

HENGSTLER®



Operating Manual

XPM 200HR™ v1 **Thermal Printer Family**

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1. Introduction

Thank you for selecting the Hengstler XPM 200HR™ thermal printer! We are proud of this feature-rich product, which was designed using all our expertise and experience, and we are confident that you will be pleased with the advanced features and outstanding performance.

This Operator Manual is designed to help you with the proper installation, connection to your host computer system and start-up of the XPM 200HR™ thermal printer system. All necessary details will be explained in the following sections. Please read this manual carefully before using the printer. If you have any further questions, please do not hesitate to contact us.

The XPM 200HR™ thermal printer family does not require any servicing and is intended primarily for printing and cutting documents and receipts from continuous or fanfold thermal paper. The XPM 200HR™ handles paper with a width of 210 to 220 mm. A cutter is standard and is integrated into every XPM 200HR™ print mechanism. Powerful motors allow the use of large paper rolls to maximize time between paper replenishment. 'Black Mark' control is available for when documents are to be printed on preprinted forms or with a predetermined length. The XPM 200HR™ has a print resolution of 300 dpi to ensure that graphics, such as logos etc. can be printed with excellent quality. The printer is available with or without a presenter.

The XPM 200HR™ printer family has been designed for use primarily in kiosks and similar information or ticket printing applications. Its robust design makes it a natural choice for such heavy-usage applications.

Equipped with either USB or Serial (RS-232) interfaces, the XPM 200HR™ printer family is versatile and flexible! Driver software is available that supports Windows 7, Windows XP and Linux operating systems. In addition, these printers can also be activated directly through ESC sequences; a detailed description of the different native commands is contained in the XPM 200HR™ Emulation Command Set Reference.

We're glad you chose the XPM 200HR™ thermal printer family. Once you've used it, we're sure you will be, too!

1.1. Scope

This manual covers the XPM 200HR thermal print mechanism, with or without presenter, and the related printer controller.

1.2. Additional Documentation

Document No.	Description
D 690 004	XPM 200HR™ Emulation Command Set Reference
D 690 005	XPM 200HR™ Windows® XP/7 Driver Manual
D 690 008	XPM 200HR™ Linux Driver Manual
D 690 xxx	XPM 200HR™ Paper Specification
D 690 075	XPM 200HR™ Dimensional Drawing

2. Important Information and Safety Instructions

Hengstler GmbH accepts no liability for any damages, direct, indirect or consequential, arising from improper use of this thermal printer, and, in particular, due to non-compliance with this operating manual or any other available documentation or due to improper handling or maintenance. Should Hengstler GmbH choose to make technical documentation available, this does not imply any authorization, implied or stated, for the making additions, repairs or modifications to this printer.

This documentation may not be copied, nor shall its contents be disclosed or used commercially unless such use has otherwise been explicitly agreed to by a duly authorized Hengstler representative in writing.








The user is responsible for proper handling and installation of this printer. The printer should only be shipped in its original packing.

2.1. General Information

Hengstler GmbH accepts no liability for the safe operation of the XPM 200HR™ thermal printer family unless Hengstler original products are used exclusively and the following instructions and recommendations are heeded.



If unauthorized persons perform any repairs or modifications to the printer and/or controller and/or related subassemblies (such as presenters, dual-feed units, bundlers, paper roll holders, chassis', etc.), HENGSTLER accepts no liability and the guarantee shall be void.

-  Printing without paper can result in damage to the platen or thermal printhead.
-  Never use paper that might contain staples, paper clips or other metal objects.
-  If the printer will be stored, or will not print, for a long period of time, it is important that a length of thermal paper be kept between the thermal printhead and the platen.
-  Unapproved types of thermal paper may dramatically reduce the life of the printhead and may void the warranty. For pre-printed thermal paper make sure that only appropriate inks are used. Detailed can be found in the Hengstler Paper Specifications document D 690 xxx.
-  The DC power connector must not be connected or disconnected under load in order to avoid damage to the electrical components and the thermal printhead.
-  Avoid strong vibration, shock and impact since they may damage or destroy sensitive electronic and mechanical components. Do not touch the surface of the printer control board in order to prevent static electricity from damaging sensitive components.
-  This thermal printer must not be used near high-frequency devices or strong magnetic fields in order to prevent magnetic interference.



Do not make any attempts to service this printer (e.g. change paper) while the printer is printing.



Installing or uninstalling the printer must only be done while using adequate ESD protection.

2.2. Systems Specific Safety Instructions and Symbols

The following symbols on the system and in the manual remind you to follow the relevant safety instructions:



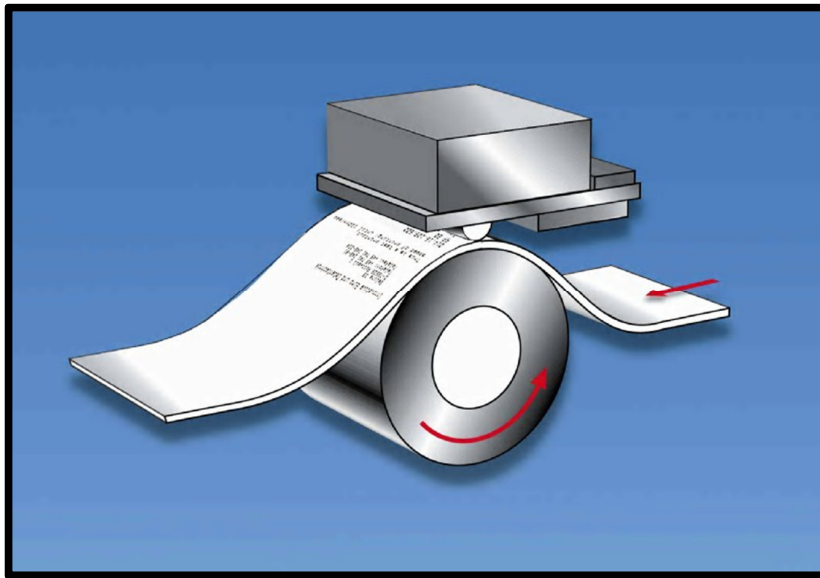
General warning for cases where the user or a service person may be in danger.



General notes and hints for operating the system safely.

3. Overview

3.1. Overview of Thermal Printing Technology



A brief overview of thermal printer technology might be helpful to understand how the XPM 200HR™ thermal printer family works. In most direct thermal printers, paper is fed over a soft, rotating platen and under the thermal printhead. The platen acts as a roller to advance the paper, and at the same time acts as a surface against which the spring-loaded printhead presses the paper to insure good thermal conductivity. Circuitry in the printer determines which heating elements to activate (“fire” or “burn”) to form the next row of dots on the paper.

The thermal paper is coated with several compounds. At room temperature, these compounds are white in color and do not react with each other. The heat from the thermal printhead acts as a catalyst in the areas where the small printhead dots are fired, causing these compounds to react with each other and form a new compound which is a contrasting color, usually black. The platen then advances the paper to the position of the next dot row, and the process is repeated.

You may note immediately several of the advantages of thermal printing. First, since the printing is done with heat, there is no noise from the printing process itself. Thermal printing is inherently quiet compared to most other technologies, such as impact dot matrix. Also, there is only one moving element in the thermal printer: the platen. This provides increased reliability and life when compared to other technologies. Since the chemistry of the thermal paper itself is what causes the printing to appear, there is no replenishment of ink ribbon, ink cartridges or toner. This makes thermal printing the least maintenance-intensive of all common printer technologies.

3.2. Functional View

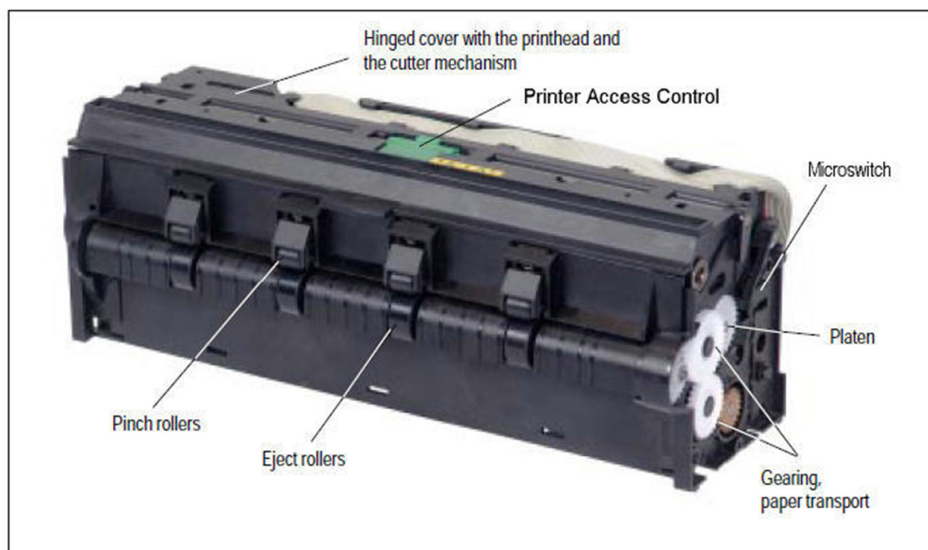


Figure 1

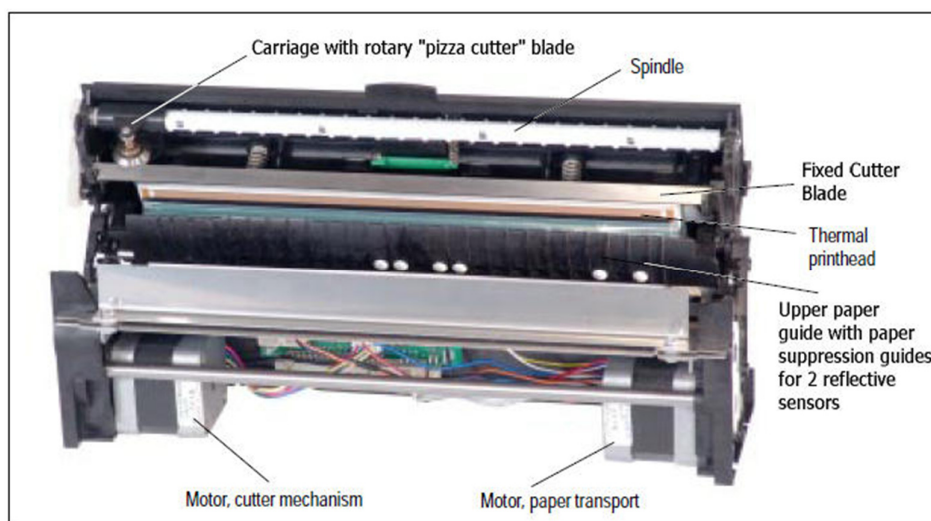


Figure 2

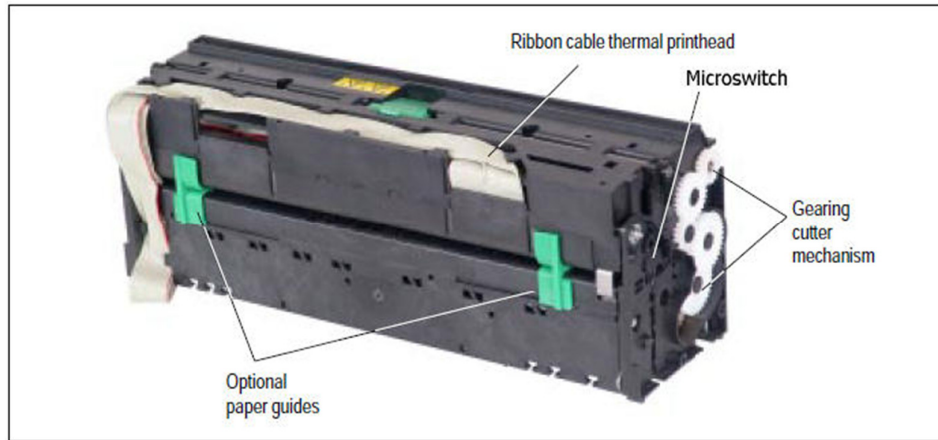


Figure 3

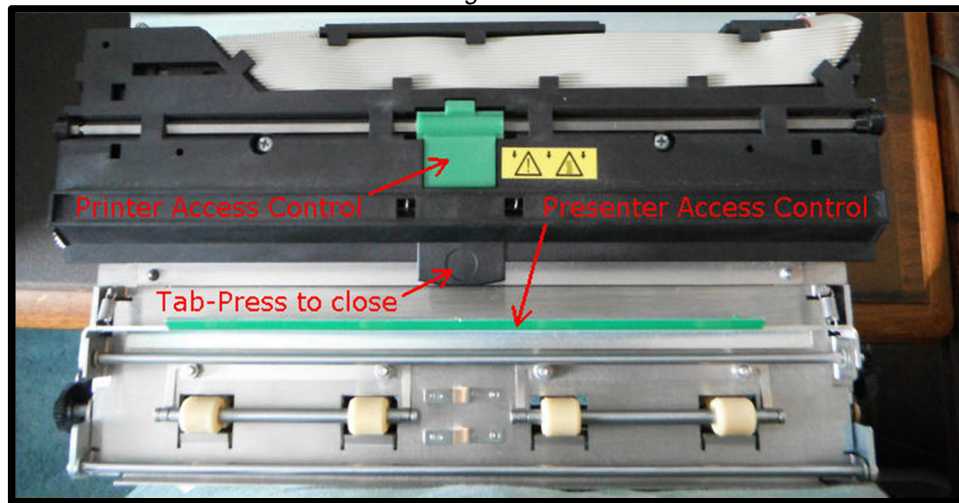
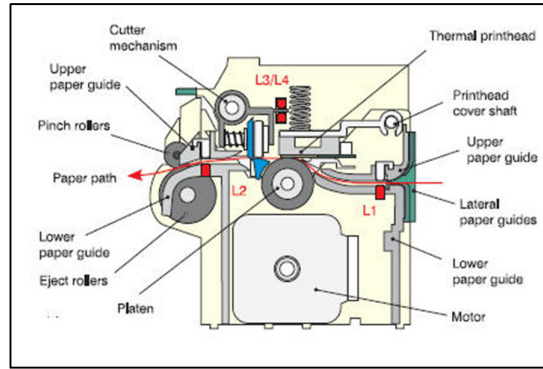


Figure 4

3.3. Description of Components and Operation

The key components or modules to the XPM 200HR™ family of thermal printers are the print mechanism, controller and optional presenter. Please refer to Figures 1, 2, 3 and 4.

The thermal printhead is positioned above the platen. With the print mechanism closed, the platen acts as a roller to advance the paper at the same time as it acts as a surface against which the spring-loaded printhead presses the paper to insure good thermal conductivity. The interface, stepper motor used to turn the platen, sensors, printhead, optional presenter motors and paper cutter are all connected to the controller, which sends commands and causes these components to function at the proper time. The cutter separates the paper from the paper supply when commanded to do so by the controller. The cutter is a “pizza cutter” type which uses a disk-shaped blade that travels along the edge of a fixed cutter blade to sever the paper. Sensors monitor progress as the printed document is created. All these items are mounted to electrically-conductive mounts to discharge any static and to provide electrical noise shielding.

*Figure 5*

When paper (red line in figure 5) is inserted into the printer, the entrance sensor L1 detects the paper edge and starts the platen motor. The platen rotates and grasps the paper as it is manually fed. The paper advances until it reaches sensor L2, which signifies to the printer the location of the paper leading edge. The printer then reverses the paper to the programmable park position.

When data is sent to the printer and printing begins, the paper is advanced by the printer platen as the individual heating elements of the thermal printhead heat as necessary to form the printout. The paper continues to advance and enters the paper cutter area, where it passes over the fixed cutting blade (lower blue element in figure 5) and out the front. Once printing is completed, the paper is advanced and a command sent to the cutter to cut off the paper. The “pizza cutter” blade (upper blue element in figure 5) cycles from one side to the other, and sensors L3 or L4 detect when the cutter has reached one of the two home positions. The paper can then be retracted to a park position to avoid wasting the paper between the printhead and cutter, ready for the next printout.

When the printer runs out of paper, the printer entrance sensor L1 detects the fact and stops printing immediately to avoid possible damage to the thermal printhead from printing with no paper underneath it. How the printer reacts next depends upon the printer’s settings. One common selection is for the partial printout to be invalidated (printed over to make it illegible) as it is retracted out the back of the printer. Another is to simply eject the partial printout out the rear of the printer.

If the XPM 200HR is equipped with a presenter, paper loading is as described above. When a printout is generated, it exits the printer mechanism and activates a sensor at the entrance to the presenter. The presenter motor pulls the paper in until it is pinched between a pair of roller, then stops. As the printer continues to print, a paper loop is formed in an area of the presenter between the presenter rollers and the print mechanism. (It is from this loop that the term “loop presenter” is derived.) When printing is completed, the print mechanism severs the paper from the paper supply. The presenter then advances the cut paper and presents it to the user, holding on to the last few millimeters so the printout doesn’t fall. The user can then take the printout.

The presenter also includes a retract feature. With this feature, the presenter printout can be retracted back into the presenter, either by command, or if it is not taken after a certain period of time, depending upon the settings. If a retract is commanded by the controller, a flap in the presenter moves to redirect the paper downward, and the presenter feed rollers reverse. The printout is routed downward and out of the bottom of the presenter to fall into a customer-supplied “reject” bin.

All other user-adjustable functions and settings in the XPM 200HR™ are controlled by the supplied software tools.

3.4. Location of Controls and Connectors

Please see Figures 1, 3, 4 and 6 for the location of connectors, indicators and controls on the XPM 200HR™ series.



Caution! Care must be taken to avoid injury due to the sharp cutter components when the print mechanism is open.



Caution! The printhead may be hot from printing that took place shortly before opening the print mechanism and may represent a burn hazard. Care must be taken to avoid touching any hot surfaces.

Pulling forward and lifting the Presenter Access Control will provide access to the presenter paper path. Press lightly on the non-moving portion of the presenter top section, to the outside of the rollers, to close the presenter again.

There are several versions of the XPM 200HR controller, depending upon the features ordered. One significant difference between them is the additional connector for controlling the optional loop presenter. Figure 6 shows the XPM 200HR controller with the connectors labeled. These consist of the USB interface, the power connection, the thermal printhead connection, the paper pre-end sensor inputs (including weekend sensors), the print mechanism connections (all the sensors, switches, etc. from the print mechanism except for the thermal printhead), and the presenter connector.

Figure 3 shows the rear of the print mechanism and the two paper guides.

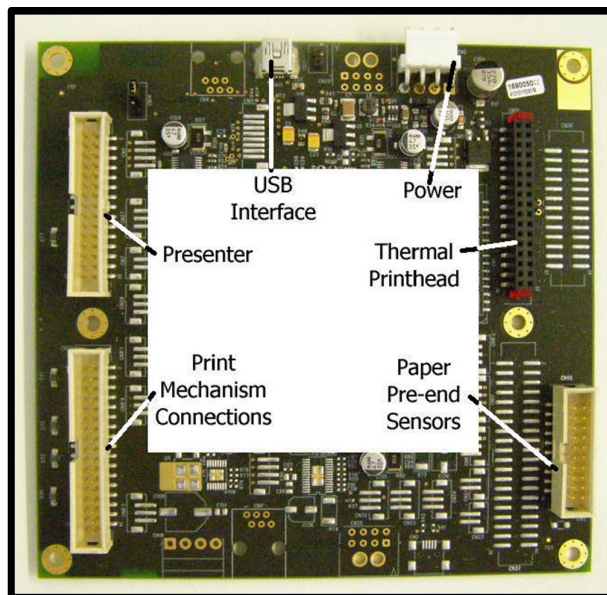


Figure 6

3.5. Operation of Controls, Sensors and LEDs

3.5.1. Printer Access Control

Figure 1 shows a view of the print mechanism and identifies the Printer Access Control. By pressing the Printer Access Control downward, the upper print mechanism will be released and it can be lifted into the position shown in figure 7. Once there, it will snap into a detent position. Do not attempt to open the upper print mechanism (top cover) further than this detent position, or damage may occur to the printer. Access can now be gained to the paper path, printhead, platen and cutter as shown in figures 2 and 7 to remove paper scraps and clean paper dust.



CAUTION! While the top cover is open, there is a serious risk of injury from the sharp cutter blades! Exercise care at all times to avoid injury.



CAUTION! The thermal printhead heats up significantly during operation and may be hot! Avoid burns by not touching the thermal printhead directly.



Avoid touching the thermal printhead at all times. Fingerprints or skin oils left on the thermal printhead may cause premature printhead failure.

To close the upper print mechanism, press down on the black tab shown below Printer Access Control in figure 3 until the upper print mechanism snaps closed. Make certain that the printhead cover release lever (see figure 8) on both sides is fully engaged when closed. If not, the "printhead raised" microswitch will signal the controller that the printer is not ready and will prevent printing from taking place.

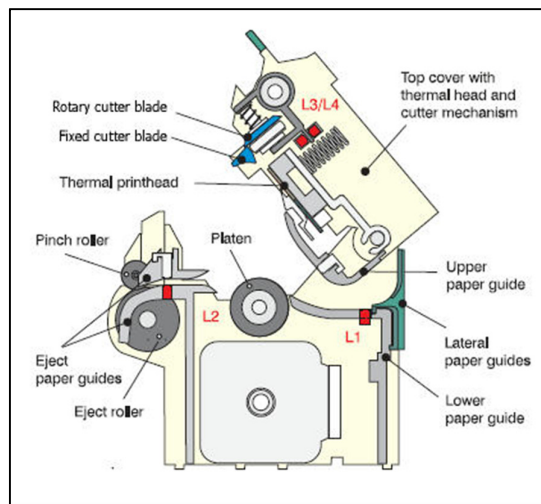


Figure 7

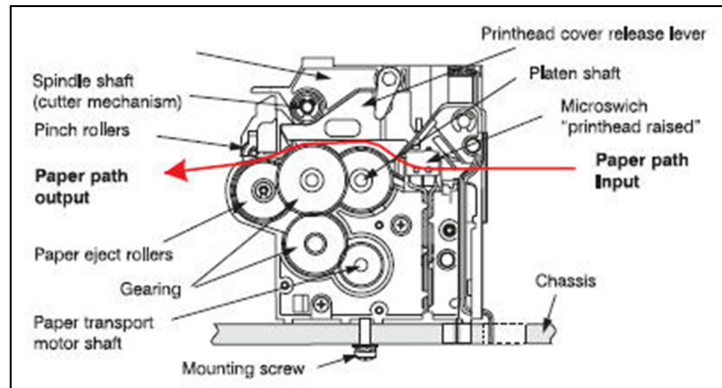


Figure 8

3.5.2. Paper Guides

Figure 3 shows the two paper guides (one left and one right) at the rear of the print mechanism. These should be adjusted to properly guide the paper into the printer. Please note that it is important at all times for the paper path to be straight. Care must be taken that the paper guides cause the paper to line up properly with the paper roll holders or the fanfold source. A crooked paper path will increase the likelihood of paper jams. The paper path should also be centered in the printer to ensure the most reliable, jam-free operation.

To adjust the paper guides, simply slide them to the desired location.

3.5.3. Paper Entrance / Black Mark Sensor

There is a sensor in the paper entrance area of the print mechanism that serves several functions. First, it detects paper entering the print mechanism and signals the controller to activate the paper advance system. Similarly, when the printer is out of paper, this sensor detects the fact and signals the printer accordingly.

The same sensor is also used to detect Black Marks. Black Marks are blackened areas placed on the paper during the converting process. They are generally used, in conjunction with appropriate printer commands, to advance the paper to a specific position after each print job. One common reason for this is to so that preprinted information is properly located with respect to information printed by the printer itself, for example, printing a date inside a preprinted box. Black marks must be located on the back (non-coated) side of the thermal paper.

The XPM 200HR™ printer is designed to allow for numerous Paper Entrance/Black Mark sensor locations during manufacturing. (The location of this sensor cannot be changed once the printer is built.) Also, two different sensor types can be used. The most common is the reflex or reflective sensor, where the light source and detector are located on a single chip. Basically, the light strikes the white paper surface and reflects back into the sensor. If enough light reflects to activate the sensor, the printer reports that paper is present. If there is not enough light reflected, the printer assumes that this area is black, meaning the printer is on a black mark or the printer is out of paper. There are 19 different possible positions for this sensor. The possible positions of these sensors are detailed in Figure 13.

The XPM 200HR™ can also use a through-beam sensor. This type of sensor has a separate light source and detector. The light is transmitted across the paper path into a prism, which redirects it back across the paper path into the detector. When the light is blocked and cannot reach the detector, the printer reports that paper is present. When the light does reach the sensor, the printer concludes that there is no paper present.

The through-beam sensor can also be used in a manner similar to a Black Mark sensor. Instead of a Black Mark, a hole is used in the paper. The through-beam sensor is located in one of 19 different possible locations. The positions of these sensors are detailed in the Figure 14.

3.5.4. “Printhead Raised” Sensor

Two additional “Printhead Raised” microswitches are used to determine whether the printhead is in the up (do not print) or down (ready to print position). (Please note that these microswitches are wired in series, and so will only report “ready to print” if both are closed.) Normally, most of the heat generated by thermal printing is transferred to the paper being printed and is removed from the printer as the paper advances. When the printhead is up, no heat is being transferred to the paper and the heat remains in the individual dots, allowing them to overheat if activated repeatedly. Because this may cause permanent damage to the printer, the XPM 200HR™ firmware will prevent printing or paper loading if the head is up.

The output of this microswitch pair is also available via the Query function. See the XPM 200HR™ Emulation Command Set Reference D 690 004 for details on determining the printhead position and the printhead temperature.

3.5.5. Cutter Sensors

The XPM 200HR™ uses a “pizza-cutter” style paper cutter. A cutting disk moves from one side to the other to sever the paper from the roll against a stationary blade. Sensors are located at the end of travel for this cutter so the controller can detect where the cutter blade is and determine in which direction it should be moved to cut the paper. Printer throughput time is improved by cutting in both directions, eliminating the need for the cutter to make a non-cutting movement to an arbitrary “home” position.

3.5.6. Paper Exit Sensor

A sensor on the exit side of the print mechanism detects when paper has passed through the cutter assembly and reached the paper exit.

3.5.7. Paper Pre-End (Paper Low) Sensors

The XPM 200HR™ has inputs for two pair of sensors indicating Paper Pre-End (Paper Low). (Pairs of inputs are used to allow connection, in other applications, to a dual-feed unit, which can handle two paper sources. In that case, one Paper Pre-End input is used for each paper source.) One sensor pair is used to detect standard Paper Pre-End (PPE). Connected to appropriately selected sensor, and positioned the desired distance from the end of the paper supply, it will signal via a query through the interface when paper has become low enough to activate this signal. This is normally used to allow time to change an almost empty paper roll before it is exhausted. This is an analog sensor input that is converted to a digital signal via analog to digital (A/D) conversion. Therefore, it is possible to read their analog values and use this information as a measure of sensor obstruction.

The second sensor pair is also for Paper Pre-End, but is intended for use as what is commonly called a “weekend sensor” (PWE). While the standard PPE sensors detect when paper has reached some user-defined point where a paper change will be required shortly, PWE sensors are usually set to signal whether there is enough paper remaining to make it through the weekend without replenishing the paper. This is especially useful for installations where there is no staff available to change the paper over the weekends. The PWE input is a direct digital input. Since no supply is provided to power an LED-style sensor, these inputs are best used with a microswitch.

Figure 9 shows the input circuit for these sensor connectors. The characters in parenthesis show the input as it is labeled in the XPM 200HR™ Diagnostic Tool. There is also an auxiliary input available on this connector. The wiring is the same as the PPE inputs. The status of this input is reported by the printer when queried. Please note that the Auxiliary input may not be available if the printer is equipped with a presenter. The pinout of the Paper Pre-End Sensors connector is as follows.

PPE Sensors Connector

- Pin 6 – 5 VDC (to be used as a voltage source for pull-ups, etc. for PWE, AUX sensors)
- Pin 7 – Common (Ground)
- Pin 8 – PPE Sensor Signal 1 (A1)
- Pin 9 – PPE Sensor Power Output 1 (A1)
- Pin 10 – PPE Sensor Power Output 2 (A2)
- Pin 11 – PPE Sensor Signal 2 (A2)
- Pin 12 – Auxiliary (AUX) Input
- Pin 19 – PWE Sensor Signal 1 (B1)
- Pin 20 – PWE Sensor Signal 2 (B2)

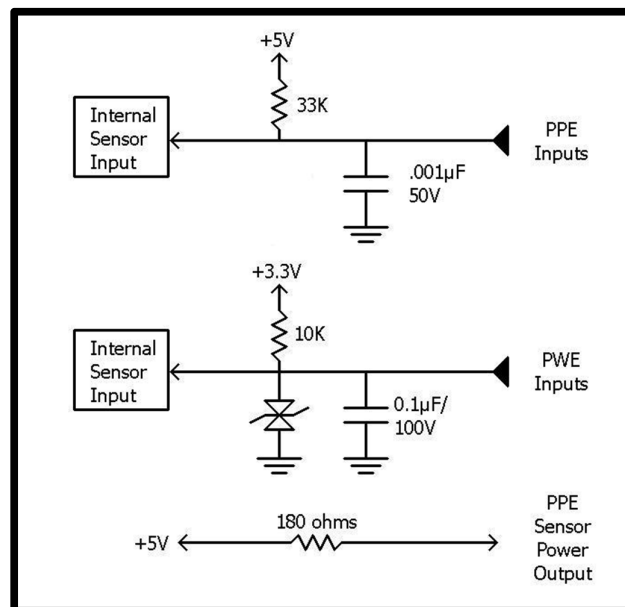


Figure 9

Please note that the XPM 200HR™ does nothing more with the PPE, PWE and AUX signals than report their status through the interface. For this reason, these inputs are not limited to being used for PPE or PWE. Any one of them may be used to detect the status of a door, for example, or any other status that can be sensed via a microswitch or (in the case of the PPE inputs) an appropriate optical sensor.

3.5.8. LED Indicators

There are two LED indicators in the XPM 200HR™ series printers, located on the opposite side of the controller board near the USB connector. These LEDs are used to signal some status information concerning the XPM 200HR™ printer. The following is a partial listing of the information supplied.

There are several flashing speeds used in the XPM 200HR™ printer LEDs. These are:

- Slow: 0.5 Hertz (LED is “on” for one second and “off” for one second)
- ▤ Medium: 1 Hz (“on” for .5 seconds and “off” for .5 seconds)
- ▦ Flicker: 10 Hz (“on” for 50 ms and “off” for 50 ms)
- Off
- On

Red LED	Green LED	Meaning
□	■	Printer operational, paper available, not printing
□	▤	Printer operational, paper available, printing
□	▦	Printer operational, out of paper
■	▦	Exchanging data (firmware, fonts, logos, etc; writing to flash
■	▦ □ ▦	Printer not operational due to printhead open, wrong configuration , wrong voltage or hard reset
■	▦ □ ■ □ ▦	Print mechanism jammed
■	▦ □ ■ □ ■ □ ▦	Cutter jammed
■	▦ □ ■ □ ■ □ ■ □ ▦	Feed unit jammed
■	▦ □ ■ □ ■ □ ■ □ ■ □ ▦	Presenter jammed
▦ □ ■ □ ■ □ ▦	▦ □ ■ □ ■ □ ▦	Fatal error; SDRAM defective
▦ □ ■ □ ■ □ ▦	▦ □ ■ □ ■ □ ▦	Fatal error; Board type cannot be identified
■	□	Probable system stall during initialization phase
■	■	Probable system stall during boot phase

Please note that much more detailed information concerning the printer's current state can be obtained by requesting the printer's status via the interface. Please refer to the XPM 200HR™ Emulation Command Set Reference D 690 004 for details.

3.6. Graphic Printing vs. Printing with Printer's Fonts

One area that causes frequent confusion with regard to printers in general is that of graphic printing versus printing using the printer's internal fonts. An explanation here may help clarify this and make application of the XPM 200HR™ easier for you.

All printers contain a set of commands that will cause the printer to perform different functions. (For the XPM 200HR™ family of thermal printers, these commands are documented in the XPM 200HR™ Emulation Command Set Reference, P/N D 690 004.) The functions are very diverse and there are no standards for what these functions may be. This allows printer manufacturers to innovate and build unique features into their products. These commands are often referred to as the printer's “Native Commands”.

A printer's Native Commands are of many different types, but a few are of particular interest to us here. One is the family of commands for printing graphics. It is these commands that allow pictures and other graphic images of any type to be printed.

Another family of commands of interest to us here is the text commands. These commands involve printing text in response to ASCII data sent to the printer. The printer itself contains one or more character sets. In these character sets, one printable character corresponds to one ASCII character. There are also commands for positioning and modifying the printout from these character sets, such as tab and indent commands and commands to enlarge the internal character set by some factor.

When printing from the internal character sets (we'll call that "ASCII printing" here for convenience), characters are sent to the printer and the corresponding characters from the character set are printed. This has both advantages and disadvantages. The biggest advantage is that the host need only send one character per printed character. So if 40 characters are being printed on a line, for example, only 40 bytes of data (plus any overhead for formatting, indenting, etc.) need be transmitted over the interface. In other words, you can print a lot of text and need send only a little data. The downside is a lack of flexibility. In today's Windows® world, we are all used to printing exactly what we see on our computer screens, in the same font, size, etc. as we see it. But with ASCII printing, what will be printed will be based on the printer's internal character set.

The other type of printing we'll call "Graphic printing". This is what happens when you print to an ink jet or laser printer from your PC. The information displayed on the screen is sent to a print driver. This print driver, which is unique for each printer, translates what is on the screen as a graphic into graphic Native Commands to be sent to the printer. **Everything printed through a print driver prints as graphics.** It takes a lot more data to transmit graphics than to transmit ASCII. In our 40 character example, assuming a 12 x 20 pixel character, the Hengstler XPM 200HR™ printer would require 1,600 bytes to print one line. (Please note that these are estimates, and that various compression routines also impact the print speed.)

The advantage of Graphic printing, then, is the ability to print anything; pictures, text, photos, etc. exactly as you see it on your screen. The disadvantage is that to do so, much more data (40 times as much data in our example) must be sent over the interface.

As a practical matter, then, it comes down to this. If you are doing ASCII printing, you can use USB or a serial interface. Both are fast enough to handle the smaller amount of data being sent. But if you are doing Graphic printing, USB is a far better choice due to its higher speed, and serial may increase the time to complete a printout to an unacceptably long period.

4. Unpacking

Care should be taken when unpacking your XPM 200HR™ printer to preserve the packing material for possible future use. XPM 200HR™ packing is specifically designed to protect the printer from damage in the harsh environment of trucks and aircraft. Please be sure to use this packing if it ever becomes necessary to reship your XPM 200HR™ unit.

5. Major Options

5.1. Presenter

XPM 200HR™ printers can be supplied with an presenter. There are generally three reasons to use a presenter. One is to prevent vandalism of the printer paper; a presenter prevent a user from touching their printout until after it has been severed from the paper roll, eliminating the opportunity for vandals to try to pull all the paper from the roll through the printer. The second reason is to protect confidential information. If confidential information is included in a printout that is presented, but the printout is not taken, the presenter can be configured to automatically retract the printout and store it in an internal reject bin. The third reason is to keep the floor around the device or kiosk in which the printer is mounted clean. If several users didn't take their receipts, they might well end up in a big pile on the floor, representing a slip hazard. By using the presenter with retract, untaken receipts will be safely stored in the reject bin.

6. Installation

6.1. Function

Please note that the XPM 200HR™ printer is a module designed to be integrated into a system and to be operated only as a part of that system, for example, in a kiosk. All technical specifications and instructions contained in this manual and related documentation must be considered and complied with in order to achieve successful operation in the completed system.

6.2. Mounting Printer

The XPM 200HR™ printer is designed to be mounted horizontally, (with the paper exit parallel to the floor), and separately from its controller. See figure 10 and drawing D690075 for detailed dimensions, mounting screw sizes, etc. If no presenter is being used, the printer may be angled downward by 90°. It may also be angled upward, as long as the design of the system into which it mounts is such that a printout cannot slide back into the printer after it is cut.

Please note that the printer itself mounts via two M4 anchor nuts built into the print mechanism. An M3 screw with lock washer (not supplied) are used for mounting.



Note: It is critical that the length of the mounting screw conform to the “thread length” dimensions shown in the drawing below. (Specifically, a minimum of 7.4 mm and a maximum of 8.5 mm above the mounting surface.) A longer screw may damage the printer, while a shorter one may not grip it properly.

If a presenter is used, the printer must be mounted parallel to the floor with the paper exiting to parallel to the floor. An angled orientation will interfere with the loop presenter function.



Care must be taken during installation to ensure that cables are not pinched or cut at any time, including when any doors or hatches are closed or moving parts of the device moved.

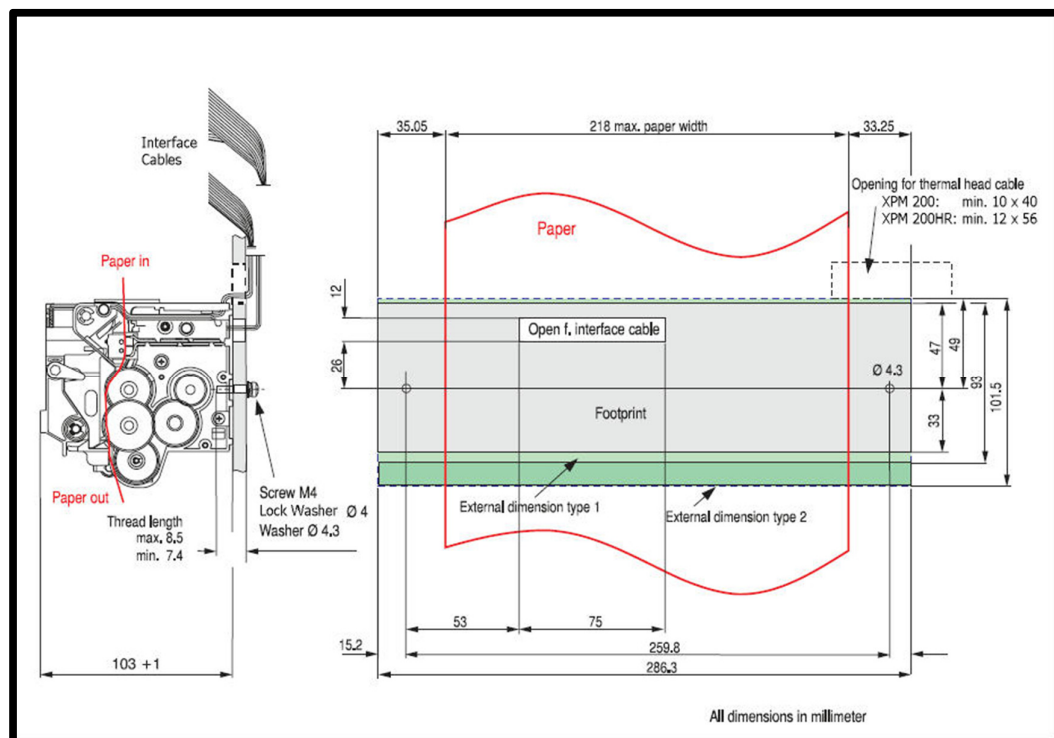










Figure 10

6.3. Mounting Controller



-  Proper ESD protection should be used at all times when handling and/or connecting the controller.
-  Static electricity can damage sensitive electronic components. Discharge your body's static electric charge by touching a grounded surface before performing any hardware procedure. Never remove the controller circuit board from its antistatic bag until you are ready to install it to prevent electrostatic damage.
-  The XPM 200HR controller board must be correctly grounded using the main ground, as described below.



The driver components of the XPM 200HR controller board, as well as thermal printhead and the motors, can become hot during operation, causing a risk of burn injuries. Care should be taken to ensure adequate cooling ventilation to the system, and to avoid contact with these components!

-  Connection or disconnection of power cables, and/or of the components, should only be performed while power is off to avoid damaging or destroying electrical components.
-  Use only a power supply with the specified capacity. Incorrect voltage can damage XPM 200HR controller circuitry as well as the thermal printhead of the XPM 200HR print mechanism.
-  Penetrating liquids, dust or paper scraps may cause faults or short circuits.
-  The XPM 200HR controller, as well as the complete system, should not be installed near high frequency devices or strong magnetic fields.
-  The XPM 200HR controller, as well as the complete system, contains sensitive mechanical and electronic components which could be damaged or destroyed by extreme vibration or shock, such as that caused by impact or dropping.

The XPM 200HR Controller board must be attached to a grounded base which is made of sheet steel. Use screws and nylon standoffs to mount the Controller board to this base. It is recommended that flat washers and internal tooth lock washers be used to secure the controller.

-  Ensure that the main ground is correctly connected to the sheet metal base!
-  Be sure to maintain the required open space above and below the controller board for cooling, as follows:

Min. space below = 5 mm
Min. space above = 26 mm

1. After mounting the XPM 200HR controller board, install the power and interface cables to the XPM 200HR printer mechanism and other optional devices, but do not connect the USB interface cable to the printer. Check the correct positioning of all connectors; please refer to the layout shown in figure 6.
2. Switch Power ON and insert paper into the XPM 200HR. An info printout should automatically be generated.
3. Leave power on and install the USB interface cable to your host system.
4. Install the necessary XPM 200HR printer driver software as a local printer.

Mount the controller as shown in Figure 10A. Take care that the controller is mounted as close as possible to the print mechanism, within reach of the cable assemblies. Check that the controller is not subject to damage when paper is loaded, doors are opened, etc.

Consideration should be given to EMI/EMC; a sheet metal cover may provide both mechanical protection for the controller and additional EMI/EMC shielding.

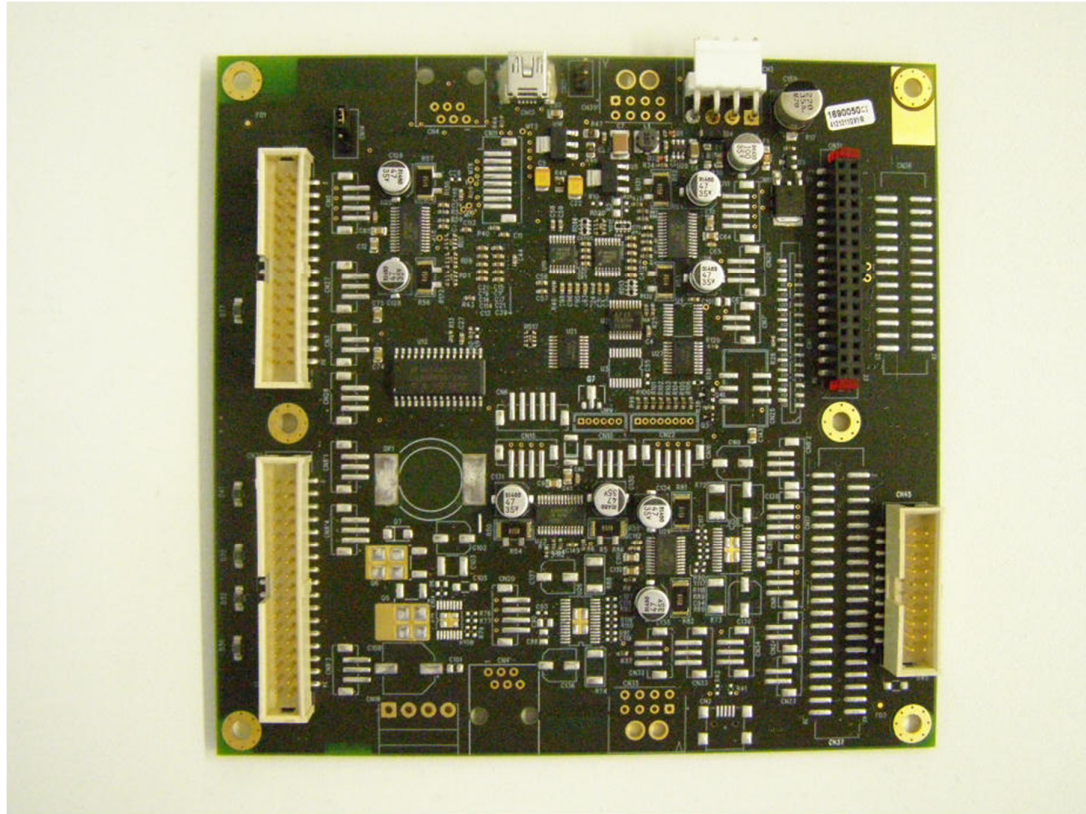


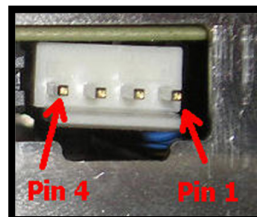
Figure 10A

6.4. Wiring

6.4.1. Power

Power is connected to the XPM 200HR™ thermal printer via a JST connector. The connector consists of a JST VHR-4N shell and two SVH-21T-P1.1 contacts. Wiring is as follows:

<u>Pin</u>	<u>Function</u>
1	Ground (0 VDC)
2	Ground (0 VDC)
3	+24 VDC
4	+24 VDC



6.4.2. Interfacing

USB

The USB versions of the XPM 200HR™ printer employ a standard USB interface cable (5 pin Mini-B connector on the printer end) to communicate from the host to the printer. Be sure that the Mini-B connector is fully engaged with the mating connector on the printer. The other end of the cable plugs into the USB port on the host. The cable length must be limited to under 3 meters.

Once the printer is connected with the host and the driver is installed, be sure to set the Port in the driver to the appropriate USB port to match the physical host-side interface cable port.

USB Pinout

<i>Pin Number</i>	<i>Signal name</i>	<i>I/O Function</i>
1	NC	no connection
2	D- I/O	Data -
3	D+ I/O	Data +
4	NC	no connection
5	SGND	I/O Signal Ground

6.5. Paper Supply

6.5.1. Paper Roll Holder

Based on our extensive experience in designing printers, we would urge you to consider the following topics and implement your paper roll holder design with care.

Large Diameter Rolls: When using paper rolls over 100 mm in diameter, a spring buffer, or “dancer bar”, should be considered. This usually takes the form of a spring-loaded arm under which the paper is placed before feeding it into the printer. As the printer starts to print, slack is taken up from the paper roll. This starts to lift the arm against the spring, which puts force on the paper roll and starts it moving slowly. As more printing takes place the roll gradually accelerates until it's up to printing speed. Without the dancer bar, slack paper would be taken up until it was suddenly no longer slack. Now the printer must accelerate a large, heavy paper roll from zero speed to full print speed in essentially no time. This can cause the paper advance motor to stall or the paper to slip against the platen, causing shortened characters until the paper roll is up to speed.

Spindle Friction: Another important consideration is spindle friction. As a paper roll rotates, it slides against the spindle that holds it, assuming a fixed spindle. This friction will tend to impede the paper roll's free motion, and is dependent upon the weight of the roll, the smoothness and material of the spindle, and the smoothness and material of the paper core. When possible, especially with paper rolls over 100 mm in diameter, design the spindle so that it can rotate, greatly decreasing friction and drag.

Catch Points: More paper jams and transport problems are caused by catch points than any other issue. Make sure that the paper path is free of anything that can interfere with free paper flow, especially any sharp edges or “pinch points” into which the paper may stray and become caught.

Alignment: Any paper roll holder design must hold the paper square to the printer in all planes. If the paper is angled in any way, it will enter the printer at an angle and will be more likely to cause paper jams.

Rigidity: It is important that the paper roll holder support the paper firmly and not move. This is especially true in high-speed printing applications and in large diameter paper roll applications. Many paper roll holders are made from metal too thin to support the heavy paper rolls they are expected to handle. This results in twisting and warpage while printing, which binds the paper and causes paper jams. Vibration during printing may also cause undesired movement of the paper roll.

Shipment: Do not ship your product with a paper roll mounted in the paper roll holder. The heavy weight of the paper roll can easily bend or otherwise damage the paper roll holder, as witnessed numerous times.

6.6. Power Supply Specifications

Selection of a power supply for thermal printers depends upon the printer's application, what percentage of the printout is black, frequency with which printouts are generated, and more. In particular, thermal printers draw very high currents for very short time periods (usually under one millisecond). The most important issue is not peak current, but the length of time that the power supply is able to deliver instantaneous current over its rated maximum, and for how long the print job prints high black percentages, thereby drawing high current. It is important that the power supply's over-current system does not shut down the power supply when these brief, high current surges occur.

With that said, we recommend the following power supply specifications for most applications. Please see the "Technical Specifications" section near the end of this document for full details.

DC Output Voltage: 24 volts \pm 5%

DC Output Current (nominal): 5.5 to 8.0 amperes

Hold Up Time: 20 ms minimum

Current Limitations: 16 amperes minimum current limit

7. Operation

7.1. Loading Paper

Before loading the printer, make sure that the printhead is in the "closed" position; see figure 4 for details.

Insert the paper, thermosensitive side up, between the paper guides. You will hear the platen motor start to run as soon as the paper detection sensor is reached. Continue to feed the paper until the printer platen grasps it and pulls it forward into the printer.

The XPM 200HR™ thermal printer family is designed to use paper with the thermosensitive side on the **outside** of the paper roll. This is important as the printer is optimized to deal with paper curl angling the paper end downward.

Please note that the XPM 200HR™ thermal printer family will, unless specifically configured not to do so, print an Information Report immediately when paper is loaded. This short report is extremely helpful during setup and configuration of the XPM 200HR™ printer. This report contains detailed information concerning the printer itself and its features, the firmware installed, the status of information in the flash memory, status of the A/D converter outputs, and the many settings that configure the printer itself. For example, this report will show all the current serial communication settings.

Please note that many of the software tools supplied with the XPM 200HR™ driver also allow this report to be printed by simply clicking on the "Print Info" button.

7.2. *Print Speed*

Print speed is affected by many factors. Significant factors affecting print speed include:

- Type of interface (USB fastest)
- ASCII printing vs. Graphics printing (ASCII fastest)
- Data transmission rate (serial) (faster is better)
- Default print density settings (smaller impact, but lower density is faster)
- Dot history factor (smaller impact, but “off” is faster)
- Dot history levels (smaller impact, but “off” is faster)
- Burn time correction setting (smaller impact, but the most negative numbers are faster)
- Multi-strobe factor (“off” is faster)
- Available current (higher is faster)
- Default print speed setting in configuration (higher is faster)

7.3. *Cutter Operation*

The XPM 200HR™ uses a “pizza-cutter” style paper cutter. A cutting disk moves from one side to the other to sever the paper from the roll against a stationary, fixed blade. A separate motor is used to control a helical cam that moves the “sled” holding the cutting disk. See Figure 2.

The cutter components can be accessed by opening the print mechanism. See “Printer Access Control” above for cautions, details and instructions.

The XPM 200HR™ configuration tool allows the specification of the weight of the paper being printed. This information is used by the printer to determine how fast the cutter should move while cutting the paper. With thinner paper, cutting can be faster. Thicker paper requires greater cutting torque from the cutter motor, which is achieved by cutting more slowly. This is automatic and transparent to the application.

In the event of a paper jam, the XPM 200HR™ can be configured to make several repeat attempts to cut the paper. The number of attempts can be specified by using the XPM 200HR™ Configuration Tool. If these attempts are unsuccessful, the printer will report a paper jam through the status system.



Note: Please be sure to remove power from the printer before opening the print mechanism and accessing the cutter blades! Always keep your fingers clear of the sharp blades themselves!

7.4. *Print Density*

The darkness of the printout can be adjusted to match the paper and your application by using the appropriate printer command (see XPM 200HR™ Command Set Manual P/N D 690 005) or by use of the “Print Density” settings in the Windows XP/7 driver. Increasing print density increases the “burn time”, (the length of time that the thermal printhead elements are heated) and may decrease print speed.



Note: Excessively long burn times may adversely affect printer life!

7.5. *Invalidation*

The XPM 200HR™ printer includes the ability to invalidate printouts (render them unreadable by overprinting them with a random pattern) under certain conditions. These conditions include after loading paper; at the end of paper; when data has been lost; and on initialization. In all cases, the purpose of the feature is to prevent printouts that might be partially valid from being misused. For example, if a ticket had been in the process of printing and the power failed, the printer would stop printing. Upon restoration of power, it would be preferable to invalidate the partially printed ticket and, if appropriate, have the host send a new one to be printed. By enabling “Invalidate paper on initialization”, this can be accomplished.

7.6. XPM 200HR™ Digital Tools

The XPM 200HR™ family of thermal printers includes with the Windows XP/7 driver a series of very useful tools. These can be run directly from the Tools folder of the driver package once the driver has been installed. A brief summary of these tools is shown below.



Note: It is important to note that the behavior of the XPM 200HR™ is heavily dependent upon the settings determined by the Configuration Tool.

XPM 200HR™ Command Tool: Tool for sending Native Commands to the printer. Very useful while developing code for your application.

XPM 200HR™ Configuration Tool: A very important tool that allows you to change virtually any variable setting or performance characteristic of your XPM 200HR™ printer.

XPM 200HR™ Diagnostic Tool: A powerful tool for identifying possible issues with your printer, its peripherals and firmware by examining the details of its operation.

XPM 200HR™ Font Tool: Used for uploading and assigning different fonts within the XPM 200HR™ printer.

XPM 200HR™ Image Tool: This very helpful tool creates XPM 200HR™ format graphic files from standard format graphic files so they can be uploaded as stored images.

XPM 200HR™ Print Terminal: The Print Terminal has six sets of 24 buttons each, many of them preprogrammed to transmit commands to your XPM 200HR™ printer. All buttons are programmable to make them transmit whatever is needed. This tool is very popular with software developers who are integrating the XPM 200HR™ into their products as a tool that they use to verify command sequences and responses.

XPM 200HR™ Uninstaller Tool: Use this tool to uninstall single or all versions of the XPM 200HR™ driver.

XPM 200HR™ Upload Tool: Used to upload new firmware, specific data files, etc. to the flash area of your XPM 200HR™ printer.

XPM 200HR™ Wide Font Tool: Used for uploading Wide Font formats (such as Chinese or Korean) from standard graphic files.

8. Low Current Operation

There are numerous factors that affect thermal printer current. It is possible to manipulate these factors consciously to reduce current draw for situations where this is important, such as operating from batteries. If battery operation only occurs when power has failed, the host software can be programmed to print at a faster, higher current rate during normal operation and then switch the XPM 200HR™ to a lower current mode when the system switches to battery operation. The following are some considerations to aid in reducing current draw.

8.1. Print Speed

With thermal printers, average current is proportional to print speed. Since the burn time for each dot row is fixed, when printing slower there is more pause between burns and therefore a lower average current. (The peak current is determined by the number of dots burned at once, and so is unaffected by print speed.) The XPM 200HR™ target print speed (called the “target speed” because other settings may cause the actual print speed to be lower than this) can be set via the interface; please refer to the XPM 200HR™ Emulation Command Set Reference for the specific command sequence. The slower this print speed is, the lower the average current draw will be. Note that when using the XPM 200HR™ Windows XP/7 driver, the driver will override settings sent to the printer directly via the interface.

8.2. Graphics/Bar Codes

Printing graphics rather than text consumes more current than printing only text. Typical text-only printing is considered to be 12.5% coverage on average, while graphic printing varies from 25% to 50% average, consuming 2X to 4X the average current. Printing bar codes is in the same category, and draws about 4X the current of text. Both should be avoided or minimized to reduce current draw. In terms of current draw, it does not matter whether printing is done using the printer's internal character set or the via the driver.

8.3. Reverse Printing

Reverse printing should be avoided, since everything that's normally black becomes white, and vice-versa, drawing (in average text) about 8 times the current.

8.4. Dot History Factor

Dot history monitors previously burned dots and reheats them for a shorter time to prevent blooming and excessively black areas, thereby decreasing total current consumption. Using dot history and minimizing the main burn time will reduce average current draw. Please refer to the XPM 200HR™ Emulation Command Set Reference for the specific command sequence.

8.5. Burn Time Correction

The XPM 200HR™ family of printers include a feature that will adjust burn time automatically depending upon ambient temperature. Burn Time Correction allows the adjustment of these burn times to "tune" the printer to maximum performance for any given paper, thereby improving print quality but having little effect on current consumption. If current draw is truly critical, reducing these values will reduce current slightly at the cost of lower contrast in the printout. Please refer to the XPM 200HR™ Emulation Command Set Reference for the specific command sequence.

8.6. Multi-Strobe Factor

This feature is the only XPM 200HR™ software feature that will reduce **peak** current. When this feature is turned on, only one side of the printhead is fired at a time, reducing the peak current by a factor of two, but having virtually no effect on average current. This is very useful if your power supply has a restrictive maximum current, but slows printing. Please refer to the XPM 200HR™ Emulation Command Set Reference for the specific command sequence.

8.7. Print Density Adjustment


Increasing print density will improve print quality, but at the same time will increase average current. Therefore Print Density is always a trade-off between these two characteristics. Use the lowest print density that is visually acceptable to minimize current draw. Please refer to the XPM 200HR™ Emulation Command Set Reference for the specific command sequence.


9. Troubleshooting

Symptom	Possible Cause	Corrective Action
No LEDs light on printer	1. Power not connected 2. PCB mounted fuse blown	1. Check line cord and outlet 2. Return printer for fuse replacement; not field replaceable
LEDs flashing	See Section "LED Indicators"	See Section "LED Indicators"
Printer prints blank paper	1. Paper inserted upside-down 2. Wrong side of roll coated 3. Printout positioned outside printable area by "set" command	1. Invert paper roll 2. Invert roll as test, have paper made properly 3. Change "set" command settings to relocate printout
Print quality poor	1. Print density set too low 2. Printhead not fully lowered 3. Incorrect paper type for XPM 200HR™ printhead	1. Adjust print density, other burn time adjustments. 2. Lower printhead. 3. Procure and use correct paper.
Baud rate, other configuration setting changes not implemented after use of Configuration Tool	1. Printer was not reset after changes made with Configuration Tool.	1. Reset printer. Consider enabling "Automatically reset printer" option on "Tool Settings" tab of XPM 200HR™ Configuration Tool.

10. Maintenance


The XPM 200HR™ printers require very little maintenance.

 **Note:** Discharge your body's static electric charge by touching a grounded surface before performing any maintenance procedure. Do not touch the connector pins of the printhead cable with your bare hands.

 **Note:** Do not touch the surface of the thermal printhead. Mechanical stress or shock (including foreign contamination) to the surface of the printhead substrate should be avoided to prevent printhead damage.

Clean the XPM 200HR™ whenever it becomes dusty, as paper dust will reduce the friction of the platen and cause the print quality to deteriorate.

- Open the print mechanism by using the Printer Access Control. **Remove any paper**, if necessary.
- Clean the platen with a special platen cleaning agent and a lint-free cloth. DO NOT use alcohol to clean the platen because alcohol hardens the platen material.
- Gently wipe the surface of the thermal printhead using a cotton pad soaked in METHANOL to remove dust on the heating elements. DO NOT use sandpaper or other abrasives.
- Dry the XPM 200HR™ mechanism completely and reload the paper.

 **Note:** Condensation should be avoided. If condensation occurs, do not power the printer until all condensation has dissipated.

11. Repair

All Hengstler printers are repaired at our facility in Aldingen, Germany. For details, and to arrange for the return of a printer for repair, please contact us at:

HENGSTLER GmbH
Uhlandstrasse 49
78554 Aldingen / Germany
Tel. +49 (0) 7424-89 0
Fax +49 (0) 7424-89 500
eMail: info@hengstler.com
www.hengstler.com

12. Buying Paper

12.1. Sourcing Paper

In order to maintain your warranty, use only paper that conforms with XPM 200HR™ Paper Specification D 689 xxx. Use of paper that does not conform with this specification may adversely affect the performance of your XPM 200HR™ printer and/or damage your printer. Please note that the XPM 200HR™ can use either roll or fanfold paper. When using fanfold paper, care must be taken to configure the printer, black mark, and positioning so that the cut always occurs **after** the fanfold bend, not on it or before it. Failure to do so will cause cutting problems and will likely increase paper jams.

12.2. Converting Paper

Thermal paper is usually purchased through paper converters. These companies buy large, jumbo rolls of specific paper types from the few true paper manufacturers in the world and then cut it and roll it to your specifications. You may elect to have preprinting or black marks added at this time, as well. Please make sure that any paper a converter wishes to supply you for use with your XPM 200HR™ printer conforms with XPM 200HR™ Paper Specification D 689 112.

12.3. Black Mark Sensor Location

The Black Mark sensor (which also functions as a “paper present” sensor) on the XPM 200HR™ printers can be located in numerous positions during manufacturing. Figure 13 shows where the black marks should be located in order to be detected when a reflex sensor is used. The default (standard) sensor positions are so marked.

The XPM 200HR™ printer is designed to allow for numerous Paper Entrance/Black Mark sensor locations during manufacturing. (The location of this sensor cannot be changed once the printer is built.) Also, two different sensor types can be used. One is the reflex or reflective sensor, where the light source and detector are located on a single chip. Basically, the light strikes the white paper surface and reflects back into the sensor. If enough light reflects to activate the sensor, the printer reports that paper is present. If there is not enough light reflected, the printer assumes that this area is black, meaning the printer is on a black mark or the printer is out of paper. Black marks must be located on the back (non-coated) side of the thermal paper. There are 19 different possible positions for this sensor. The positions of these sensors are detailed in Figure 13. (Please note that sensor positions 1, 7 and 16 are not usable due to a lack of an open position to their left.) The default (standard) positions are so marked. Paper suppression guides are small inserts with mushroom-shaped heads that are used to ensure that the paper is at the correct distance to be detected properly by the sensor. Please also note that sensor locations other than the default location are intended for OEM applications.

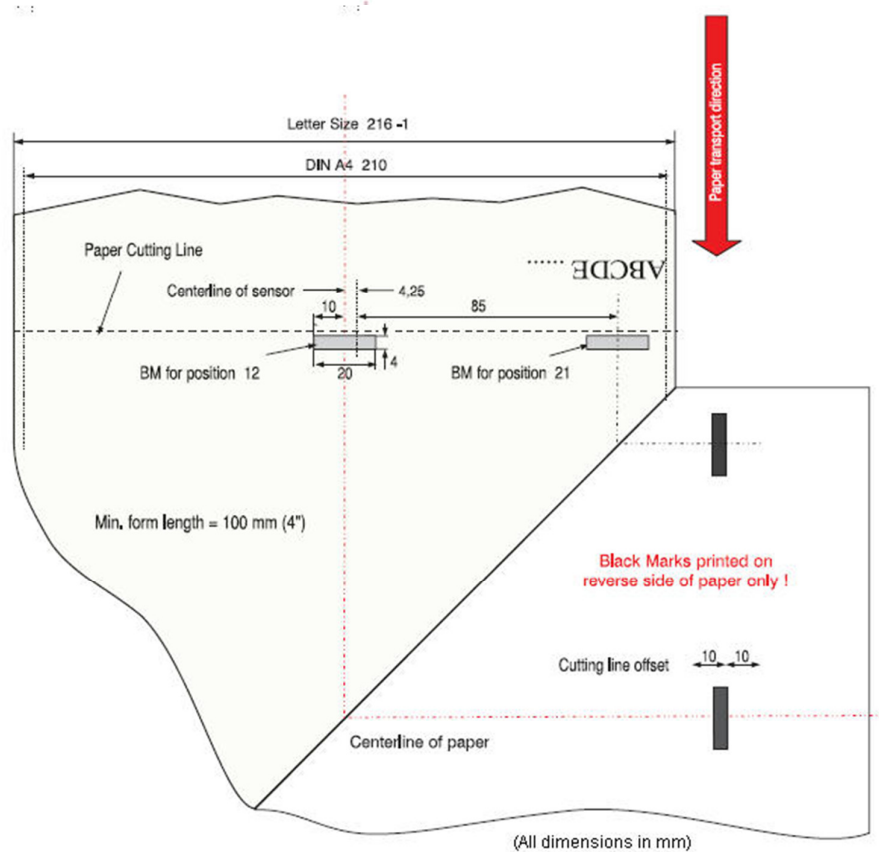
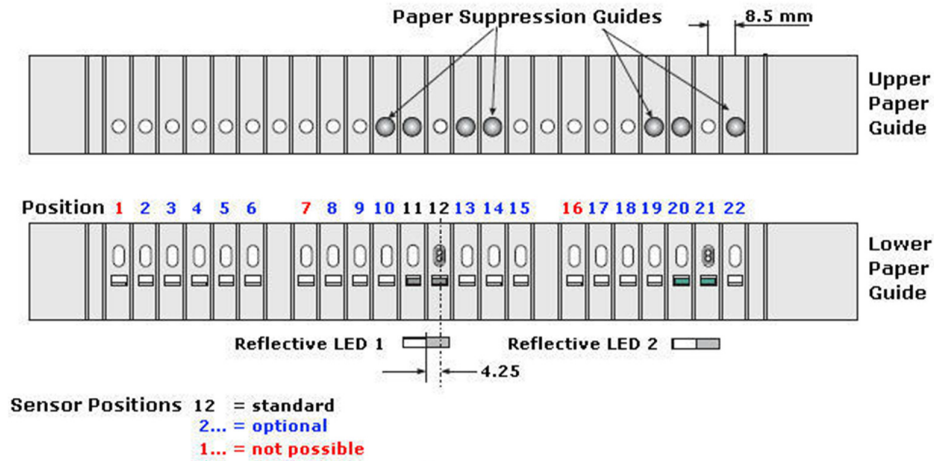


Figure 13

The XPM 200HR™ can also use a through-beam sensor. This type of sensor has a separate light source and detector. The light is transmitted across the paper path into a prism, which redirects it back across the paper path into the detector. When the light is blocked and cannot reach the detector, the printer reports that paper is present. When the light does reach the sensor, the printer concludes that there is no paper present.

The through-beam sensor can also be used in a manner similar to a Black Mark sensor. Instead of a Black Mark, a hole is used in the paper. The through-beam sensor is located in one of 19 different possible locations; the centerline location of the paper path is the default. The possible positions of these sensors are detailed in the Figure 14.

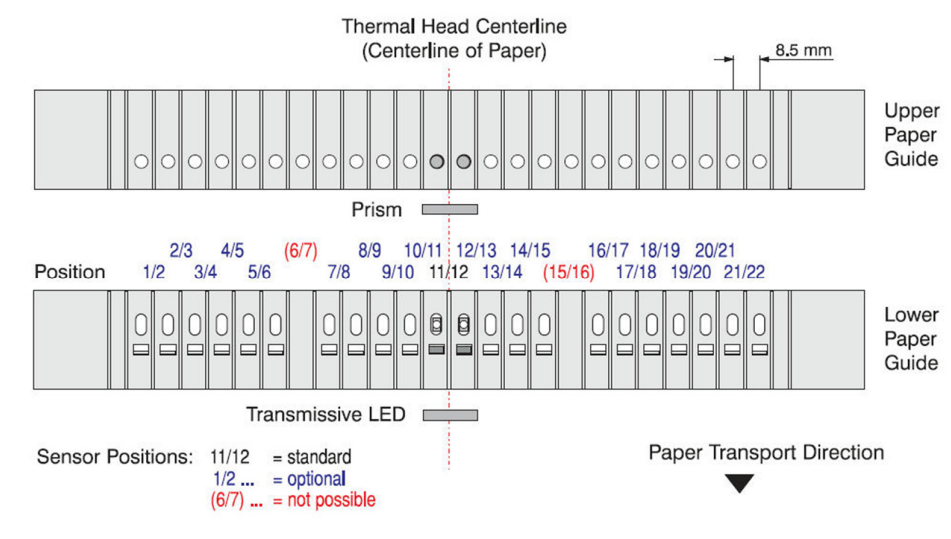


Figure 14

13. Technical Specifications

Technology:	Direct Thermal
Print Speed:	Up to 100 mm/sec
Resolution:	300 dpi
Printhead Life	
<i>Abrasion (based on 12.5% print density)</i>	100 km of paper
<i>Electrical:</i>	100 million dot pulses
Graphic Driver:	Windows® XP/7, Linux (CUPS)
Bar Codes:	
<i>Internally Generated:</i>	UPC-A, UPC-E, EAN-13, EAN-8, Code 39, Interleaved 2 of 5, Code 128, Codabar, PDF 417
<i>Externally Generated:</i>	Any, generated by Windows® standard GDI file by host
Paper Width:	210-220 mm (narrower widths may be possible in certain OEM applications. Contact Hengstler for details.)
Printable Width:	216 mm
Paper Weight:	80-100 g/m² (Other paper weights may be possible in certain OEM applications. Contact Hengstler for details.)
Paper Capacity:	6 inch (150 mm) roll diameter 12 inch (300 mm) (reduced performance)
Interface Type:	USB 1.1 (Cable length <3 meters)
Operating Voltage:	24 VDC ±5%
Current Draw:	
In standby, approx.	3.6 VA typ., (depending upon options and settings)
Printing:	Depends upon printed content, speed and settings.
Cutter:	"Pizza-cutter" type
Dimensions (WxHxD):	287 x 103 x 102 mm (approx.) (print mechanism only)
Temperature Range	
<i>Operating:</i>	0°C to +50°C (Wider temperature range may be possible; consult Hengstler for details)
<i>Storage:</i>	-30°C to +70°C
Humidity Range	
<i>Operating:</i>	20%-90% RH, non-condensing
<i>Storage:</i>	10%-90% RH, non-condensing

13.1. Electromagnetic Compatibility

13.1.1. FCC Part 15 Class B Device

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

13.1.2. EN55022 – Emissions

The XPM 200HR™ family of thermal printers are class “B” appliances.



When operating the printer from a DC building power supply, or when the DC power cable exceeds 3 meters in length, appropriate EMI filters must be used.

13.1.3. EN55024 – Electromagnetic Susceptibility



Electrostatic discharges and burst effects may cause short printing interruptions, but the automatic recovery function of the printer will restore it to its original state.



Additional action regarding lightning and overvoltage protection will be needed if cables and wires are installed outside of a building.

However, this standard can be met only if original units, components, and cables are used and the installation instructions are respected and followed completely.



External interference caused by ESD or EMI can temporarily cause corrupted printing or data loss.

13.2. Printer Drawings

Please refer to the appropriate drawing listed in section 1.1 of this document for dimensions and mounting information.