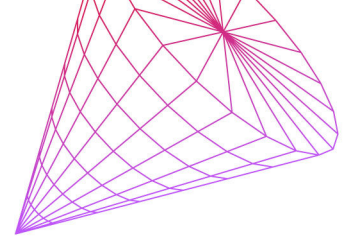
If their functions are not needed, there is no need to drive the host outputs -SOUTEN or RES since the printer provides pull down resistors on these signals.

Signal	Name	Direction	Description
Serial data In	PTR-SIN	To printer	Serial data sent by host to printer, also used to wake the printer Active at High level
Serial data Out	PTR-SOUT	To Host	Serial data sent by printer to host Active at High level
Signal Ground	GND	N/A	Common reference
Serial data Out Enable	PTR-SOUTEN	To printer	Indicates printer may send data to host Active at Low level
Serial data In Enable	PTR-SINEN	To host	Indicates host may send data to printer Active at Low level
Ready	PTR-RDY	To host	Indicates printer is able to communicate with the host Active at Low level
Printer Present	PTR-PPR	To host	Indicates printer is connected to host Active at Low level (connected to GND on the printer driver board)
Reset	PTR-RES	To printer	Resets printer

Electrical characteristics

Parameter	Symbol	Minimum	Maximum	Units
Input current	I_{IN}		200	μA
Input capacitance	C_{IN}		20	pF
Low level input voltage	V_{IL}		0.8	volts
High level input voltage	V_{IH}	2		volts
Low level output voltage ¹	V_{OL}		0.4	volts
High level output voltage ¹	V_{OH}	2.4		volts

¹@ Iout \pm 6mA



Timing chart

Parameter	Symbol	Minimum	Typical	Maximum	Units
Rise time	T_r			125	ns
Fall time	T_f			125	ns
Bit time	T_{bit}	8.5		8.8	μ Sec
Reset time	T_{Res}	20			μ Sec
Reset delay	T_{DReset}			100	mSec

.....3.1.4 Serial communication description

Field	Level
1 start bit	Low
8 data bits	True logic (0=low, 1=high), LSB first
1 stop bit	high
No parity bit	

The printer supports data rates of 115.2 Kbps. The same rate is used for SIN and SOUT.

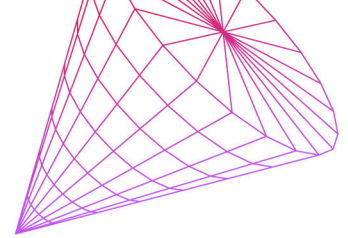
By monitoring the signal lines driven by the printer, the host can determine if the printer is connected, if it is powered up and its state, as shown in the table below.

Note that if two or more signals change between conditions, they may not change at precisely the same time.

Condition	PTR-SINEN	PTR-RDY	PTR-SOUT
Not connected	HIGH ²	HIGH ²	HIGH ²
Not Powered	HIGH ²	HIGH ²	HIGH ²
Failed state ³	HIGH	HIGH	HIGH
Init state	HIGH	LOW	HIGH
Room in printer receive buffer for host data in On-line, Off-line, or exception states	LOW	LOW	DATA
No room in printer receive buffer for host data in On-line, Off-line, or exception states	HIGH	LOW	DATA

² If pull up resistors are installed on the host side

³ These are intended levels, but some failures may produce indeterminate outputs

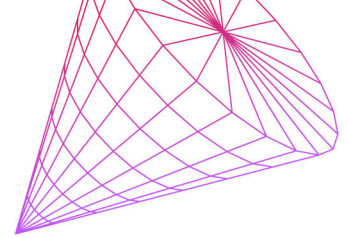


3.2 USB COMMUNICATION CONNECTOR

The GPR212-M0 printer offers a USB communication interface (according selected option).

GPR212-M0 device connector CN3	User side matching connector
Micro B series 5 contacts (female)	Micro B series (male)

Pin number	Signal name
1	Vbus
2	D-
3	D+
4	ID
5	GND



4. HANDLING THE GPR212

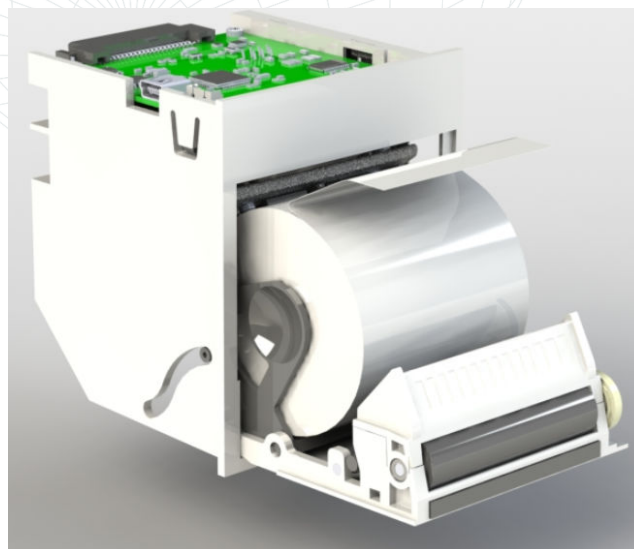
4.1 HOW TO OPEN THE DOOR

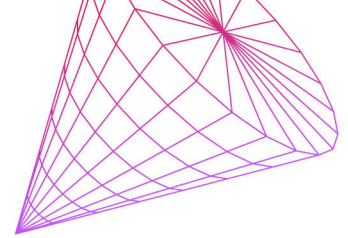
Push on the bottom of the door unlocking button in order the Door Group is released from its locking position.



4.2 HOW TO LOAD THE PAPER ROLL

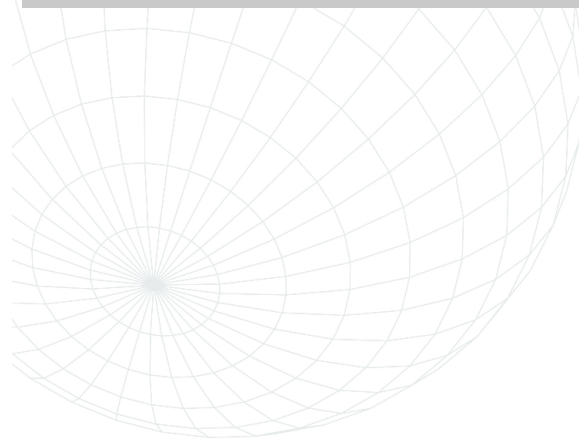
The axle of the paper roll has to be inserted between the two roll supports

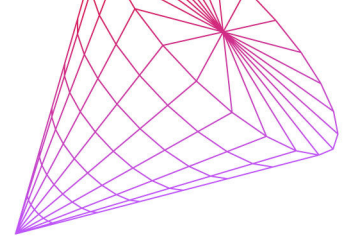




4.3 HOW TO CLOSE THE DOOR

By pushing on the top of the door in the middle.





5. GPR212 DEVICE OPERATIONS

5.1 STANDARD MODE

The printer GPR212 is a 2-inch thermal printer optimized for use as a chart recorder. It interfaces to another instrument or controller, referred to as the host, through a serial data link.

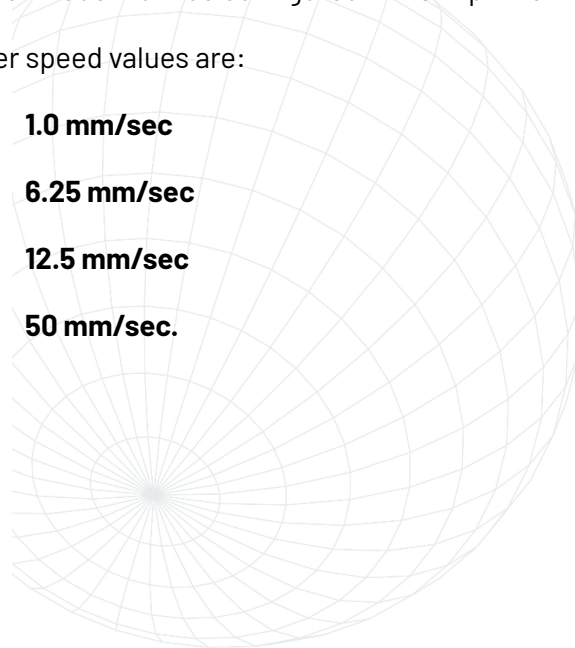
The host controls the printer by sending commands and data. It can configure the printer by setting such parameters as printing speed, number of traces, data sample rate, and grid definition. The host sends a variety of data to the printer including text, waveforms and graphics information.

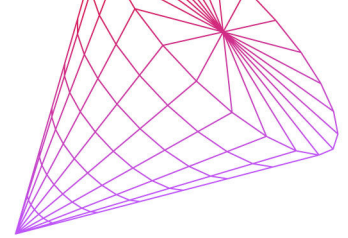
The printer processes these commands and data, and can send messages to the host when necessary. It replies to various queries from the host and also automatically generates messages both periodically and when significant changes occur.

In print mode, only text and raster graphics are printed, while in recorder mode, the printer prints waveform traces, grids, and various text and graphics elements. These two modes are mutually exclusive, but recorder mode must be configured while in printer mode.

The required recorder speed values are:

0.5 mm/sec	1.0 mm/sec
5.0 mm/sec	6.25 mm/sec
10.0 mm/sec	12.5 mm/sec
25 mm/sec	50 mm/sec.





The controller board has two resident fonts : font 0 (10 point font), font 1 (8 point font). All character bitmaps will be shown with their hexadecimal code (row being the most significant nibble, and column the least significant nibble). Example: ASCII code for 'A' is 41 hex (or 65 decimal).

Note: only one specific font is used with GLINK version

- **Font 0** : Character size is 16 x 20 pixels
- **Font 1**: Character size is 12 x 24 pixels

Font 0

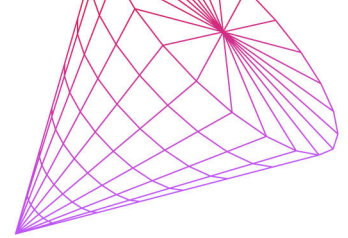
```

0 123456789ABCDEF
2  !"#$%&'()*+,-./
3 0123456789:;<=>?
4 @ABCDEFGHIJKLMNO
5 PQRSTUVWXYZ[\]^_
6 `abcdefghijklmno
7 pqrstuvwxyz{|}~
8 (-_>=<~≠√∞∫∏∑∏∑
9 ▶◀▼▲↓↔↗↘⊕⊖⊗⊘⊙⊚⊛
A |ç£¤¥¦§¨©ª«¬®¯°±²³´µ¶·¸¹º»¼½¾¿
B °±²³´µ¶·¸¹º»¼½¾¿
C ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏ
D ÑÒÓÔÕÖ×ØÙÚÛÜÝÞß
E àáâãäåæçèéêëìíîï
F ðñòóôõö÷øùúûüýþÿ
  
```

Font 1

```

0 123456789ABCDEF
2  !"#$%&'()*+,-./
3 0123456789:;<=>?
4 @ABCDEFGHIJKLMNO
5 PQRSTUVWXYZ[\]^_
6 `abcdefghijklmno
7 pqrstuvwxyz{|}~
8 (-_>=<~≠√∞∫∏∑∏∑
9 ▶◀▼▲↓↔↗↘⊕⊖⊗⊘⊙⊚⊛
A |ç£¤¥¦§¨©ª«¬®¯°±²³´µ¶·¸¹º»¼½¾¿
B °±²³´µ¶·¸¹º»¼½¾¿
C ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏ
D ÑÒÓÔÕÖ×ØÙÚÛÜÝÞß
E àáâãäåæçèéêëìíîï
F ðñòóôõö÷øùúûüýþÿ
  
```

5.2 GLINK PROTOCOL VERSION

A specific P/N is dedicated for this version, see chapter .8

6. OPERATING CONTROL CODES /BYTES

There are two different ways to control the printer depending of the version:

- Standard mode version
- Graphic Link Protocol compliant version

6.1 STANDARD MODE CONTROL CODES CROSS REFERENCE

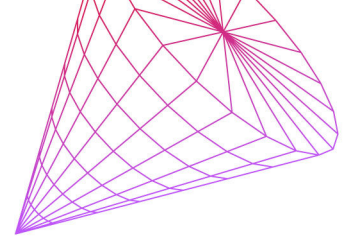
Control codes are non-printable characters or sequences of characters that control the operation of the printer. Within the following description, a control code causes the printer to interpret the following byte as part of a command and not as a printable character.

Printer configuration commands

Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
ESC ! k n1 M	Set Paper printing speed	P	P/R
ESC @	Reset printer	P	P
ESC d	Recover factory setup parameters	P	P/R
ESC GS M	Enter Bootloader mode	P	P
ESC GS T	Print a self-test ticket	P	P
ESC I	Send printer identity	P	P
ESC s	Save in flash setup parameters	P	P/R
GS B n1	Set serial communication settings	P	P/R
ESC ! k n1 A	Set printing intensity	P	P/R

Printer status commands

Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
ESC ! q n1 A	Status request	P/R	P/R
ESC ! a n1 B	Echo data	P/R	P/R
ESC v	Send printer status request (short)	P	P



Text printing commands

Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
CR	Print and carriage return	P	P
ESC ! k n1 D	Select Font	P	P/R
ESC ! k n1 F	Line Size (from Font)	P	P
ESC ! k n1 O	Font Orientation	P	P/R
ESC ! s n1 A	Assign Character	P	P/R
ESC ! s n1 C	Select Character	P	P/R
ESC ! s n1 E	Symbol Set (Extra)	P	P/R
ESC ! s n1 M	Symbol Set (Main)	P	P/R
ESC 2 n1	Set line pre-spacing	P	P
ESC b n1	Set normal/inverse video mode	P	P
ESC c n1	Set maximum number of characters	P	P
ESC C n1	Set text justification	P	P
ESC j n1	Feed paper backward (n1 dot lines)	P	P
ESC J n1	Feed paper forward (n1 dot lines)	P	P
HT	Horizontal tab	P	P
LF	Print and line feed	P	P

Table 1: Text printing command set.

Graphics printing commands

Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
ESC ! r n1 G <data..>	Print raster graphic	P	P

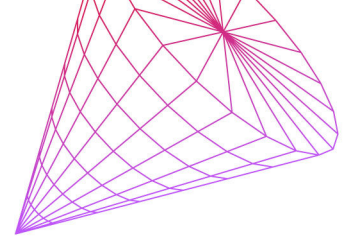
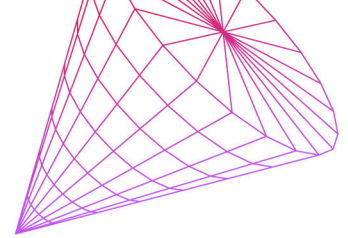


Table 2: Graphics printing command set.

Recorder mode commands

Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
ESC ! k n1 S	Start recorder mode	P	R
ESC ! k n1 H	Stop recorder mode	P/R	R
ESC ! d 0 B	Clear page	P	R
ESC ! d n1 L	Page size	R	R
ESC ! c n1 A	change TEXT	P/R	R
ESC ! c n1 C	Select TEXT ID	P/R	R
ESC ! c n1 D <data..>	Define TEXT	P/R	R
ESC ! j n1 B	Trigger TTEXT	R	R
ESC ! r n1 V	TTEXT Vertical position	P/R	R
ESC * p n1 X	Cursor Positioning (X)	P	R
ESC * p n1 Y	Cursor Positioning (Y)	P	R
ESC ! b n1 H	Set bitmap height (max 255)	P	R
ESC ! b n1 V	Set bitmap width (max 255)	P	R
ESC ! b n1 D<data>	Set bitmap content (max 4096)	P	R
ESC ! m n1 S	Set Selection of rectangle. (1/4 possible)	P/R	R
ESC ! m n1 H	Set height of rectangle in pixels	P	R
ESC ! m n1 W	Set width of rectangle in pixels	P	R
ESC ! m n1 E	Selected rectangle	P	R
ESC ! m n1 R	Set repeat distance in pixels.	P	R
ESC ! m n1 Y	Set X position of rectangle in pixels.	P	R
ESC ! m n1 Y	Set Y position of rectangle in pixels.	P	R
ESC ! m n1 T	Trig selected rectangle.	R	R

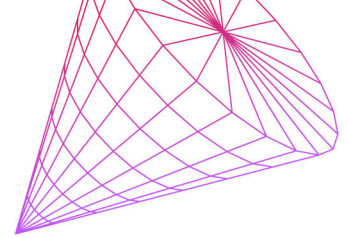
Traces / Grids commands



Command	Description	Valid in Printer or Recorder mode	Affects Printer or Recorder mode
ESC ! g n1 S	Select Grid	P/R	R
ESC ! g n1 H	Grid Height	P	R
ESC ! g n1 L	Grid Horizontal Line Spacing	P	R
ESC ! g n1 V	Grid Vertical Line Spacing	P	R
ESC ! g n1 D	Grid Horizontal Dot Repeat	P	R
ESC ! g n1 P	Grid Vertical Dot Repeat	P	R
ESC ! g n1 T	Grid Top/Bottom Darkness	P/R	R
ESC ! g n1 I	Grid Interior Darkness	P/R	R
ESC ! g 0 S	Standard Grid	P	R
ESC ! w n1 S	Select Trace	P	R
ESC ! w n1 E	Control Trace	P	R
ESC ! w n1 O	Trace Offset	P	R
ESC ! w n1 I	Trace Weight	P	R
ESC ! w n1 C	Trace Scaling	P	R
ESC ! w n1 P	Trace Phase Offset	P	R
ESC ! w n1 R	Trace Sample frequency	P	R
GS n1 <data>	Waveform data	R	R

Control code sequences detailed description

Please refer to the **GPR212 programming manual**.



6.2 GRAPHIC LINK PROTOCOL COMPLIANT VERSION

The default (Power on) serial port parameters are 19.2 Kbaud, 1 start bit, 8 data bits, 1 stop bit, no parity to and from the printer (Direct Digital Writer – DDW).

Two formats are used: one for Real Time data and one for Non Real Time (NRT) data.

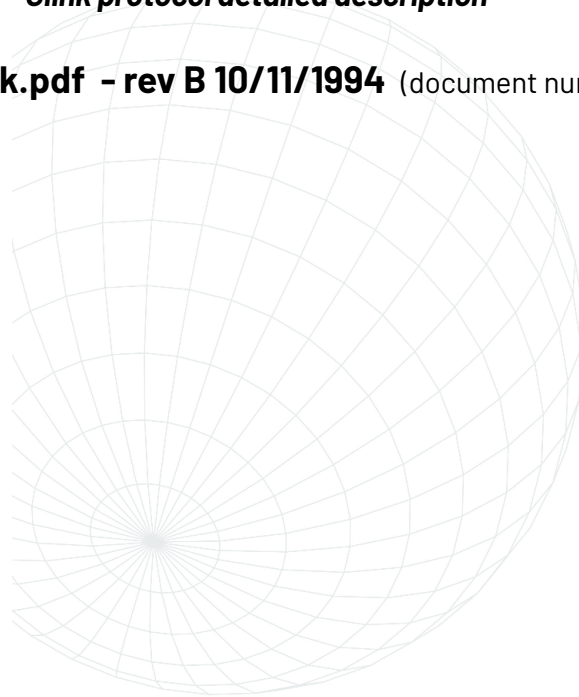
The real time data format consists of a 27 byte packet being sent to the DDW every 1/60th of a second.

The DDW transmits a status byte every 1/2 sec.

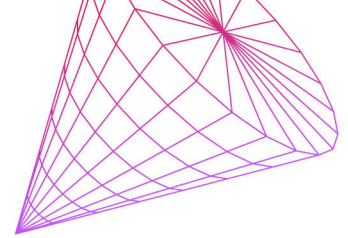
The NRT format consists of a single, variable length packet being sent to the DDW. The DDW transmits a status byte every 1/2 sec.

Glink protocol detailed description

See Document **glink.pdf - rev B 10/11/1994** (document number ES413338-001)



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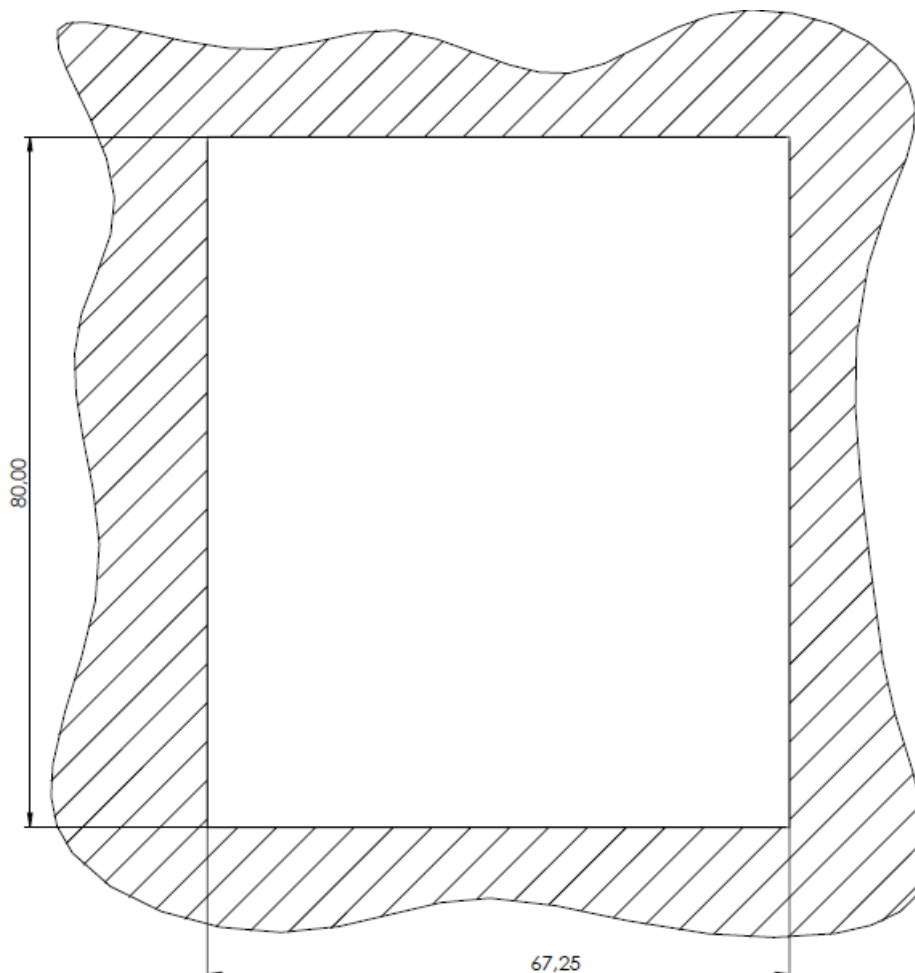


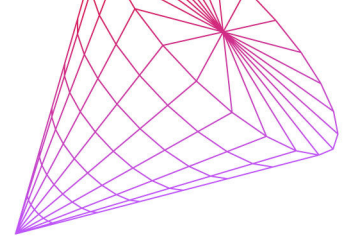
7. MECHANICAL AND HOUSING

7.1 THE DRAWING OF MANUFACTURING

See attached drawings at the end of this technical reference for overall dimensions.
3D files, for mechanical details, are available upon request, ask A.P.S for more information.

Mounting panel dimensions:





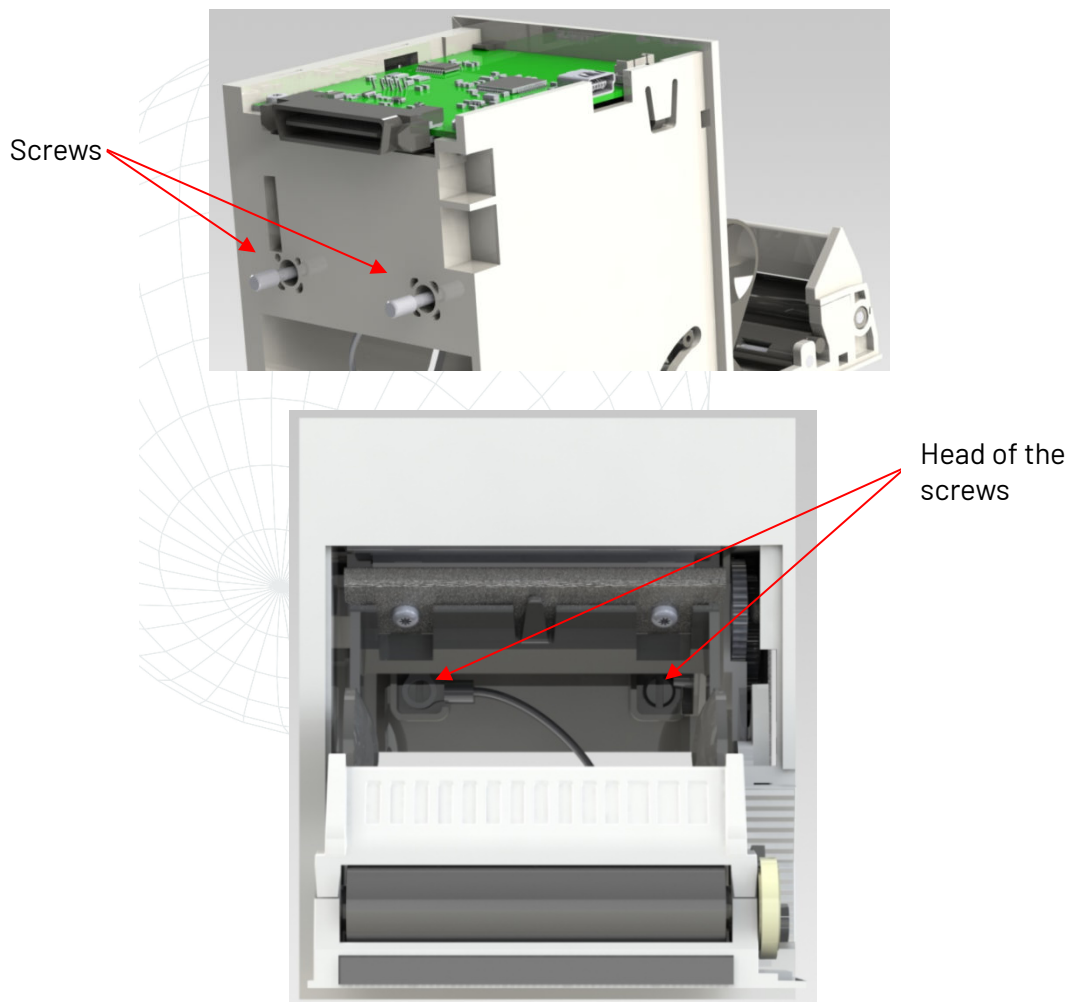
7.2 PRINTER MODULE FIXATION

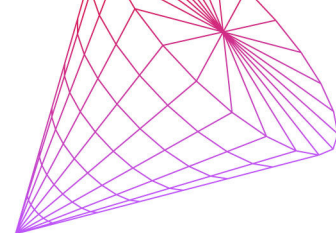
Vertical orientation is to be preferred; reliability and life tests have been based only according to this orientation.

Alternatively, it is possible to choose different orientation angles, horizontal or 45°.

The mechanism has to be fixed using the 2 screws provided for this purpose at the back of the printer.

To avoid any kind of deformation or distortion, a flat surface for contact areas is required, otherwise, the print quality and printer's life will be drastically reduced.

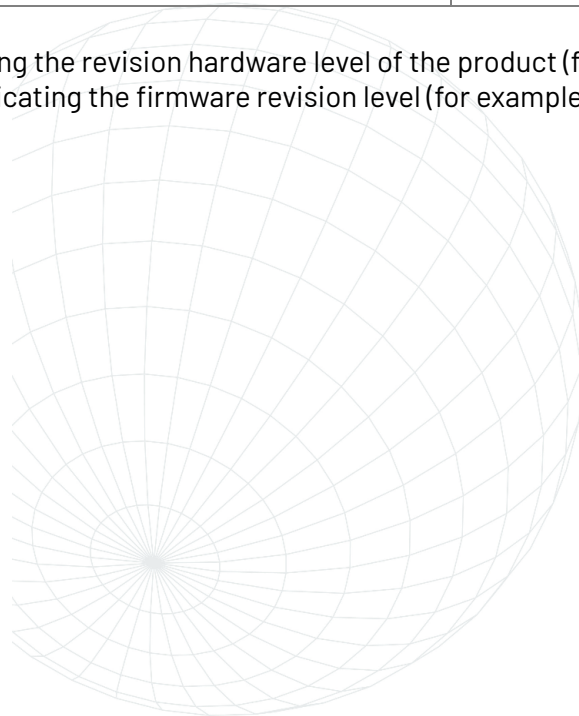


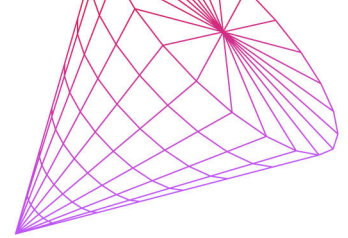


8. ORDERING CODES

Product Name	Ordering Code
GPR212-M0 BUCKET PRINTER 2" 12V (standard version)	90GPR212 E1130 *
GPR212-GL-M0 BUCKET PRINTER 2" 12V (GLINK protocol version)	90GPR212 E2000 *

***X** is indicating the revision hardware level of the product (from A, B, C...etc)
yyyy are indicating the firmware revision level (for example 1000 means rev 1.00)





9. LABELLING

9.1 IDENTIFICATION LABEL

Each printer is identified with a label (mm 30 x 50) on its left side.
Ex:



Barcode codification example:

14 03 18 100092 000001

D M Y PO SN

D - day (1 or 2 digits); *In case single digit "8" it means "08" as date*

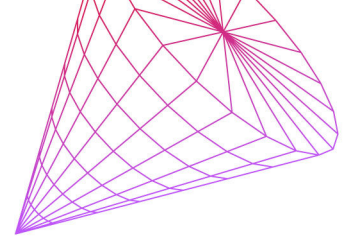
M – month (2 digits)

Y – Year (2 digits)

PO – Production Order (6 digits)

SN – Serial Number of this P.O. (5 digits)





9.2 PAPER REFERENCE LABEL

An additional label indicating the reference of the recommended paper is inside the door:

