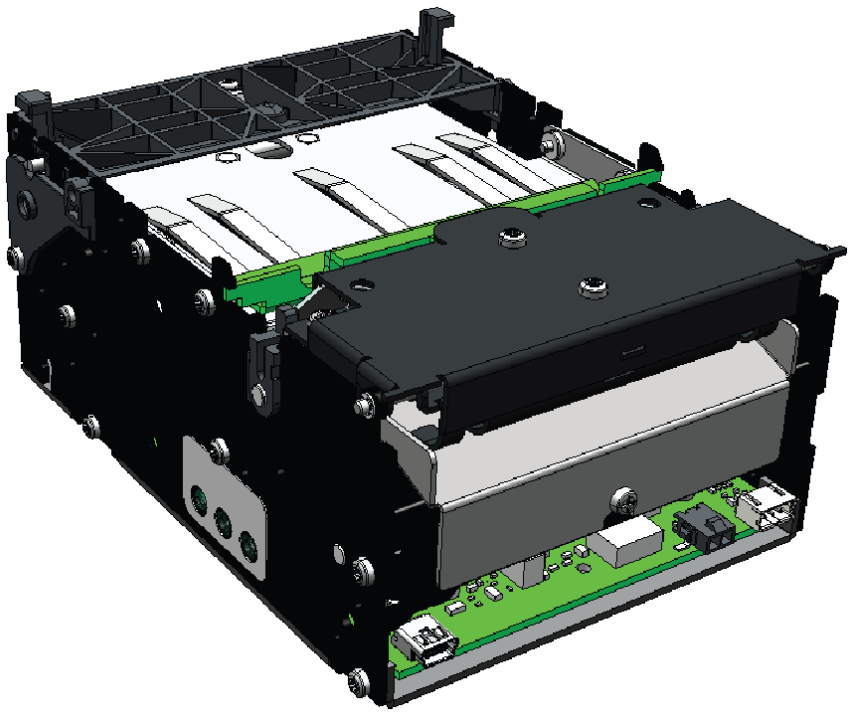

Zebra® KR203
Kiosk Receipt Printer

Programming Manual

P1066584-001 Rev. A

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REVISION HISTORY

Version	Date	Author(s)	Description
A	11 June 2013		First Release Version

1 Description

1.1 Purpose

This manual is for integrating KR203 into systems not using a printer driver supplied by Zebra Technologies, for example embedded system using a proprietary controller and Operating System.

1.2 Scope

This document covers the command set, settings and user interface of the KR203 kiosk printer.

1.3 Document Format

In this document, binary data is represented in Zebra Toolbox format, which interprets data within < and > symbols as binary data. Standard ASCII names such as <ESC> and <ENQ> are converted to their equivalent binary values by Toolbox. Numbers such as <5> are sent directly as binary data to the printer. Anything not appearing in brackets, such as the & in <ESC>&<4> is sent directly as ASCII text to the printer. See Toolbox help for more information.

When values are specified in the format <N1 2> the space and the 2 indicate that the value is a 16-bit value. Similarly, <N1 4> specifies that it is a 32-bit value.

2 User Interface

2.1 User Interface Overview

The KR203 printer adapts the standard Zebra user interface used on the GX series desktop products with a couple modifications and extensions. The printer has four LEDs, two on each side. The LEDs are labeled Power and Status. There is also a button labeled Feed on each side.

The user interface is the same on each side. Neither the buttons nor the LEDs are individually addressable.

The Power LED is green and is always on when 24V is applied to the unit. The Power LED monitors only the 24V system.

The Status LED displays the current printer status. This LED is bi-color, and can signal green, red and yellow. The following table explains the LED states when the feed button is not pressed.

The KR203 printer has two pieces of software, a bootware and an application.

2.1.1 Application LED States

Status LED State	Definition
Solid Yellow	Starting up. Present for about 100ms at first power on. If the solid yellow stays, the printer failed RAM test and cannot start.
Solid Green	Printer OK
Flashing Red	Printer has detected a severe error. The pattern of flashing signals the error. See below for error table.
Flashing or Flickering Green	Printer is receiving data.

When the printer is flashing red the following error states can be signaled:

Flash Pattern	Definition
* _ * _	Paper jam in presenter, Error Code 1
* * _ * * _	Cutter jam, Error Code 2
* * * _ * * * _	Out of paper, Error Code 3
* * * * _ * * * * _	Printhead lifted, Error Code 4
* * * * * _ * * * * * _	Paper feed error, Error Code 5
Amber On and Off	Head temperature error, Error Code 6

The lowest number error is always reported with the exception of error 4, head open. If the head is open and the paper is out, the head open will be reported. All errors can be cleared by the conditions causing them being removed, except cutter jam, which requires a power cycle or reset command to be issued.

In addition “Paper jam in presenter” will clear automatically when the paper is removed from the presenter, and “Head temperature error” will clear when the head cools sufficiently. See “Status Codes” for more information.

2.1.2 Application User Interface

The user interface is accessed via the feed button. To use the user interface, press and hold the feed button. As soon as you depress the button, the user interface activates and signals this by displaying a solid green LED on the status indicator.

The user interface can be accessed when the application is in an idle state, including while an error has occurred. It cannot be accessed while the printer is already printing.

The function of the UI is dependent on how long the feed button is held. Continuing to hold the button beyond a given entry in the table proceeds to the next entry in the table.

While Button Held	**Meaning**
Solid Green	Appears for 2 seconds, release during this time for a feed, cut and present. Equivalent to command sequence <RS><0>.
One Flash, then Solid Green	Release during this time to print the internal self test page. Equivalent to command sequence <ESC>P<0>
Two Flashes, then Solid Green	Performs media guide detection, cutter calibration, and paper/TOF calibration. Must be started with paper out or error is signaled, see "Media Guide Detection" for more information. Equivalent to command sequence <ESC>g.
Three Flashes, then Solid Green	Performs simulated USB cable disconnect and reconnect causing a USB plug and play event to occur. No equivalent command.
Four Flashes, then Solid Green	Defaults all printer settings except "EOP Threshold", and then performs a media calibration. <ESC>&F<0> is similar but does not perform the calibration and resets all settings.
Five Flashes, then Solid green	Prints a 50% grey pattern, cuts and ejects it; prints diagonal line pattern, cuts and presents it. Equivalent to command sequence <ESC>P<4><ESC>P<5>
LED Off	Occurs if you continue to hold button beyond five flashes, releasing button during this time does nothing.

2.1.3 Additional UI Operations

In addition to the above items, the printer performs the following tasks:

When the printhead transitions from open to close the following operations occur:

Media Present	**Meaning**
Yes	Advances the media to the next mark in mark mode or the minimum amount of media required to maintain media control in continuous mode and then cuts media and presents minimum amount.
No	Prepares the printer for auto-load operation.

2.1.3.1 Head Close Presenter Clearing

When the printhead is closed, the printer will attempt to clear the presenter if it detects media is present at it **and** there is no media at the end of paper sensor. This is in preparation for calibration. The calibration routine also does this check independently when media is inserted.

2.1.3.2 Auto Load Operation (Calibration)

When the printer either starts up with no media present or the head is closed and no media is detected, the printer prepares to auto load media. It also occurs after the defaulting as part of the 4-flash operation.

When media is inserted into the rear of the printer, it is detected by the active media sensor, and after a 1 second delay the printer begins to accept the media into the printer, and the printer will perform a media calibration.

During the one second delay, presenter calibration is performed, so it is important to ensure no media is present in the presenter when starting a calibration or media load. The firmware ensures this by attempting to clear the presenter if it detects media present at it when media is detected at the EOP sensor.

This media calibration occurs when the printer is both continuous and mark mode. In mark mode, it requires two full forms to complete the calibration. The calibration type depends on the "TOF Synchronization" parameter. Calibration can fail for the following reasons:

Reasons For Calibration Failure
Media is pulled out during 1 second start delay.
Head is opened at any time during operation.
In mark mode, printer fails to detect a the first mark within 625mm.
In plain paper mode if the white level of the media varies excessively and cannot be stabilized within 625mm.
If entire calibration process does not complete within 1250mm.
If any printing has occurred since the last cut (Only when used as a command)
If the printer detects media in the presenter and is unable to clear it

When calibration fails, the media will be cut and ejected, and no error is signaled on the LED, although a "Black mark calibration error" is reported to the host. If calibration succeeds, calibration settings are stored. The "Black mark calibration error" is only reported if there are no other severe errors active.

The following parameters are stored on a successful calibration:

Parameter No.	**Description**
35	TOF synchronization
37	Page length
39	TOF marker length
40	Garbage filter
51	TOF marker sensitivity
58	Out of paper level
70	Presenter PWM percentage

2.1.3.3 Manual Media Loading

Media can also be loaded by opening the printhead, placing media under the printhead and then closing the printhead. When this happens, no calibration occurs and previous calibration settings are used. The printer will feed media the minimum amount, move to cut position, cut and eject the media.

2.1.3.4 Media Guide Detection

When the media guide is changed, the printer will signal media present even when none is. You must instruct the printer to detect the sensor it should use. This is accomplished with the two flash function.

This process must be done without media in the printer. If the process is attempted with media in the printer a "Media guide detection error" (Code 41) occurs. Upon successful detection of the guide, guide settings are stored, and a "Media guide detection success" (Code 42) message occurs. The "End of paper threshold" (Parameter 68) is captured during guide detection along with the read only "Installed guide width" (Parameter 69).

2.1.3.5 Startup Behavior

The printer must ensure that at startup the printer is in a known state. When the printer is powered on, it will make a small click to signal it has become ready.

2.1.3.6 Additional Notification

When settings are stored to flash with the <ESC>&<4> command, a small click will be made to signal the storage.

2.1.4 Bootware User Interface

When the bootware is in error, holding the feed button down will signal the error condition:

Status LED State	**Meaning**
Rapid Flash Yellow	Firmware missing or corrupt
Fading in and out green	Bootware OK
Alternating Green-Red	Installing application – Do Not power off
Solid Off	Installing bootware – Do Not power off

Force entry into boot mode by powering on the printer while holding the feed button and having the printhead open. Exit boot mode from a “Bootware OK” state by pressing and holding the feed button for 10 seconds.

3 Commands

3.1 Command Overview

The following is a table of all commands implemented in the KR203 Kiosk printer.

The Mode field indicates what modes the command is available in, A indicates it is available in the Application; B indicates it is available in Bootware.

Command	Modes	Category	Description	Page
<ESC><ENQ><1>	A & B	Enquiry	Send status	12
<ESC><ACK>	A	Enquiry	Send ack marker	12
<ESC><ENQ>c	A & B	Enquiry	Send information	13
<ESC><ENQ><5>	A	Enquiry	Send sensor	13
<ESC><ENQ>P	A	Enquiry	Send parameter	14
<ESC><ENQ>Q	A	Enquiry	Send all parameters	14
<ESC>s	A	Graphics	Print uncompressed graphics line	14
<ESC>J	A	Feed	Feed forward	15
<ESC>j	A	Feed	Feed backward	15
<FF>	A	Feed	Advance to TOF	15
<RS>	A	Feed	Cut and present media	15
<ESC><RS>	A	Feed	Cut media	16
<US>	A	Feed	Partial cut media	16
<ENQ>	A	Feed	Eject media	16
<ESC>?	A & B	System	Hard reset	17
<ESC>@	A	System	Soft reset	17
<ESC>&p	A	System	Set parameter in queue	17
<ESC>P	A	System	Print test page	17
<ESC>p	A	System	Force print	18
<ESC>&<4>	A	System	Store parameters	18
<ESC>&F	A	System	Recall parameters	18
<ESC><255>	A	System	Exit application	19
<ESC><0>	B	System	Load application	19
<ESC>#	A	System	Calibrate Media	20
<ESC>g	A	System	Calibrate System	20

3.2 General Notes on All Commands

Once transmission begins, a complete command must be received by the printer within 5 seconds. If the complete command is not received, the printer will automatically reset.

Commands marked “Immediate” will always operate as soon as they are parsed, regardless of if there is any error conditions present.

Commands marked as “Synchronized” are placed into the printers command queue when they are received.

Commands marked “Initiate” cause processing on the command queue to start as soon as they are received by the printer.

Note that when any Severe error occurs, “Synchronized” commands that were present in the print queue are not executed and are deleted. Some commands (such as Send ack marker) do special things when they are deleted from the queue in this way. See individual commands for more details.

Some of the parameters reference trays which are folders to store parameter data in. The available trays are:
0 which is the current temporary values (these values will be deleted during a power cycle)
1 which are the stored values (these values will remain after a power cycle)
255 which are the default values of the firmware version loaded into the printer

3.3 Enquiry Commands

For all Enquiry commands, the status will be returned in the format selected by the “Status protocol” parameter (number 66). The contents of the returned data vary based on the selected protocol. See the “Status protocol” parameter, specifically the “Send Status” section of the selected protocol.

3.3.1 Send status - <ESC><ENQ><1>

Quick Command Facts	
Name	Send status
Modes	Application and Boot
Parameters	None
Type	Enquiry
Execution	Immediate

This command instructs the printer to return its current status to the host.

3.3.2 Send ack marker - <ESC><ACK><N1>

Quick Command Facts		
Name	Send ack marker	
Modes	Application	
Parameters	N1	Marker Number 0-255
Type	Enquiry	
Execution	Synchronized, Initiate	

This command instructs the printer to return an ack marker to the host.

An ack marker is a marker that is returned to the host when all the commands in the command queue have been executed up to the point at which the command was received. Executed means physically printed in the case of motor or feed commands, not just received by the printer.

N1 specifies the marker number to return. Resending the same marker will cause the same marker to be returned twice.

The contents of the returned data vary based on the selected protocol. See the “Status protocol” parameter, specifically the “Send ack marker” section of the selected protocol. If the protocol supports it, the marker can either be positive, meaning all commands up to this point were executed, or negative, indicating that an error occurred on a command executed before this point.

3.3.3 Send information - <ESC><ENQ>c

Quick Command Facts	
Name	Send information
Modes	Application & Boot
Parameters	None
Type	Enquiry
Execution	Immediate

This command instructs the printer to return system information to the host.

See the “Status protocol” parameter, specifically the “Send information” section of the selected protocol.

NOTE! – This command takes several seconds to execute if information level setting in parameter n67 is set to High.

3.3.4 Send sensor - <ESC><ENQ><5><N1>

Quick Command Facts		
Name	Send sensor	
Modes	Application	
Parameters	N1	Sensor Number, or 0 for all.
Type	Enquiry	
Execution	Immediate	

This command instructs the printer to information about a sensor to the host.

A value of zero indicates a negative “NO” for the sensor. A value of one indicates a positive “YES” for the sensor.

Table of Sensor Numbers:

Number	**Name**	**Range**	**Description**
0			Returns information on all available sensors
1	End of paper selected	0,1	Determines if paper is out at the selected paper sensor
2	Top of form	0,1	Determines if the paper is currently at top of form position
5	Paper at presenter	0,1	Determines if there is paper present under the presenter sensor
9	Printhead temperature (C)	-57..122	Determines the printhead temperature in degrees Celsius
10	Environment temperature (C)	-60..127	Not implemented on KR203 printer.
11	Head down	0,1	Determines if the printhead is in the down and locked position
12	Cutter home	0,1	Determines if the cutter is in home position
13	Paper low	0..2	Determines if paper is detected at the paper low sensor. The result is 2 if no sensor is connected.
14	24V level (V)	0..50	Determines the voltage of the 24v supply running into the printer. Printer will reset below 18 volts.
15	Media width	60,80	Determines the sensed guide width. Set during calibration, and the same as the “Installed guide width” setting.
16	FF button	0,1	Determines if the feed button is depressed. The two feed buttons are ganged and not individually addressable.
17	Pull detect	0,1	Determines if the presenter feed motor is currently sensing motion. Note that this may be active during print.

Number	Name	Range	Description
18	End of paper 80mm	0,1	Determines if paper is out at the 80mm sensor on the printer, regardless of the selected guide.
19	End of paper 60mm	0,1	Determines if paper is out at the 60mm sensor on the printer, regardless of the selected guide.

Specifying an invalid sensor number for N1 will result in an “Index error”.

3.3.5 Send parameter - <ESC><ENQ>P<N1>

Quick Command Facts		
Name	Send parameter	
Modes	Application	
Parameters	N1	Parameter number
Type	Enquiry	
Execution	Immediate	

This command instructs the printer to return a parameter settings value.

N1 specifies the parameter number to return.

Specifying an invalid parameter number for N1 will result in an “Index error”.

For a list of available parameters see the “Parameters” section.

3.3.6 Send all parameters - <ESC><ENQ>Q<N1>

Quick Command Facts		
Name	Send all parameters	
Modes	Application	
Parameters	N1	Tray Number
Type	Enquiry	
Execution	Immediate	

This command instructs the printer to return all parameters for a given tray value.

N1 specifies the tray to return.

The available trays are 0 which is the current temporary values, tray 1 which are the stored values and 255 which are the default values. Specifying a value for N1 other than these values will result in an “Index error”.

3.4 Graphics Commands

3.4.1 Print graphics line - <ESC>s<N1><N2>..<nX>

Quick Command Facts		
Name	Print uncompressed graphics line	
Modes	Application	
Parameters	N1	Data Size
	N2...NX	Data
Type	Graphics	
Execution	Synchronized	

This command sends a graphics stream to the printer.

N1 specifies the stream size, which is the number of bytes fron N2 to nX.

N2 specifies the graphic data to transmit to the printer in raw binary format.

Any line for which less data than the current print width is specified, the remainder of the line will be filled with blank dots. Excess data beyond the print width specified for a line will be ignored.

When printing graphic lines, the print speed is determined by the burn time settings and the compensation systems. The printer will drop speed when this occurs. Feed media commands always moves media at the selected speed, so the rapid change between feed speed and print speed can reduce print quality.

3.5 Feed and Cut Commands

3.5.1 Feed forward - <ESC>J<N1>

Quick Command Facts		
Name	Feed forward	
Modes	Application	
Parameters	N1	Amount
Type	Feed	
Execution	Synchronized	

This command feeds media forward, i.e. feeds without printing.

N1 specifies the amount to feed in motor steps. There are approximately 8 steps per mm.

The media feed always occurs at the selected print speed.

3.5.2 Feed backward - <ESC>j<N1>

Quick Command Facts		
Name	Feed backward	
Modes	Application	
Parameters	N1	Amount
Type	Feed	
Execution	Synchronized	

This command feeds media backward.

N1 specifies the amount to feed in motor steps. There are approximately 8 steps per mm.

The media feed always occurs at the selected print speed.

Note that it is possible to back the media out of the printer. A reverse operation at the start of a page should never exceed 7mm, or a N1 value of 56.

3.5.3 Advance to TOF - <FF>

Quick Command Facts	
Name	Advance to TOF
Modes	Application
Parameters	None
Type	Feed
Execution	Synchronized, Initiate

This command feeds media to the next top of form. The top of form position is either when the next mark is detected when “TOF Synchronization” is enabled, or the “Page Length” when in continuous mode.

If the setting “Auto Cut After TOF” is enabled, a cut occurs after the movement, and the cut media is presented the default amount (50mm).

3.5.4 Cut and present media - <RS><N1>

Quick Command Facts		
Name	Cut and present media	
Modes	Application	
Parameters	N1	Present Amount
Type	Feed	
Execution	Synchronized, Initiate	

This command feeds media to the next top of form. The top of form position is either when the next mark is detected when “TOF Synchronization” is enabled, or the “Page Length” when in continuous mode, and then cuts the media.

The media is then presented based on the amount specified by N1:

N1 Value	Amount Presented
0	50mm
1-254	1-254mm respectively
255	Entire page length minus 20mm.

The first time media is presented, the parameter “Wall Compensation” is added to the present amount.

Subsequent presentations do not have this addition performed.

It is important to note that no presenting operation can cause the media to be completely ejected from the printer. Only an eject command can completely remove the paper from the printer. This cut is affected by the “Auto advance before cut” setting.

3.5.5 Cut media - <ESC><RS>

Quick Command Facts	
Name	Cut media
Modes	Application
Parameters	None
Type	Feed
Execution	Synchronized, Initiate

This command feeds media to the next top of form. The top of form position is either when the next mark is detected when “TOF Synchronization” is enabled, or the “Page Length” when in continuous mode, and then cuts the media.

No present operation occurs when using this command so a “Present media” command must then be performed to present the media to the customer. This cut is affected by the “Auto advance before cut” setting.

3.5.6 Partial cut media - <US><N1>

Quick Command Facts		
Name	Partial cut media	
Modes	Application	
Parameters	N1	Amount to leave uncut in MM
Type	Feed	
Execution	Synchronized, Initiate	

This command feeds media to the next top of form. The top of form position is either when the next mark is detected when “TOF Synchronization” is enabled, or the “Page Length” when in continuous mode, and then partially cuts the media. The value specified by N1 determines how much media is left uncut in millimeters.

The amount specified is generally only accurate to 10mm increments, and has a range of 10-60mm. Values above 60 result in no cut, a value of 0 results in a full cut, and is identical to the <ESC><RS> command.

Note that if a partial cut fails, a full cut may occur in the process of trying to resolve the error, but the customer will still be able to get both of their receipts, just fully separated.

A complete cut operation must be performed before the media can be ejected. This cut is affected by the “Auto advance before cut” setting.

3.5.7 Eject media - <ENQ>

Quick Command Facts	
Name	Eject media
Modes	Application
Parameters	None
Type	Feed
Execution	Synchronized, Initiate

This command completely ejects a cut piece of media from the presenter.

This command does nothing if the media has not been cut yet.

3.6 System Commands

3.6.1 Hard reset - <ESC>?

Quick Command Facts	
Name	Hard reset
Modes	Application & Boot
Parameters	None
Type	System
Execution	Immediate

This command performs a hard printer reset. This is equivalent to a power cycle.

When in the bootware, this command is used to exit the bootware and start execution of the application, provided a valid application is installed.

3.6.2 Soft reset - <ESC>@

Quick Command Facts	
Name	Soft reset
Modes	Application
Parameters	None
Type	System
Execution	Immediate

This command performs a software reset of the printer. A software reset resets all communication interfaces, and empties all queues and buffers.

3.6.3 Set parameter in queue - <ESC>&p<N1><N2>..<NX>

Quick Command Facts		
Name	Set parameter in queue	
Modes	Application	
Parameters	N1	Parameter Number
	N2...NX	Parameter Value
Type	System	
Execution	Synchronized	

This command sets a parameter in the printer. Parameters control all system options in the printer.

N1 specifies the parameter number to set.

N2 to NX specifies a binary value to set the parameter to. Different parameters are different sizes in the KR203, so it is critical to send the proper number of bytes for a given setting.

If N1 is an invalid parameter number, an “Index error” will occur. If the value specified by N2..NX is outside the valid range for parameter N1, an “Out of range” will occur.

For a list of available parameters see the “Parameters” section.
This command just loads the setting into the operating parameters; to store them, use <ESC>&<4><1>

3.6.4 Print test page - <ESC>P<N1>

Quick Command Facts		
Name	Print test page	
Modes	Application	
Parameters	N1	Type of page
Type	System	
Execution	Asynchronous, Initiate	

This command instructs the printer to print a built in test page.

N1 specifies the type of page to print. See the table below for more details. Each print is followed by a move to cut position, and a cut and default eject. Specifying an invalid value for N1 will result in an “Index error”.

The execution of this command is Asynchronous, meaning that while it will be executed in queue order; commands around it may also be executed at the same time. For this reason, when executing these commands, other printing commands should not be executed; however additional test pages can be executed.

N1 Value	Page Description	Continuous Mode Length
0	Self test page – Displays logo and firmware version number	92mm
3	25% staggered dot page	177mm of printing, 190mm total
4	50% 1-dot page	177mm of printing, 190mm total
5	2-bit rotating pattern page	177mm of printing, 190mm total
6	50% 2-dot page	177mm of printing, 190mm total
7	Density pattern page	152mm of printing, 165mm total

When “TOF Synchronization” is enabled, after the page is completed, the printer will advance to the next mark, then cut and eject.

3.6.5 Force print - <ESC>p

Quick Command Facts	
Name	Force print
Modes	Application
Parameters	None
Type	System
Execution	Immediate, Initiate

This command forces all items in the printer’s queue to be executed immediately upon receipt of this command.

Note that when there is a severe error, the queue is emptied, so sending this command during a severe error has no effect.

3.6.6 Store parameters - <ESC>&<4><N1>

Quick Command Facts		
Name	Store parameters	
Modes	Application	
Parameters	N1	Tray to store parameters in
Type	System	
Execution	Immediate	

This command instructs the printer to store the current operating parameters in flash, making them the power on settings.

N1 specifies the tray to store the parameters in. Tray 1 is the only tray present on the KR203. Specifying an invalid tray will result in an “Index error”.

After execution of this command is complete, the printer will make a small click noise to give the user acknowledgement that the save has occurred.

Note that parameters set with <ESC>&p as well as any temporary parameters send by an installed driver will be stored via this command.

3.6.7 Recall parameters - <ESC>&F<N1>

Quick Command Facts		
Name	Recall parameters	
Modes	Application	
Parameters	N1	Tray to load parameters from
Type	System	
Execution	Immediate	

This command instructs the printer to load the current operating parameters from the specified tray.

N1 specifies the tray to load the parameters from.

On the KR203, tray 1 holds the parameter values stored in flash, and tray 255 holds the factory default values. Specifying any other value will result in an “Index error”.

This command just loads the specified set into the operating parameters; to store them, use <ESC>&<4><1>.

3.6.8 Exit application - <ESC><255><n1>

Quick Command Facts	
Name	Exit application
Modes	Application
Parameters	Boot or application PID
Type	System
Execution	Immediate

This command exits the application and enters the bootware. When the application is terminated all data present in that session is lost.

When this command is issued, the printer will leave the USB bus and return as either the same or a different device.

If n1=0, the boot loader will return with the boot loader USB ID (PID = 0x00B4)
If n1=1, the boot loader will return with the firmware's USB ID (PID = 0x00B3)
You should use interactive polling to ensure you entered boot mode successfully.

To exit the boot and start the application, use the <ESC>? command.

3.6.9 Load application - <ESC><0><Application data>

The sequence for firmware (application) update has to be interactive:

1) Send: <ESC><255><0> or <ESC><255><1>
   If you use 0, the boot loader will come up with a boot loader USB ID string. If you use 1, it will come up with the firmware's ID string and you should use interactive polling to ensure you entered boot mode successfully. In Windows 7 and above it is best to use 1 as a change of identity requires a new driver and administrative rights to load.

2) Wait for the USB Device to leave the bus and then reenter.

3) Send: <ESC><0><firmware file>

4) Verify load complete and successful.

5) <ESC>? Reset printer to exit the boot.

6) Wait for the USB device to re-appear.

7) Verify update.

Quick Command Facts	
Name	Load application
Modes	Boot
Parameters	Components of application file
Type	System
Execution	Immediate, Initiate

This command instructs the bootware that it should load a new application.

When this command is issued, an application file is to follow.

The first four bytes of the application file is the file size, and the boot first checks to make sure the new application will fit between the boot and the flash disks. If it does not, a "Boot/Application version mismatch" error occurs.

Next, the application is checked to ensure it is an application file, this is accomplished via the tagging mechanism in the firmware files. If the file is not detected to be an application file a "Wrong object type" error occurs.

The printer must have been previously programmed with tags in order to load any file, application or bootware. If the current bootware cannot find the system tags on the printer's flash disk, or if the bootware cannot find any tag entries in the first 2k of the application file, a "Tag system not found" error occurs.

Next it is checked for compatibility with this specific controlled PCB. If the bootware file is not detected as being compatible with this board, a "Wrong target" error occurs.

As the application is received by the printer, it is burned directly to flash memory.

After the entire application has been received and flashed to the application flash space, a checksum is then received by the printer, which is the final four bytes of the application file. If the checksum provided and the checksum of the data in flash do not match, a "Checksum error" occurs.

After a successful load, there is a single 50ms write operation to the boot area to inform it where the new application starts in memory. If the printer is powered off during the application, the printer might not be recoverable.

After successful load, the printer remains in the bootware. To exit the bootware, issue an <ESC>?.

3.6.10 Calibrate Media - <ESC>#

Quick Command Facts	
Name	Calibrate Media
Modes	Application
Parameters	None
Type	System
Execution	Synchronized, Initiate

This command instructs the printer to perform a media calibration.

Media calibration can be done for both continuous and mark based media, and the type of calibration performed is based on the option selected by the "TOF Synchronization" parameter. See more details in the user interface section for what occurs during calibration.

The media calibration process must begin with no other print in progress. If it is attempted while there is a print out in progress, the printer will cut and eject the page, and signal a "Black mark calibration error".

Sending this command multiple times will only cause one calibration until the calibration which is active is complete.

3.6.11 Calibrate System - <ESC>g

Quick Command Facts	
Name	Perform System Calibration
Modes	Application
Parameters	None
Type	System
Execution	Immediate

This command instructs the printer to select media guide, and calibrate cutter and media, If TOF synchronization if enabled through parameter n35, the printer will be calibrated for the TOF media loaded.

System calibration triggered with this command is the same as holding the Feed button pressed until two blinks.

In order to start this process, no media must be present under the platen or under the presenter sensor, the printhead must be closed, and no cutter jam must exist.

If these conditions are not met, a "System calibration error" occurs. If the calibration is successful, a "System calibration success" occurs.

This command also calibrates the cutter, so it is normal that as part of its execution 3 cuts occur. If the cutter calibration cannot compete successfully, a “Cutter jam” error occurs.

Upon successful calibration of the media guide, “End of paper threshold”, “Installed guide width”, “Cutter calibration” and “Presenter threshold” are stored to flash.

4 Parameters

4.1 Parameters Overview

The following is a table of all parameters implemented in the KR203 Kiosk printer.

For any parameter, if the value specified is not in the range, an “Out of range” error occurs.

Number	Name	Range	Default	Size	Attributes
6	Secondary burn time	10..900	130	2	None
7	Primary burn time	10..2600	560	2	None
8	Max print speed	50..175	152	1	None
9	Presenter loop length	0,80..600	400	2	None
31	Presenter speed	50..450	300	2	None
34	Auto cut and present after FF	0..1	0	1	None
35	TOF synchronization	0..1	0	1	None
37	Page length	11..600	85	2	None
39	TOF marker length	1..30	5	1	None
40	Garbage filter	1..15	1	1	None
41	TOF cut offset	0..255	0	1	None
45	Eject Timeout	0..600	0	2	None
46	Cut position calibration	-127..127	0	1	None
47	Wall Compensation	0..600	0	2	None
48	Print width	0,20..80	0	1	None
49	Advance before cut	0..1	1	1	None
51	TOF marker sensitivity	0..255	120	1	None
53	Lock parameters	0..1	0	1	None
57	System	0..255	255	1	None
58	Out of paper level	0..255	0	1	None
65	Status mode	0,1,3	3	1	None
66	Status protocol	0..1	1	1	None
67	Information level	10,20,30	10	1	None
68	End of paper threshold	0..235	60	1	None
69	Installed guide width	60,80	80	1	Read Only
70	Presenter PWM percentage	0..100	100	1	None
71	EOP PWM percentage	0..100	100	1	None
75	Keepalive timeout	0..65535	0	2	None
80	Compensation mode	0..255	255	1	None
81	Compensation curve knee	1..1000	88	2	None
82	Compensation curve divisor	1..10000	1000	2	None
83	Compensation slope	1..1000	610	2	None
84	Compensation Y-intercept	1..10000	1481	2	None
248	Last reset reason	10,20,30,40,50,60,70	10	1	Read Only
249	Power down count	(All values valid)	0	4	Read Only
250	Media length (m)	(All values valid)	0	4	Read Only
251	Number of cuts	(All values valid)	0	4	Read Only
252	MIFS low page erases	(All values valid)	0	4	Read Only
253	MIFS high page erases	(All values valid)	0	4	Read Only
254	Uptime (s)	(All values valid)	0	4	Read Only

4.1.1 6 – Secondary burn time

Parameter Facts	
Number	6
Name	Secondary burn time
Range	10..900
Size	Unsigned 16-bit
Default	120 (µS)

When “Compensation mode” bit 2 is enabled, this is the amount of time spent burning the history control dot line during printing, it is ignored otherwise.

History lines give extra burn time to pixels which have been off in order to improve print darkness on those dots.

The time is specified in microseconds. Note that setting this value to a high number can reduce print speed.

4.1.2 7 – Primary burn time

Parameter Facts	
Number	7
Name	Primary burn time
Range	10..2600
Size	Unsigned 16-bit
Default	546(µS)

T is the amount of time spent burning the dot line during printing.

The time is specified in microseconds. Note that setting this value to a high number can reduce print speed.

Using very large values can reduce printhead life. Generally there is no reason to set this above 1000.

Darkness	Total burn time	N6	N7
5%	33	6	28
10%	67	12	55
15%	100	18	82
20%	133	24	110
25%	167	30	137
30%	200	36	164
35%	233	42	192
40%	267	48	219
45%	300	54	246
50%	333	60	274
55%	367	66	301
60%	400	72	328
65%	433	78	356
70%	467	84	383
75%	500	90	410
80%	533	96	438
85%	567	102	465
90%	600	108	492
95%	633	114	520
100%	667	120	546
105%	700	126	574
110%	733	132	602
115%	767	138	629
120%	800	144	656
125%	833	150	684
130%	867	156	711
135%	900	162	738
140%	933	168	766
145%	967	174	793
150%	1000	180	820

4.1.3 8 – Max print speed

Parameter Facts	
Number	8
Name	Max print speed
Range	50..175
Size	Unsigned 8-bit
Default	152 (mm/s)

This parameter specifies the maximum print speed. This speed is used as the feed speed.

The value specified is in millimeters per second. It is not advised to set this value less than 75 or over 152.

4.1.4 9 – Presenter loop length

Parameter Facts	
Number	9
Name	Presenter loop length
Range	0,80..600
Size	Unsigned 16-bit
Default	400 (mm)

This parameter specifies the maximum media length stored in the presenter loop during printing. Once this much media is stored in the loop, it begins feeding out as more is printed.

The value specified is in millimeters. A value of zero indicates no loop. Note that because of gearing differences in the motors, the size of the loop will slowly increase as more printing occurs, even if the loop is disabled.

4.1.5 31 – Presenter speed

Parameter Facts	
Number	31
Name	Presenter speed
Range	50..450
Size	Unsigned 16-bit
Default	300 (mm/s)

This parameter specifies the speed the presenter moves media at when presenting and ejecting. It does not control the speed when maintaining the height of the loop.

The value specified is in millimeters per second.

4.1.6 34 – Auto cut and present after FF

Parameter Facts	
Number	31
Name	Auto cut and present after FF
Range	0..1
Size	Unsigned 8-bit
Default	0 (Disabled)

This parameter specifies whether or not the printer automatically cuts and presents after an <FF> command.

A value of zero performs no cut after <FF>, a value of 1 causes a cut and default present to occur after <FF>, equivalent to an

<RS><0>

4.1.7 35 – TOF Synchronization

Parameter Facts	
Number	35
Name	TOF Synchronization
Range	0..1
Size	Unsigned 8-bit
Default	0 (Disabled)

This parameter specifies whether the printer should sync to TOF (Black) marks or not.

A value of 0 places the printer in continuous mode.
A value of 1 places the printer in TOF synchronization mode.

If you attempt to use mark media in continuous mode, normal operation occurs unless the marks are larger than the value specified by “TOF marker length”. If this is the case, media out may be signaled when a mark is encountered.

If you attempt to use continuous media in mark mode, at the end of each page, the printer will feed media for twice the “Page length” searching for the mark. If it is not found, a “Black mark not found” error occurs.

Value	Result
0	Continuous Mode
1	TOF Synchronization Mode

4.1.8 37 – Page length

Parameter Facts	
Number	37
Name	Page length
Range	11..600
Size	Unsigned 16-bit
Default	92 (mm)

This parameter specifies the length of a page.

When “TOF Synchronization” is enabled, twice this value is the length of media that will be fed searching for the next valid mark to cut at.

When it is disabled, this represents the minimum page length that the printer will produce.

This setting is set automatically during a calibration when “TOF Synchronization” is enabled.

Page length is always resolved just before a cut operation.

Generally speaking, the printer will always regard this setting when making any cut. Note that during startup, the printer may cut without regard to this setting. This is by design and needed to avoid a paper jam at startup.

4.1.9 39 – TOF marker length

Parameter Facts	
Number	39
Name	TOF marker length
Range	1..30
Size	Unsigned 8-bit
Default	5 (mm)

This parameter specifies the maximum length of a mark, and is measured in millimeters.

If a mark is longer than this value plus 5mm, a media out condition is signaled.

This setting is set automatically during a calibration when the calibration was started while “TOF Synchronization” is enabled.

4.1.10 40 – Garbage filter

Parameter Facts	
Number	40
Name	Garbage filter
Range	1..15
Size	Unsigned 8-bit
Default	1 (mm)

This parameter specifies how big a mark must be to be detected as a mark.

If a mark is shorter than this, it is ignored.

This setting is set automatically during a calibration when the calibration was started while “TOF Synchronization” is enabled.

4.1.11 41 – TOF cut offset

Parameter Facts	
Number	41
Name	TOF cut offset
Range	0..255

Size	Unsigned 8-bit
Default	0 (mm)

This parameter specifies how much media should be fed once a mark is detected before media is considered to be in cut position. It has no effect when “TOF Synchronization” is not enabled.

Note that additional marks can be found in the interim and this will have no effect on the operation, and may desynchronize the mark system.

4.1.12 45 – Eject timeout

Parameter Facts	
Number	45
Name	Eject timeout
Range	0..600
Size	Unsigned 16-bit
Default	0 (Seconds)

This parameter specifies how long the printer waits after a present operation occurs before it automatically ejects the page.

If this value is set to zero, no eject will occur. Note that the time is measured from the completion of the first present operation.

4.1.13 46 – Cut position calibration

Parameter Facts	
Number	46
Name	Cut position calibration
Range	-127..127
Size	**Signed** 8-bit
Default	0 (steps)

This parameter is used to set how many steps the cut position is to be modified by. Note that this is a signed 8 bit value. Negative values will cause the printer to cut sooner than default position. Note that the adjustment will never result in a reverse feed.

4.1.14 47 – Wall compensation

Parameter Facts	
Number	47
Name	Wall Compensation
Range	0..600
Size	Unsigned 16-bit
Default	0 (mm)

This parameter is used to set the thickness of the kiosk wall. This value is added to the first present operation of any printed page as an additional feed. It only applies to the first present operation of a given page, subsequent feeds will be at their actual values.

Note that the presenter will never lose control of the media with a present operation. Eject cannot occur using present commands.

4.1.15 48 – Print width

Parameter Facts	
Number	48
Name	Print width
Range	0,20..80
Size	Unsigned 8-bit
Default	0 (automatic based on n69)

This parameter is used to set the desired print width output. This setting overrides setting 69, “Installed guide width” and instructs the system to print in the specified width in millimeters.
The print window will always be centered.

If this value is 0, the value is based on “Installed guide width” and is 54 if a narrow guide is detected and 72 if a wide guide is detected.

4.1.16 49 – Advance before cut

Parameter Facts

Number	49
Name	Advance before cut
Range	0..1
Size	Unsigned 8-bit
Default	1 (Enabled)

If this parameter is set to 1, meaning it is enabled, the printer will feed the print line to cutter distance before it tries to move to cut position. A value of zero means no motion occurs, which means that part of the previous page will appear on the top of the next page.

Because the print line to cutter distance is less than the EOP sensor to print line distance, this should never cause an extra form to be fed when "TOF synchronization" is enabled.

Value	Result
0	Do not advance before cut
1	Advance before cut

4.1.17 51 – TOF marker sensitivity

Parameter Facts	
Number	51
Name	TOF marker sensitivity
Range	0..255
Size	Unsigned 8-bit
Default	122 (AD Steps)

This setting determines what level the selected EOP sensor must see before it starts evaluating whether or not a detected mark is valid. This is a detection done prior to the garbage filter detection.

This is set during media calibration when "TOF synchronization" is enabled.

4.1.18 53 – Lock parameters

Parameter Facts	
Number	53
Name	Lock parameters
Range	0..1
Size	Unsigned 8-bit
Default	0 (Unlocked)

This value specifies if parameters can be changed using the <ESC>&p command. When set to 1, setting any parameter other than this one results in an "Index error".

Note that the "Recall parameters" command overrides this setting.

Value	Result
0	Do not lock parameters
1	Lock parameters

4.1.19 57 – System

Parameter Facts	
Number	57
Name	System
Range	0..255
Size	Unsigned 8-bit
Default	255

The System parameter is a bit field that will control up to eight system components in the printer. Bits 0-6 are unspecified and should always remain set to 1.

Bit7 1: default. One PC /one KR203 USB driver instance regardless of USB port used; 0: each USB port has its own KR203 USB driver instance.

4.1.20 58 – Out of paper level

Parameter Facts	
Number	58
Name	Out of paper level

Range	0..255
Size	Unsigned 8-bit
Default	0

This parameter is not currently used and is set during calibration.

4.1.21 65 – Status mode

Parameter Facts	
Number	65
Name	Status mode
Range	0 and 3
Size	Unsigned 8-bit
Default	3 (Active to USB)

This setting determines the status reporting behavior of the KR203.

When set to 3, the printer will actively report status changes. These responses are equivalent to the responses generated by <ESC><ENQ><1>. The reporting format will vary based on the value of "Status protocol" (parameter 66).

These requests will be generated automatically, without an enquiry. For a list of the codes generated, see "Status codes".

Value	**Result**
0	No active status reporting
3	Report active status to USB port

4.1.22 66 – Status protocol

Parameter Facts	
Number	66
Name	Status protocol
Range	0..1
Size	Unsigned 8-bit
Default	1 (XML Reporting)

This setting determines the status reporting protocol of the KR203 printer.

All data that is returned by the printer will be in a format supported by the specified protocol.

Value	**Result**
0	TTP Reporting
1	XML Reporting

For a detailed reference of the responses of each protocol, see the "Status protocols" section.

4.1.23 67 – Information Level

Parameter Facts	
Number	67
Name	Information Level
Range	10,20,30
Size	Unsigned 8-bit
Default	30 (Maximum information)

This setting determines the amount of information to be reported when using the "XML Reporting" option as selected by the "Status protocol" setting.

It only applies to the "XML Reporting" option, and does nothing when any other protocol is enabled.

Value	**Result**
10	Minimum Information Level
20	Medium Information Level
30	Maximum Information Level

For a detailed reference of the responses at each information level, see the “Status protocols” section.

4.1.24 68 – End of paper threshold

Parameter Facts	
Number	68
Name	End of paper threshold
Range	0..255
Size	Unsigned 8-bit
Default	60 (AD Steps)

This setting determines the thresholds for the EOP sensor to determine if the printer is out of paper. This is in addition to the detection system afforded by the mark detection system (which is if the mark length is greater than “TOF marker length” plus 5mm).

This value is set after a successful media guide calibration.

4.1.25 69 – Installed guide width

Parameter Facts	
Number	69
Name	Installed guide width
Range	60,80
Size	Unsigned 8-bit, **read only**
Default	80 (or 82.5mm)

This setting instructs the system which EOP sensor to use, either the sensor for wide guides or the sensor for narrow guides.

This value is set after a successful media guide calibration.

Value	Result
60	60 (or 58mm) guide installed
80	80 (or 82.5mm) guide installed

4.1.26 70 – Presenter PWM percentage

Parameter Facts	
Number	70
Name	Presenter PWM percentage
Range	0..100
Size	Unsigned 8-bit
Default	100 (percent)

This setting instructs the system what amount of time the LED should be turned on per cycle. 100% is equal to full on, 0% is equal to full off. This setting controls the presenter sensor’s PWM.

This value is set after a successful media calibration, regardless of the “TOF Synchronization” setting. This parameter should not be manually set.

4.1.27 71 – EOP PWM percentage

Parameter Facts	
Number	71
Name	EOP PWM percentage
Range	0..100
Size	Unsigned 8-bit
Default	100 (percent)

This setting instructs the system what amount of time the LED should be turned on per cycle. 100% is equal to full on, 0% is equal to full off. This setting controls both EOP sensor’s PWM.

This parameter should not be manually set.

4.1.28 75 – Keepalive timeout

Parameter Facts	
Number	75

Name	Keepalive timeout
Range	0..65535
Size	Unsigned 8-bit
Default	60

If active status reporting is enabled (see "Status mode"), this setting instructs the system to send back an active status message at regular intervals as specified by this parameter. The parameter is measured in seconds.

Once an active status message is sent, a timeout is started based on this value. If no new active status message occurs during that time, a special keepalive status message will be transmitted based on the currently selected status protocol (see "Status protocol"). The timer always resets when the system broadcasts any active status message or keepalive message.

A value of zero indicates that this function is disabled, all other values indicate the timeout in seconds.

4.1.29 80 – Compensation mode

Parameter Facts	
Number	80
Name	Compensation mode
Range	0..255
Size	Unsigned 8-bit (bit field)
Default	255 (all enabled)

This setting instructs the system to enable or disable various printing compensation systems.

These systems can change the values specified by "Primary burn time".

This parameter is a bit field parameter, add the values below to get the desired effect.

Bit Number	Value to Add	Definition
0	1	Enable Thermal Compensation Decreases burn time based on head temperature.
1	2	Enable Speed Compensation Increases or decreases burn time based on print speed.
2	4	Enable Secondary Burn Enables the history system, and burns history lines at the "Secondary burn time" time

Note that enabling or disabling these settings can have an effect on print speed during printing.

4.1.30 81 – 84 Compensation

Parameter Facts	
Number	81
Name	Compensation curve knee, k
Range	0..1000
Size	Unsigned 16-bit
Default	88 ($\times 10^{-1}$)

Parameter Facts	
Number	82
Name	Compensation curve divisor, d
Range	0..1000
Size	Unsigned 16-bit
Default	1000 ($\times 10^{-1}$)

Parameter Facts	
Number	83
Name	Compensation slope, l
Range	0..1000
Size	Unsigned 16-bit
Default	610 ($\times 10^{-3}$)

Parameter Facts	
Number	84
Name	Compensation Y-intercept, y
Range	0..10000
Size	Unsigned 16-bit
Default	1481 ($\times 10^{-3}$)

These four settings are used by the speed compensation system determine how much to compensate the burn by based on the following formula:

$$x = \frac{o - \left(y - \left(\frac{(p+s)}{l}\right)\right)k}{d}$$

Element	Meaning
o	Time head has been off in µS
y	Compensation Y-intercept
p	Primary burn time value in µS
s	Secondary burn time value in µS
l	Compensation slope
k	Compensation knee
d	Compensation divisor
x	Result in µS to add to the primary burn

The total amount of time burned when speed compensation is enabled cannot exceed the minimum step length by more than a small amount, so the net speed impact is small. Also speed compensation never reduces burn, only increases it.

4.1.31 248 – Last reset reason

Parameter Facts	
Number	248
Name	Last reset reason
Range	10,20,30,40,50,60,70
Size	Unsigned 8-bit, **read-only**
Default	10 (Reset from power loss)

This value contains the last reason the printer reset.
This value is read only

Value	Meaning
10	Reset from power loss
20	Reset by command
30	Reset by request to enter boot
40	Reset by brownout (voltage dipped below 18 and then rose above 22v)
50	Reset by software watchdog
60	Reset by operating system error
70	Reset by bad interrupt

4.1.32 249 – Power down count

Parameter Facts	
Number	249
Name	Power down count
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0

This value is the number of times the printer has been powered down. It is not incremented when a brownout occurs.

4.1.33 250 – Media length (m)

Parameter Facts	
Number	250
Name	Media length
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0

This value is the total length of media fed by the platen motor in meters. It is reported in meters but tracked in platen steps.

4.1.34 251 – Number of cuts

Parameter Facts	
Number	251
Name	Number of cuts
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0

This value is the total number of times the cutter blades have contacted. This includes normal cuts, partial cuts and retry cuts.

4.1.35 252 & 253 – Page Erases

Parameter Facts	
Number	252
Name	MIFS low page erases
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0
Parameter Facts	
Number	253
Name	MIFS high page erases
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0

These two values store the number of times the printers two flash disks have been written to. The printer has a mirroring system for the flash disk, and these counters track the number of writes to each one. Each flash disk is rated for, at minimum, 50,000 writes.

4.1.36 254 – Uptime (s)

Parameter Facts	
Number	254
Name	Uptime (s)
Range	(All values valid)
Size	Unsigned 32-bit, **read only**
Default	0

This value is the total number of seconds the controller PCB has been powered.

5 Status Codes

5.1 Application Status Code Overview

The following table is all status codes that can be reported by the KR203 printer from the application.

Number	Name	Type	Group	LED Reporting
0	Ok	Normal	Informational	Solid green
1	Paper jam in presenter	Normal	Severe	1 red flash
2	Cutter Jam	Normal	Severe	2 red flashes
3	Out of paper	Normal	Severe	3 red flashes
4	Printhead lifted	Normal	Severe	4 red flashes
5	Paper feed error	Normal	Severe	5 red flashes
6	Head temperature error	Normal	Severe auto-clear	Yellow flashing
10	Black mark not found	One-time	Informational	Not signaled
11	Black mark calibration error	One-time	Informational	Not signaled
12	Index error	One-time	Informational	Not signaled
18	Out of range	One-time	Informational	Not signaled
19	Paper low	Normal	Warning	Not signaled
20	Media in presenter	Normal	Informational	Not signaled
40	Printer entered USB bus	One-time	Informational	Not signaled
41	Media guide detection error	One-time	Informational	Not signaled
42	Media guide detection success	One-time	Informational	Not signaled

5.2 Groups, Types and Reporting

The group and type values in the above table are important pieces of information to know how to deal with a status.

Type

Items in the above table marked “One-time” will only be reported to the host once; that is as soon as they are transmitted to the host, either as part of an active status report if “Status mode” is set in such a way, or after a query such as “Send status”, they are automatically cleared.

“Normal” type status messages will continue to be reported until the status changes.

Reporting

Severe errors are reported to the user via the user interface using the status LED. The order of the above list expresses the order in which they are reported on the user interface.

When status is requested, all status codes that are active will be returned to the user each time the information is requested. Additionally, if the status changes and is reported actively, it will be re-reported when any status changes.

For example, if the head is open and the printer is out of media, an active status report will arrive showing both these codes. If the head is then closed but media is not present, an additional active status report will be issued that informs the host that only media is out.

Groups

Groups allow the host to make determinations about what to do with an error without knowing what the error means. In addition to the above names, groups are assigned numbers reported in the status report.

These codes give an indication of how the host should handle each of these classes of errors if it does not know what a certain status code means.

Category	Group value	Meaning
Severe	1	A serious error has occurred and a technician will be required to resolve it.
Severe auto-clear	10	A serious error has occurred, but it may clear on its own given time.
Warning	30	An error may occur in the future.
Informational	100	Information only, there is no risk of error.

5.2.1 0 – Ok

Status Code Facts	
Number	0
Name	Ok
Type	Normal
Group	Informational
LED Reporting	Solid Green

This code is reported when no other codes are active. It indicates that everything is okay.

5.2.2 1 – Paper jam in presenter

Status Code Facts	
Number	1
Name	Paper jam in presenter
Type	Normal
Group	Severe
LED Reporting	1 red flash

This code indicates that media is stuck in the presenter. This error is set when the printer attempts to eject media completely, and cannot complete the operation after feeding the length of the page plus 175mm.

It can be cleared by removing the media from the presenter sensor.

5.2.3 2 – Cutter Jam

Status Code Facts	
Number	2
Name	Cutter jam
Type	Normal
Group	Severe
LED Reporting	2 red flashes

This code indicates that the printer could not find the cutter blade or could not properly manage its position.
This error is set when the printer attempts to cut but fails, and three retries also fail.

It can be cleared by power cycle only.

5.2.4 3 – Out of paper

Status Code Facts	
Number	3
Name	Out of paper
Type	Normal
Group	Severe
LED Reporting	3 red flashes

This code indicates that the selected EOP sensor has detected no media present. This value is signaled either when the mark engine has detected a mark larger than "TOF marker length" plus 5mm, or when the A/D reading of the EOP sensor drops below the "End of paper threshold".

It is cleared after successful media load (either via calibration or via regular media load).

5.2.5 4 – Printhead lifted

Status Code Facts	
Number	4
Name	Printhead lifted
Type	Normal
Group	Severe
LED Reporting	4 red flashes

This code indicates that the printhead is lifted. It can only be cleared by the head being restored to its locked position.

5.2.6 5 – Paper feed error

Status Code Facts	
Number	5
Name	Paper feed error
Type	Normal
Group	Severe
LED Reporting	5 red flashes

This code indicates that the paper failed to reach the presenter sensor within an expected amount of time.
This error is signaled if the media does not reach the presenter sensor after feeding the length from the cutter to the sensor plus fifteen millimeters.

It can only be cleared by opening and closing the head, or by cycling the power.

5.2.7 6 – Head temperature error

Status Code Facts	
Number	6
Name	Head temperature error
Type	Normal
Group	Severe auto-clear
LED Reporting	Yellow flashing

This status code indicates that the printhead has exceeded the maximum permitted temperature.

This status code is set when the printhead temperature exceeds 65° Celsius. When this code is raised, the printer feeds 100mm of blank media, cuts and presents the page.

This code will clear automatically if the printhead temperature drops below 55° Celsius.

5.2.8 10 – Black mark not found

Status Code Facts	
Number	10
Name	Black mark not found
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code indicates that the printer is in "TOF Synchronization" mode, but could not find a mark within two times the value specified by "Page length".

It is cleared as soon as it is read or actively reported.

5.2.9 11 – Black mark calibration error

Status Code Facts	
Number	11
Name	Black mark calibration error
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code indicates that the printer is in "TOF Synchronization" mode, but it failed to properly calibrate the media. This could be because no mark was found, the mark was not sufficiently detectable, the printhead was opened during calibration, or the media was not sufficiently stable to detect.

It is cleared as soon as it is read or actively reported.

5.2.10 12 – Index error

Status Code Facts	
Number	12
Name	Index error
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code indicates that a command sent to the printer referenced an invalid index.

The following commands can raise this status code:

Command	Raised When
Get all parameters	Tray number is invalid
Get parameter	Parameter number is invalid
Get sensor	Sensor number is invalid
Print self test	Test number is invalid
Recall parameters	Tray number is invalid
Save parameters	Target tray is invalid
Set parameter	Parameter number is invalid
Set parameter in queue	Parameter number is invalid

It is cleared as soon as it is read or actively reported.

5.2.11 18 – Out of range

Status Code Facts	
Number	18
Name	Out of range
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code indicates that a command sent to the printer specified a value that was out of range for that command.

The following commands can raise this status code:

Command	Raised When
Print uncompressed graphics line	Length is zero
Set parameter in queue	When an invalid value is specified for a parameter

It is cleared as soon as it is read or actively reported.

5.2.12 19 – Paper low

Status Code Facts	
Number	19
Name	Paper low
Type	Normal
Group	Warning
LED Reporting	Not signaled

This status code indicates that paper is low.

It is set when the paper low sensor is both connected and has not detected media for the last 3 cuts.

It is cleared and replaced by “paper out” when the printer runs out of media. It is also cleared when the printer detects media present at the sensor for three consecutive cuts.

5.2.13 20 – Media in presenter

Status Code Facts	
Number	20
Name	Media in presenter
Type	Normal
Group	Informational
LED Reporting	Not signaled

This status code indicates that paper has reached the presenter during normal printing operations. It does not reflect the momentary status of the sensor.

It is cleared once the media is ejected.

5.2.14 40 – Printer entered USB bus

Status Code Facts	
Number	40
Name	Printer entered USB bus
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code is set when the USB cable is connected to the printer.

It is cleared as soon as it is read or actively reported.

5.2.15 41 – Media guide detection error

Status Code Facts	
Number	41
Name	Media guide detection error
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code is when a media guide detection sequence fails. It can fail as a result of a defective sensor or media being present when the calibration is started.

It is cleared as soon as it is read or actively reported.

5.2.16 42 – Media guide detection success

Status Code Facts	
Number	42
Name	Media guide success
Type	One-time
Group	Informational
LED Reporting	Not signaled

This status code is when a media guide detection sequence is successful. The host may desire to read information about the new guide to adjust itself as needed.

It is cleared as soon as it is read or actively reported.

5.3 Bootware Status Code Overview

The bootware has its own list of status codes. These codes will be visible during firmware loading.

Number	Name	LED Reporting
0	Ok	Fading in and out green
13	Checksum error	Rapid yellow, does not change with feed button press
14	Wrong object type	Rapid yellow, press feed button shows solid yellow
15	Corrupt or missing application	Rapid yellow, press feed button shows off
21	Boot/Application version mismatch	Rapid yellow, press feed button shows slower yellow flash
22	Wrong target	Rapid yellow, press feed button shows solid yellow
23	Tag system not found	Rapid yellow, press feed button shows solid yellow

5.3.1 0 – Ok

Status Code Facts	
Number	0
Name	Ok
Type	Normal
Group	Informational
LED Reporting	Fading in and out green

This code is reported when no other codes are active. It indicates that everything is okay.

5.3.2 13 – Checksum error

Status Code Facts	
Number	13
Name	Checksum error
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, does not change with feed button press

This code is reported when firmware file has been transmitted to the printer but its internal checksum is not correct.

It is cleared by a successful load operation or a reset.

5.3.3 14 – Wrong object type

Status Code Facts	
Number	13
Name	Wrong object type
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, press feed button shows solid yellow

This code is reported when a firmware file has been transmitted to the printer but it is the wrong type of object, for example, trying to load a bootware file as firmware.

It is cleared by a successful load operation or a reset.

5.3.4 15 – Corrupt or missing application

Status Code Facts	
Number	13
Name	Corrupt or missing application
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, press feed button shows off

This code is reported at startup when there is no valid firmware application installed in the flash.

It is cleared by a successful application load operation.

5.3.5 21 – Boot/Application version mismatch

Status Code Facts	
Number	21
Name	Boot/Application version mismatch
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, press feed button shows slower yellow flash

This code is reported at during a firmware load attempt if this bootware cannot load it because it is not compatible.

It is cleared by a successful load of a compatible firmware file, or upgrading of bootware which can only be done at a Zebra service center.

5.3.6 22 – Wrong target

Status Code Facts	
Number	22
Name	Wrong target
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, press feed button shows solid yellow

This code is reported during a firmware load attempt if the firmware file is not intended for the printer version it is sent to.
It is cleared by a successful application load operation.

5.3.7 23 – Tag system not found

Status Code Facts	
Number	23
Name	Tag system not found
Type	Normal
Group	Informational
LED Reporting	Rapid yellow, press feed button shows solid yellow

This code is reported at during a firmware load attempt if either the file did not contain a tag structure in its first two kilobytes, or the bootware could not locate the hardware tags in the printer.

It is cleared by a successful application load operation.

6 Status Protocols

6.1 Status Protocol Overview

The KR203 provides two options for status reporting format, either the XML format or the legacy TTP format.

Not all protocols implement all status responses. Refer to the following table to see the features of the protocols:

Protocol	"Status Protocol" Setting	Active designation	Send status	Send ack marker	Send information	Send Tags	Send Sensor	Send Parameter	Send all parameters
XML	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TTP	0	No	Lim	Yes	Lim	Lim	Lim	Lim	Yes

"Lim" in the above table means that only limited information is available in this protocol.

Active Designation

If a protocol supports this feature, the host will be able to designate the difference between an actively reported "Send status" command, and one that was issued by the host. The only active reporting that occurs in the KR203 is in the form of a "Send status" command.

6.2 XML Protocol

The XML protocol is the default reporting protocol of the KR203 printer, it is fully featured and returns the maximum amount of information. The protocol returns complete XML documents to the host for processing.

Protocol Streaming

When this protocol transmits data to the host, the printer does not form the entire buffer in memory before transmitting it, rather it streams it to the host. For this reason it is very important that once the host starts reading data that it continues. Once a read has started, each streamed data packet has a "time to live". If the packet is not retrieved within that time, the packet dies.

Protocol Wrapping

In the XML protocol, if more than one status request (including an active status message) are received close together (within 70ms), they are concatenated into a single XML document. This can include messages of different types. The host will receive a different block for each enquiry it must answer.

Information Level

In the XML protocol, the XML information level determines how much information is provided with each response; the higher the number the more information is provided. The information level can be set to 10 (minimum), 20 (medium), or 30 (maximum).

6.2.1 Header

All communication from this protocol starts with the following XML header, stating the XML version and character coding.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
```

The header does not have an end element.

6.2.2 Root Element

The root element is reported in all XML documents and is as follows. It is marked as bold in XML below.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
          ...
</zebra-eltron-personality>
```

6.2.2.1 Model Element

This element is included in all communication and states the model of the printer sending the XML data. It also includes one XML attribute named “module”. This specifies which piece of printer software is sending the message. It is included with all responses at all information levels.

"Application"	The message is from the application.
"Boot"	The message is from the bootware.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
</zebra-eltron-personality>
```

6.2.2.2 Uptime element

This element is included in all communication and tells the user how long the printer has been powered up in this session. It is measured in the in printer clock ticks. The “Tick” field under the “Send information” response tells you how many microseconds (µS) each tick represents.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
</zebra-eltron-personality>
```

6.2.2.3 ID element

This element is included in all communication and tells the user a unique number assigned to each controller PCB. This is useful when processing messages from many printers.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
</zebra-eltron-personality>
```

6.2.2.4 Serial Number Element

This element is included in all communication and tells the user a unique number assigned to each printer frame. This is the same information that is printed on the serial number label of the unit.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
</zebra-eltron-personality>
```

6.2.3 Send status block

One or more status codes can be transmitted in a single status block. The element is laid out as follows.

Besides status codes, ack markers are also transmitted in the status block.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <status>
     <code value=”3” group=”1” />
     <code value=”4” group=”1” />
  </status>
</zebra-eltron-personality>
```

Type attribute

If the status block originates from active status reporting (not from an enquiry) it will have the type attribute present, otherwise it will not.

```
...
  <status type="active">
     ...
  </status>
...
```

Additionally, the type may be designated as “keepalive”. This is status reported by the automatic status reporting feature “Keepalive timeout”.

```
...
  <status type="keepalive">
     ...
  </status>
...
```

The status block has the elements presented on the following table:

<code	Present in all levels
<timestamp	Present in information level 20 and higher
<name	Present in information level 20 and higher

6.2.3.1 Code element

The code element can be an empty element or a node element, depending on the information level requested. The following example shows an information level 10 response, showing status codes 3 and 4, as well as their group numbers. See “Status codes” for more information on code numbers and groups.

```
<code value=”3” group=”1” />
<code value=”4” group=”1” />
```

6.2.3.1.1 Value

This field shows the status code number.

6.2.3.1.2 Group

This field shows the status’s group number.

6.2.3.2 Code child elements

When the information level is greater than 10, several child elements are also presented for each code element.

6.2.3.2.1 Name

This represents the name of the status code being reported in English.

6.2.3.2.2 Timestamp

This represents the timestamp that the status code was set. It is relative to the “uptime” element in the root of the XML document.

Both of these elements are shown below:

```
...
  <status>
    <code id="3" group="1">
      <timestamp>9120</timestamp>
      <name>Out of paper</name>
    </code>
  </status>
...
```

6.2.4 Send ack marker

One or more ack markers can be transmitted in a status block. The element is laid out as follows.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <status>
     <ack_marker value = "1" />
  </status>
</zebra-eltron-personality>
```

If an ack marker is removed from the buffer without all the commands preceding it having executed, a negative ack marker can be received. This indicates that at least one command before the ack marker was not executed and disposed of.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <status>
     <nak_marker value = "1" />
  </status>
</zebra-eltron-personality>
```

Only one additional element is added at information levels greater than 10, timestamp.

6.2.4.1 Timestamp

This represents the timestamp that the ack marker was executed. It is relative to the “uptime” element in the root of the XML document.

```
<?xml version=”1.0” encoding=“UTF-8” standalone=”yes” ?>
<zebra-eltron-personality>
  <model module=”Application”>KR203</model>
  <uptime>412090</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <status>
     <ack_marker value = "1">
     <timestamp>17820</timestamp>
     </ack_marker>
  </status>
</zebra-eltron-personality>
```

6.2.5 Send information

Send information returns information about the application and bootware installed in the printer. The identity block always contains the same information regardless of information level.

```
...
  <identity>
    <device_id>MFG:Zebra Technologies ;MDL:ZTC
KR203;CMD:KPL;CLS:PRINTER;DES:KR203 Kiosk Printer;</device_id>
    <version module="Application">
      <version_number>K69.1.1</version_number>
      <protover>1</protover>
      <major>1</major>
      <minor>0</minor>
      <service_pack />
      <svnrevision>1858</svnrevision>
      <sandbox />
      <configuration>Application_Based_On_Tag</configuration>
      <compile_date>May 18 2010</compile_date>
      <compile_time>15:09:49</compile_time>
      <compiler_version>5040002</compiler_version>
    </version>
    <version module="Boot">
      <version_number>V49a</version_number>
      <svnrevision>1855</svnrevision>
      <sandbox />
      <configuration>Boot</configuration>
      <compile_date>May 18 2010</compile_date>
      <compile_time>14:58:13</compile_time>
      <compiler_version>5040002</compiler_version>
    </version>
    <tick>250</tick>
  </identity>
...
```

6.2.5.1 Device ID element

The device ID contains the complete plug and play string for the printer.

6.2.5.2 Version element

The version element is an element which has child elements that contain version information. It also includes one XML attribute named “module”. This specifies which piece of software (bootware or application) this particular version element is reporting on. It is included with all responses at all information levels.

"Application"	The version information is for the application.
"Boot"	The version information is for the bootware.

If this element is empty as shown below, it indicates that the indicated software item is not installed.

```
<version module="Boot" />
```

6.2.5.3 Version child elements

All version child elements are returned at all information levels, if they are returned at all.

6.2.5.3.1 Version Number

The version number tag contains the complete version string of the specified file type.

```
<version_number>K69.1.1</version_number>
```

6.2.5.3.2 Service Pack

If this is a service pack release, this contains the service pack letter. If this release is not a service pack, the element is empty. It does not appear in the bootware.

```
<service_pack />
```

Populated example:

```
<service_pack>A</service_pack>
```

6.2.5.3.3 Sandbox

This will appear as an empty element if the firmware was built with changes from the committed SVN revision. It does not appear if the file is identical to the SVN version.

```
<sandbox />
```

6.2.5.3.4 Configuration

This element tells what configuration the build system was in when the file was built. This information is present for both bootware and applications. The valid options are as follows:

Application_Based_On_Tag	This is normal release build.
Boot	This is a normal release bootware.

```
<configuration>Application_Based_On_Tag</configuration>
```

6.2.5.3.5 Compiler Information

There are three elements that provide information about the compile date, compile time and the version of the compiler.

```
<compile_date>May 18 2010</compile_date>
<compile_time>15:09:49</compile_time>
<compiler_version>5040002</compiler_version>
```

6.2.5.4 Tick Element

This element provides information about how many microseconds (µS) have elapsed for each tick in an uptime value or timestamp value.

```
<tick>250</tick>
```

6.2.5.5 Additional Information Reported

At information level 20 and higher, a complete report of all the parameter settings is provided for all trays, and also a status report.

At information level 30, stack debugging information is included.

6.2.6 Send sensor

One or more sensors can be transmitted in a sensor block. The element is laid out as follows.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<zebra-eltron-personality>
  <model module="Application">KR203</model>
  <uptime>10818</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <sensors>
    <sensor id="1" value="0" />
    <sensor id="9" value="26" />
  </sensors>
</zebra-eltron-personality>
```

The sensor block has the elements presented on the following table:

<sensor	Present in all levels
<raw	Present in information level 20 and higher
<range	Present in information level 20 and higher
<thresh_min	Present in information level 20 and higher
<thresh_max	Present in information level 20 and higher
<name	Present in information level 20 and higher

6.2.6.1 Sensor element

The sensor element can be an empty element or a node element, depending on the information level requested. The above example shows an information level 10 response, showing sensors one and nine. See the “Send sensor” command for more information on sensors.

6.2.6.1.1 ID

This field contains the ID number of the sensor being reported on.

6.2.6.1.2 Value

This contains the value of the sensor specified by the ID.

6.2.6.2 Sensor child elements

The following sensor child elements are available on all information levels over 10.

6.2.6.2.1 Raw Value

This element reports on the raw, unprocessed value of the sensor. This is an immediate reading. The raw element has one attribute, bits, which contains the size, in bits, of the raw value.

```
<raw bits="8">227</raw>
```

6.2.6.2.2 Range

This element expressed the range of the value element. It can contain both positive and negative numbers. Individual values are separated by a comma, and ranges are signified with two periods (..).

```
<range>0,1</range>
```

6.2.6.2.3 Range

This element expressed the range of the value element. It can contain both positive and negative numbers. Individual values are separated by a comma, and ranges are signified with two periods (..).

```
<range>0,1</range>
```

6.2.6.2.4 Thresholds

For sensors that use thresholds (all A/D sensors), this reports on the high and low thresholds for the specified sensor. In order to signal a change, the sensor must detect that it has pushed beyond the threshold in the given direction that it is detecting.

```
<thresh_min>168</thresh_min>
<thresh_max>148</thresh_max>
```

For example, when these values, the raw value must move above 168 to trigger positive, or below 148 to trigger negative. Values in the middle will not cause a state change.

6.2.6.2.5 Name

This represents the name of the sensor being reported on in English.

The following is an information level 30 example showing all elements.

```
    <sensor id="1" value="0">
      <raw bits="8">227</raw>
      <range>0,1</range>
      <thresh_min>168</thresh_min>
      <thresh_max>148</thresh_max>
      <name>End of paper selected</name>
    </sensor>
```

6.2.7 Send parameter

One or more parameters can be transmitted in a parameter block. The element is laid out as follows.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
<zebra-eltron-personality>
  <model module="Application">KR203</model>
  <uptime>10818</uptime>
  <id> 432578253033553005D4FF32</id>
  <serial_number>96J101200003</serial_number>
  <parameters tray="0">
    <parameter id="254" current="105988" />
    <parameter id="48" current="0" />
  </parameters>
</zebra-eltron-personality>
```

The parameter block has the elements presented on the following table:

<parameter	Present in all levels
<default	Present in information level 20 and higher
<stored	Present in information level 20 and higher
<name	Present in information level 20 and higher
<size	Present in information level 20 and higher
<range	Present in information level 20 and higher
<attribute	Present in information level 20 and higher

6.2.7.1 Parameter element

The parameter element can be an empty element or a node element, depending on the information level requested. The above example shows an information level 10 response, showing parameters 48 and 254. See the “Parameters” section for more information on parameters.

6.2.7.1.1 ID

This field contains the ID number of the parameter being reported on.

6.2.7.1.2 Current

This field contains the current value of the parameter being reported on.

6.2.7.2 Parameter child elements

The following parameter child elements are available on all information levels over 10.

6.2.7.2.1 Default

This element contains the default value of the selected parameter. This is the same as reading the parameter from tray 255.

```
<default>0</default>
```

6.2.7.2.2 Stored

This element contains the stored value of the selected parameter. This is the same as reading the parameter from tray 1.

```
<stored>105836</stored>
```

6.2.7.2.3 Name

This represents the name of the parameter being reported on in English.

```
<name>Uptime (s)</name>
```

6.2.7.2.4 Size

This represents the size of the parameter in bytes. This is important to know because this is how much data must be specified when setting the parameter.

```
<size>4</size>
```

6.2.7.2.5 Range

This element expressed the range of acceptable values for the parameter. It can contain both positive and negative numbers. Individual values are separated by a comma, and ranges are signified with two periods (..). If all values are valid, the range element is empty.

```
<range />
```

Non-empty example:

```
<range>0,20..80</range>
```

6.2.7.2.6 Attributes

This element has two child elements that provide information about the read and write state of the parameter.

```
<attributes>
  <read_only>false</read_only>
  <write_protected>false</write_protected>
</attributes>
```

6.2.7.2.6.1 Read Only

This attribute contains “true” if the parameter is a read only parameter that cannot be set, otherwise it contains “false”.

6.2.7.2.6.2 Write Protected

This attribute contains “true” if the parameter cannot currently be written to, otherwise it contains “false”.

The following is a complete example of two parameters at information level 30.

```
  <parameters tray="0">
    <parameter id="254" current="107198">
      <default>0</default>
      <stored>105836</stored>
      <name>Uptime (s)</name>
      <size>4</size>
      <range />
      <attributes>
        <read_only>true</read_only>
        <write_protected>true</write_protected>
      </attributes>
    </parameter>
    <parameter id="48" current="0">
      <default>0</default>
      <stored>0</stored>
      <name>Print width</name>
      <size>1</size>
      <range>0,20..80</range>
      <attributes>
        <read_only>false</read_only>
        <write_protected>false</write_protected>
      </attributes>
    </parameter>
  </parameters>
```

6.2.8 Send all parameters

Send all parameters simply returns many single parameter entries. No additional information is provided.

6.3 TTP Protocol

The TTP protocol is designed to be easier to handle than the XML protocol, but provides substantially less information. It is primarily intended for backwards compatibility and for systems that cannot process XML.

6.3.1 Send status

In this mode, the printer will return a binary <06> if there are no statuses to report, or a <21> followed by a status code (which is the same as the status number). This <21><code> pattern is repeated for each status.

6.3.2 Send ack marker

In this mode, the printer will return a single byte indicating the ack number that was requested.

6.3.3 Send information

In this mode, the printer will return two bytes indicating the length to follow and the USB plug and play string. For the KR203 this is:

```
MFG:Zebra Technologies ;MDL:ZTC KR203;CMD:KPL;CLS:PRINTER;DES:KR203
Kiosk Printer;
```

6.3.4 Send tags

In this protocol, the firmware returns one byte indicating the length of the data to follow and then the product's serial number as stored in the tag system.

6.3.5 Send sensor

In this protocol, the parameter n is ignored, and the firmware returns two bytes. The first byte is always a null. The second byte will have bits 0 and 1 set if media is detected at the selected EOP sensor. The second byte will have bits 2, 3, 4 if there is media at the presenter. These responses mimic the virtual status command of the TTP 2000.

6.3.6 Send parameter

In this protocol, the printer will simply return one to four binary bytes specifying the value of the requested parameter from MSB to LSB. The number of bytes received depends on the parameter requested.

6.3.7 Send all parameters

This command returns all the available parameters in the following format:

One byte indicating the total number of parameter record entries to follow.

For each record:

- One byte indicating the parameter number
- One byte indicating the size of the value in bytes.
- The specified number of bytes which contains the current value of the specified parameter.

7 Tutorials

7.1 Text on KR203

7.1.1 Introduction

This mini tutorial describes how to print text on a graphics printer like the Zebra KR203 on embedded systems not using a printer driver supplied by Zebra.

The description is general and does not give examples in any specific programming language nor how to send data to the USB port.

7.1.2 Document Format

Data is represented in standard Zebra Toolbox format, which interprets data within < and > symbols as binary data. Standard ASCII names such as <ESC> and <ENQ> are converted to their equivalent binary values by Toolbox, additionally numbers such as <5> are sent directly as binary data to the printer.

To type in binary data , add a leading B <B 10000001>.
To type in hex data , add a leading H <H 41>.
Anything not appearing in brackets, such as the & in <ESC>&<4> is sent directly as ASCII text to the printer. See Toolbox help for more information. Toolbox version 1.70 and higher must be used with the KR203 printer

7.1.3 Overview

This section describes how to print the text string: "**Text Arial 12B**"

The KR203 is host based and does not contain any fonts. Therefore it cannot receive text to be printed and convert it to pixels inside the printer.

The application program must convert the text to a bitmap and add the commands for the receipt to be generated.
The printer uses a very simple system; 0 means a white pixel and 1 means a black pixel. With 203 dpi we have 8 pixels per mm so one byte with FF will print a 1 mm wide and 1/8 mm high line.
11111111 = -----
11110000 = –

The print starts from the left edge of the print area, at the top of the paper. All print is in portrait mode. For landscape, the text must be rotated before converting it to a bitmap in the application.

7.1.4 Print graphics line

The command to print a pixel line is:

<ESC>s<n1><n2>..<nX>

n1 = Data Size in bytes

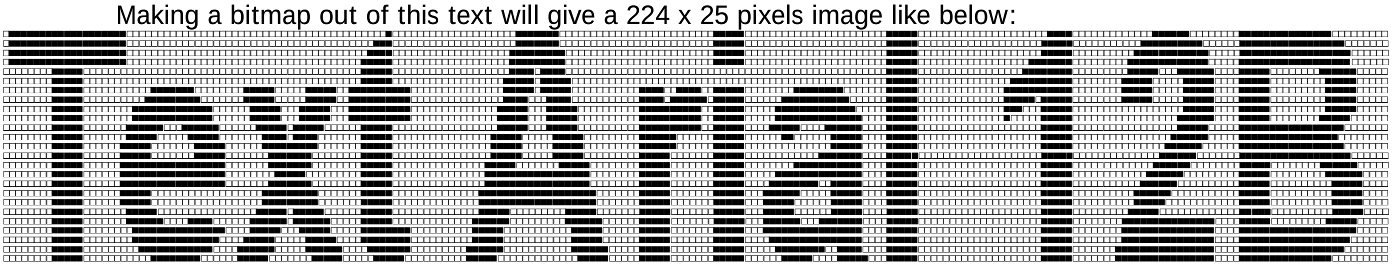
n2...nX = Data

n1 can be between 1 and 80. Any line for which less data than the current print width is specified, the remainder of the line will be filled with blank pixels.

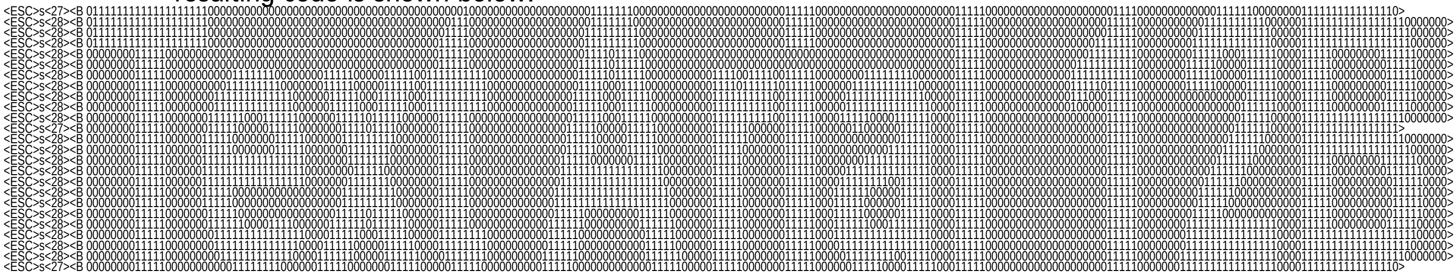
Our example **Text Arial 12B**

Only takes up 27.5 mm so there is no need sending 80 bytes, 28 will do. Cropping the lines from white data in the right edge of the paper saves transfer time and memory.

Making a bitmap out of this text will give a 224 x 25 pixels image like below:



Use 1 for black and 0 for white, add the ESC s command and line length to each line. The resulting code is shown below.



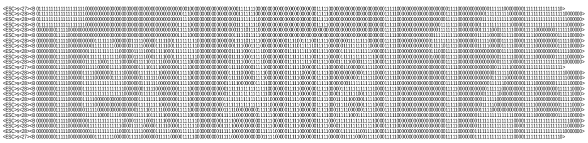
<RS><255>

Note that three of the lines are one byte shorter because they each had 8 trailing zeroes which are unnecessary to send.

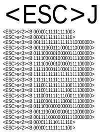
The graphics block ends with <RS><255> which cuts and ejects the receipt when printed.

One can copy the above code and paste it into Toolbox for an example print out.

To print more lines of text on the receipt, add line spacing by jumping ahead one mm, then send the next text line. The Feed forward command is ESC J n. Add <ESC>J<8> to get 1 mm feed:



<ESC>J<8>



<RS><255>

Only three commands are required to print text. Graphics and bar codes are done exactly the same way; convert to bitmap and send with ESC s.

7.2 Status from KR203

7.2.1 Introduction

This section describes how to add status readouts when you print on the graphics printer Zebra KR203 from embedded systems not using a printer driver supplied by Zebra. Please read section 7.1 before continuing with this section.

The description is general and does not give examples in any specific programming language nor how to send data to the USB port.

7.2.2 Document Format

Data is represented in standard Zebra Toolbox format, which interprets data within < and > symbols as binary data. Standard ASCII names such as <ESC> and <ENQ> are converted to their equivalent binary values by Toolbox, additionally numbers such as <5> are sent directly as binary data to the printer.

To type in binary data , add a leading B <B 10000001>.
To type in hex data , add a leading H <H 41>.
Anything not appearing in brackets, such as the & in <ESC>&<4> is sent directly as ASCII text to the printer. See Toolbox help for more information. Toolbox version 1.70 and higher must be used with the KR203 printer.

7.2.3 Overview

This section builds on 7.1 and adds status commands . Simple status messages will be created to illustrate polling.

Typical status requests:
Printer is ready before data is sent
Printout was successful after completion of commands
Customer has taken the receipt

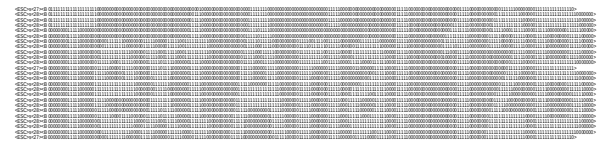
The application might want to know if paper low is signaled. Or, if printing valuable vouchers, that the part containing the bar code used for claiming the value is printed before continuing with the rest of the printout.

7.2.4 Set up the printer

The command to set the printer to Poll Mode is:
<ESC>&p<65><0>
The command to set the printer to TTP Status Protocol:
<ESC>&p<66><0>

By default, the printer is in Verbal Mode, which will send status automatically when something happens, and the replies will be sent as XML with a header allowing the reply will be identifiable. Describing that protocol is not in the scope of this section.

The examples in this section use the above command string to specify the printer responses.
<ESC>&p<65><0><ESC>&p<66><0>



<ESC>J<8>

<RS><255>

7.2.5 Send status – <ESC><ENQ><1>

TTP mode query table

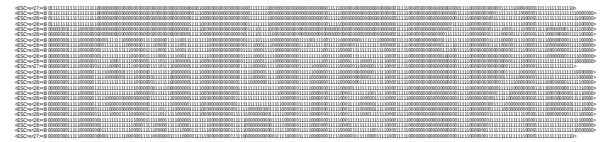
Reply	Name	Type	Group
<ACK>	Ok	Normal	Informational
<NAK><1>	Paper jam in presenter	Normal	Severe
<NAK><2>	Cutter Jam	Normal	Severe
<NAK><4>	Printhead lifted	Normal	Severe
<NAK><3>	Out of paper	Normal	Severe
<NAK><5>	Paper feed error	Normal	Severe
<NAK><6>	Head temperature error	Normal	Severe auto-clear
<NAK><10>	Black mark not found	One-time	Informational
<NAK><11>	Black mark calibration error	One-time	Informational
<NAK><12>	Index error	One-time	Informational
<NAK><16>	Timeout Occurred	One-time	Informational
<NAK><18>	Out of range	One-time	Informational
<NAK><19>	Paper low	Normal	Warning
<NAK><20>	Media in presenter	Normal	Informational
<NAK><24>	Invalid operation	One-time	Informational
<NAK><26>	Target is read only	One-time	Informational
<NAK><40>	Printer entered USB bus	One-time	Informational
<NAK><41>	System calibration error	One-time	Informational
<NAK><42>	System calibration success	One-time	Informational

If more than one error is present when the query is sent, more than one reply will be received.

7.2.5.1 Programming Example, Status

The below example asks for status before and after the printout.

```
<ESC>&P<65><0><ESC>&P<66><0>
<ESC><ENQ><1>
<* The application should wait for the reply and if <ACK>, continue with
the print data or if <NAK><N> take appropriate actions>
```



```
<ESC>J<8>
```

```
<RS><255>
<* The application should wait until the printout is ready>

<ESC><ENQ><1>
<* The application should wait for the reply and if <NAK><20> everything is
OK (Paper in presenter)>
```

If everything is OK, the reply will be <ACK><NAK><20> (ACK showing that the printer is OK before the printout and NAK 20 because the printed receipt is in the presenter).

If the reply starts with <NAK><20>, the previous customer left the receipt. Send an <ENQ> to eject the media.

7.2.6 Send ACK marker – <ESC><ACK><N1>

This command is used for synchronization and instructs the printer to return an ack marker to the host when all the commands in the command queue have been executed up to the point

at which the command was received. Executed means physically printed in the case of motor or feed commands, not just received by the printer.

N1 specifies the marker number to return. To avoid misinterpretation of the reply it is good practice to select a value that does not correspond to any of the values returned by the Send Status query explained above.

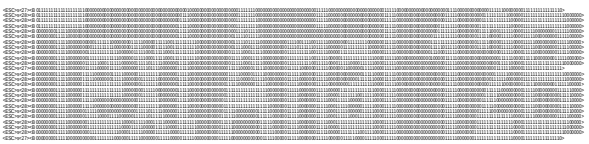
7.2.6.1 Programming Example, Status and Sync

This example adds an ACK marker with the value 240 (0xF0) after the print command so we know when printing and presenting is ready so we can ask for status the second time.

Note: The example also includes grayed-out Toolbox code to wait for the status replies and display messages based on them, and stops on error. Copy and Paste into Toolbox to try the functions.

```
<ESC>&P<65><0><ESC>&P<66><0>
<ESC><ENQ><1>

<DECLARE @A>
<LOOP 20>
<SET @A (POLL 250)>
<IF (LEN @A)><IF (ISNOTEQUAL @A (ACK))><MSGBOX "NOT ready to
print"><STOP><ELSE><EXITLOOP><ENDIF><ENDIF>
<ENDLOOP>
```



```
<ESC>J<8>
```

```
<RS><255>
<ESC><ACK><240>

<DECLARE @B>
<LOOP 20>
<SET @B (POLL 250)>
<IF (LEN @B)><IF (ISNOTEQUAL @B (240))><MSGBOX "Wrong data
received."><STOP><ELSE><EXITLOOP><ENDIF><ENDIF>
<ENDLOOP

<ESC><ENQ><1>

<DECLARE @C>
<LOOP 20>
<SET @C (POLL 250)>
<IF (LEN @C)><IF (ISNOTEQUAL @C (SADD (NAK) 20))><MSGBOX "PRINTING
FAILED!"><STOP><ELSE><MSGBOX "Printed OK!"><EXITLOOP><ENDIF><ENDIF>
<ENDLOOP>
```

7.2.7 Monitoring when customer takes receipt

The easiest way to know when a receipt is taken is to temporarily switch back to verbal status mode by adding <ESC>&P<65><3> after the last line in the previous example. In verbal mode the printer will automatically send <ACK> when the customer removes the printout, without the application having to poll for status indefinitely. When the <ACK> has been received, switch back to poll mode again with <ESC>&P<65><0>.

Another option is to leave the printer in poll mode and poll repeatedly for a status change. A polling interval of 250 ms is recommended for this printer.

7.2.8 Printing valuable vouchers

On some receipts, it is important to know if an element of value has been imaged. For example, a redemption voucher has printed the barcode for the customer to redeem the coupon.

Place the sensitive element in the first 75 mm of the printout, and as close to the 75 mm line as possible.

Stop after printing 75 mm and request status. The leading edge of the printout has reached the presenter sensor and the printer should return <NAK><20> as reply indicating that the sensor detects the paper and the printout is of the correct length. This implies the barcode was imaged and the remaining receipt image can be printed.

A different reply should signify an error has occurred during the imaging of the voucher. It is recommended to issue an alert and shut down the kiosk until the error can be cleared.

7.2.8.1 Programming overview, Voucher print

It is best to monitor the printer during feed commands of white space. Issue an <ESC>J <n> command to feed forward.

One more command, <ESC>p which triggers printout

Graphics to print “Bonus Voucher”
<ESC>p
<ESC><ACK><240>
Wait for the return of the ack marker
<ESC><ENQ><1>
<ESC>J<n>

Graphics to print “With the value of”
<ESC>p
<ESC><ACK><240>
Wait for the return of the ack marker
<ESC><ENQ><1>
<ESC>J<n>

Graphics to print “€50”
<ESC>p
<ESC><ACK><240>
Wait for the return of the ack marker
<ESC><ENQ><1>
<ESC>J<n>

And so on until the receipt is completed.

There is no cut and paste code for this printout as it would be too long for this document but the concept can be applied in the application programming.

7.2.9 Summary of commands used:

Cut and present media	<RS><N1>
Eject media	<ENQ>
Force print	<ESC>p
Print graphics line	<ESC>s<N1><N2>..<nX>
Send ack marker	<ESC><ACK><N1>
Send status	<ESC><ENQ><1>
Feed forward	<ESC>J<N1>
Set parameter	<ESC>&p<N1><N2>..<NX>