



Printer Paper Roll Specification

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Revision History

The following table describes the modifications to the most recent version of this document. The modifications to the previous versions can be seen in the respective document stored in the archived repository. The author is to describe the modifications as clearly as possible.

Version	Date	Modifications	Changed by:	Engineering Approval
1.0	2008.02.13	First draft version for review.	Bill Behm	
1.1	2008.02.23	Added list of approved paper stocks Added verbiage on paper testing requirements	Bill Behm	
2.0	2008.02.25	Updated Drawing in Section Added the PMS color of color stripe in section 5.1	Carla Merrell	
2.1	2009.08.26	Changed Paper Roll Max to 177.8 mm (7.0")	Tom Herrick	
3.0	2009.11.23	Updated Section 5 (black ink instead of blue ink) and added Section 13.3 Thermal Paper Responses.	Carla Merrell	
4.0	2009.11.30	Updated end of roll drawing (RF20-0013) in Section 5.2	Carla Merrell	
5.0	2010.01.01	Updated drawing RF20-0012	Carla Merrell	
6.0	2010.08.05	Add a table in Section 2.2 that presents the plain paper from Mitsubishi that have been certified by Axiohm	Carla Merrell	
7.0	2010.12.15	Update drawing RF20-0012 Rev D	Carla Merrell	
8.0	2011.01.19	Updated Section 5.1 based on an ECO101028 on RF20-0013	Carla Merrell	
9.0	2011.07.12	Corrected errors in Section 4.1. Added inside core dimension in section 4.2.		Tom H.

Version	Date	Modifications	Changed by:	Engineering Approval
10.0	2011.07.13	Updated table of contents. Insert updated table in section 2.2 and revised list in section 10 and 11. Corrected some minor text errors.	Christian Kessner	Tom H
10.1	2011.08.31	Update list of certified converters	Christian Kessner	Tom H.
10.2	2011.09.22	Changed minimum core OD section 4.2. Added Eng approval column.	Tom H	Tom H.
10.3	2012.04.23	Section 2.2 – Changed wording to include Cognitive and Fujitsu. Section 5.2 Added drawing for PAT Paper Low. Corrected Table of Contents.	Tom H	Tom H.
10.4	2012.04.24	Corrected Title page revision & date. Section 6 added Resiste 600-3.1 V2	Tom H	Tom H
11.0	2012.07.30	Updated drawings, generalized for Wave / Flair / PAT, revised and reorganized	Evan L	
12.0	2012.09.25	Edited approved paper list	Tom H	Tom H
13.0	2012.09.25	Additional edits to paper list	Tom H	Tom H
14.0	2012.10.29	Additional edits for Ireland	Evan L	

1. PRINTER OVERVIEW

The WAVE, FLAIR and PAT Printers are modular thermal devices sharing the following characteristics:

- High speed printing
- Accommodates paper roll size up to 7 inches
- A paper low sensor that senses a stripe printed on the back of the roll



WAVE Printer



FLAIR Printer



PAT Printer



2. PAPER STOCK

2.1. Dimensions and Weight

Thickness: 60 to 85µm (microns)
0.0024 to 0.0033 inches

Weight: 60-90 g/m²

Note that the use of thicker and/or more dense (heavier) paper stock may result in light print and a reduced life expectancy for the cutter.

2.2. List of Approved Paper Stocks

The following paper stocks are approved for use in the WAVE printer mechanism:

Appleton	Résiste™ 600-3.1
Kanzaki	Lotto 850
Mitsubishi	TP 8065

SG has certified the following plain paper for the E5, E6 and MX printer

Appleton	Résiste™ 600-3.1
Kanzaki	Lotto 462

The use of any other paper stock must be approved by the printer manufacturer (Axiom, Cognitive and Fujitsu - this will depend on product) and Scientific Games in order to maintain the warranty on the print mechanism and print head. This testing (Section 6) is a thorough process and is at the expense of the customer or their paper stock supplier. The following printers are currently in use:

WAVE	PR60-0008-01	(Axiom 80-82.5 / XBFVS020)
	PR60-0011	(Cognitive A799-K548)
FLAIR	PR60-0010	(Fujitsu FTP-63AMCL-411-R)
PAT	PR60-0006	(Fujitsu FTP-639MCL540)



3. PRINTING INKS

The print head in a thermal printer reaches temperatures in the vicinity of 100°C. Any printing inks used to enhance the appearance of the roll stock, whether printed on the front or back of the ticket stock must have resin melt points well above 100°C and must be abrasion resistant with excellent graphic adhesion.

Any printing ink accumulation on the print head will result in overheating of the print head resulting in reduced print head life.

Use of converted paper rolls containing display printing added to the thermal paper stock must be approved by the printer manufacturer and Scientific Games in order to maintain the warranty on the print mechanism and print head. This testing (Section 6) is a comprehensive process and is at the expense of the customer or their paper converter.

4. PAPER DIMENSIONS, TOLERANCES AND CORE ATTACHMENT

The dimensions and tolerances associated with the paper roll are:

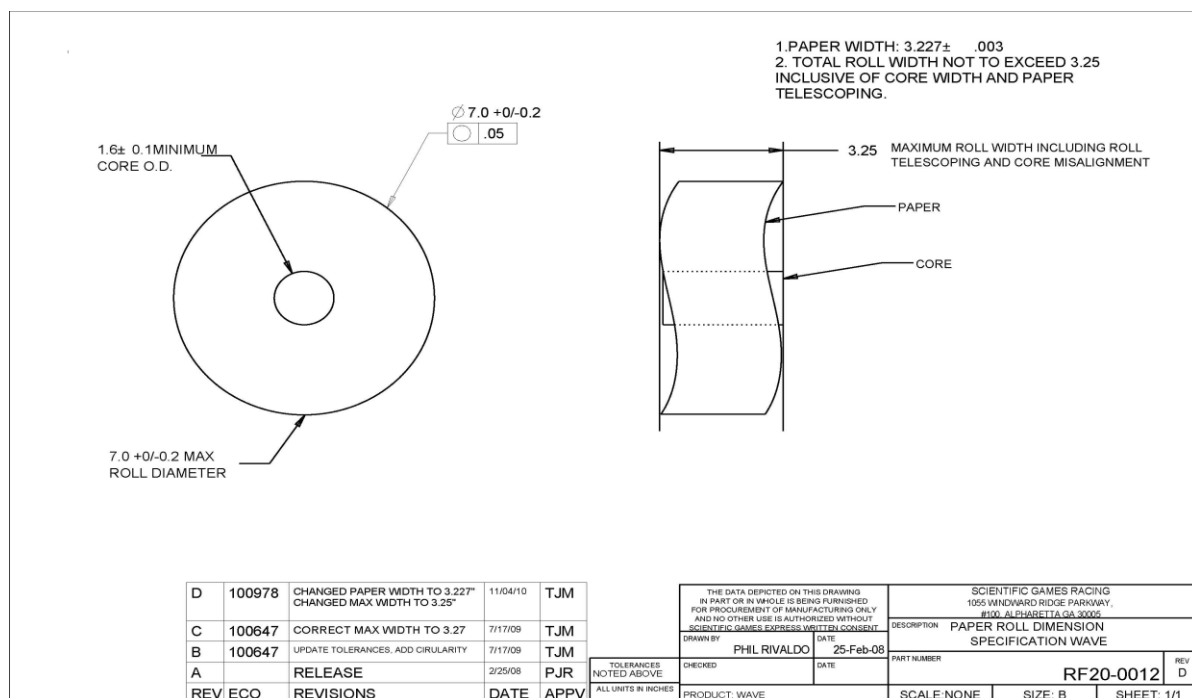
4.1. Widths

Paper stock width	81.96mm +/- 0.076 mm 3.227in +/- 0.003in
Maximum roll core width	82.042 mm 3.230 in
Maximum width of the wound roll including the paper, roll core any telescoping of wound paper	82.55 mm 3.250 in

4.2. Diameters

Nominal paper roll diameter	177.8 mm 7.00 in
Maximum paper roll diameter	177.8 mm 7.00 in
Minimum core outside diameter	39.75 mm 1.565 in
Minimum core Inside diameter	33.32 mm 1.312 in
Maxium core inside diameter	41.275 mm 1.625 in

The figure below illustrates the above dimensions:





4.3. Paper Attachment to the Core

Paper may not be glued or taped to the roll core.

5. PAPER LOW STRIPE

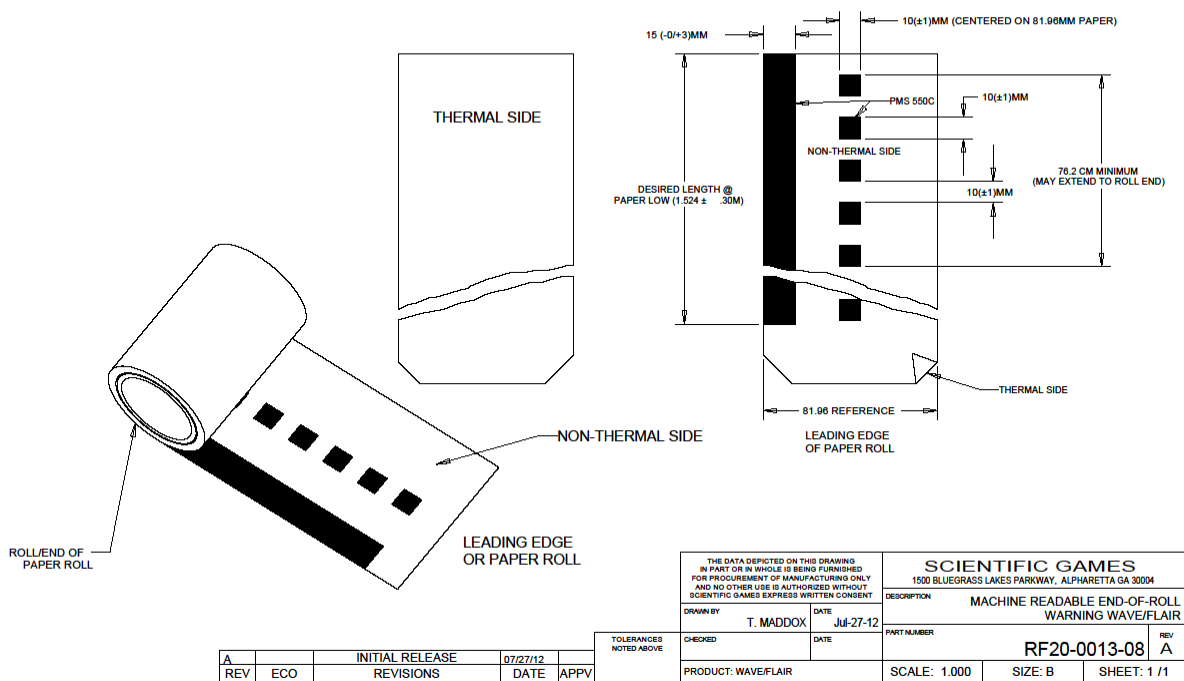
The printer includes an optical sensor that can detect a stripe printed on the back of the ticket for the purpose of signaling to the host application that the end of the paper roll is approaching. Typically such a mark is printed during the paper to roll conversion process and is about 1 meter in length.

5.1. Color of Stripe

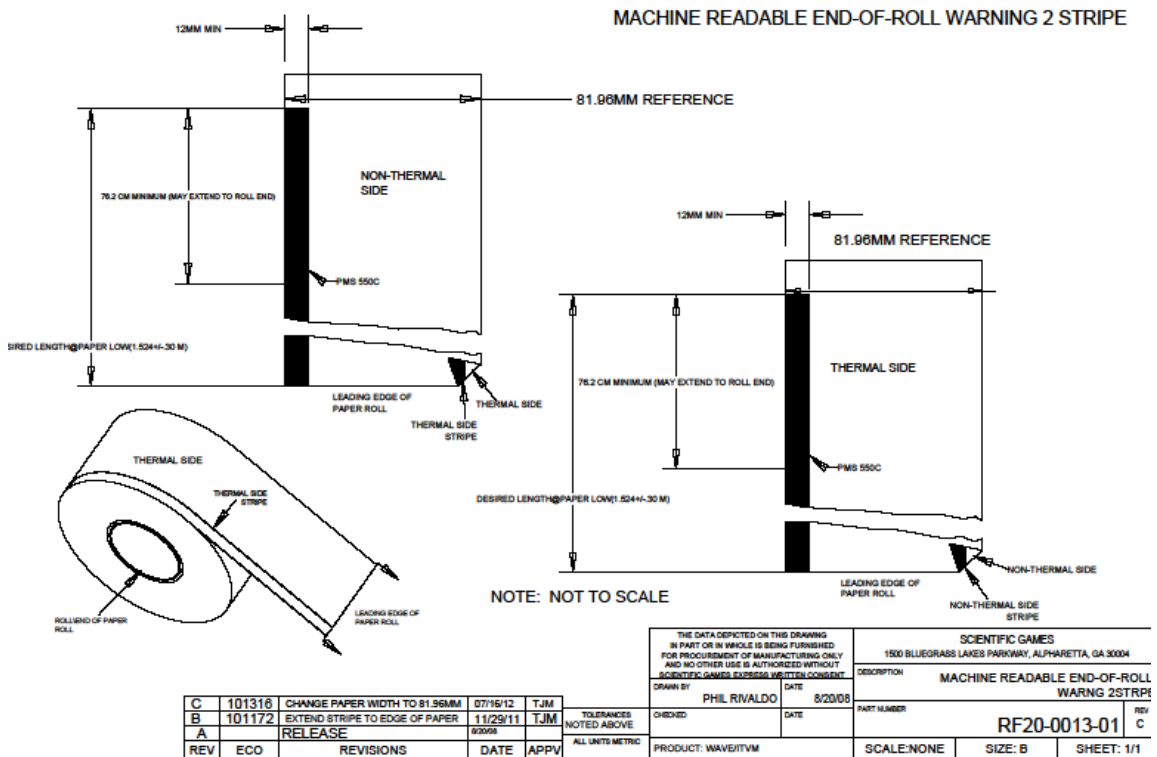
The stripe shall be printed in black ink with a 900NM wave length and a maximum reflectance of 7%.

5.2. Location of Stripe

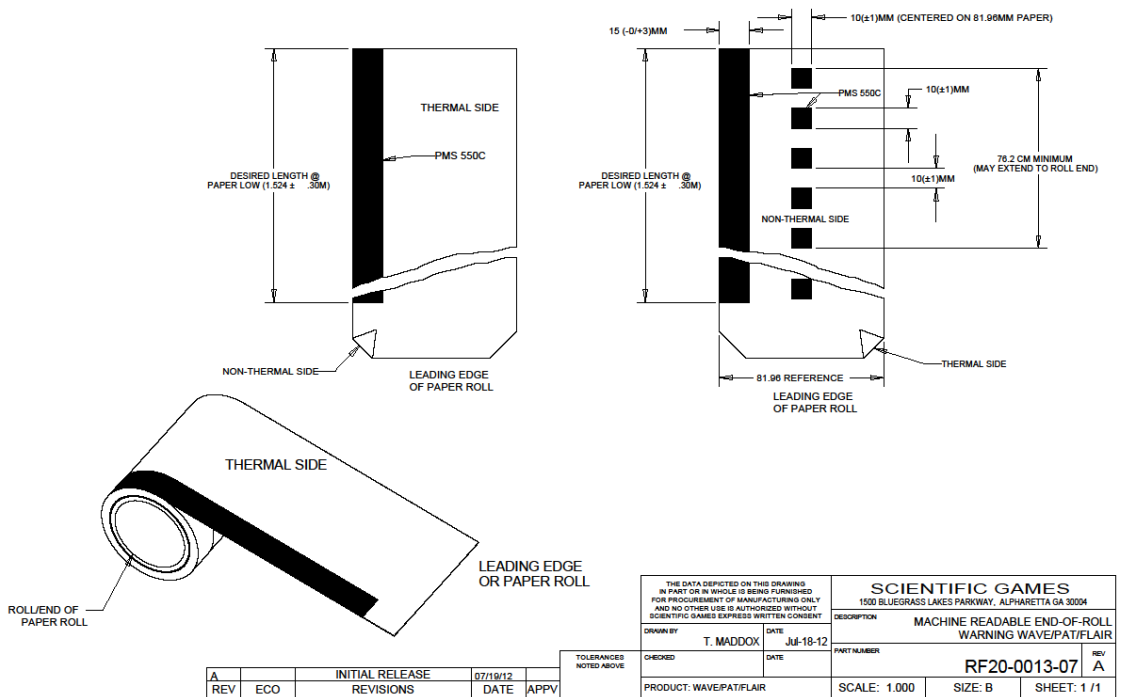
The WAVE terminal requires a stripe positioned at the left on the non-thermal side of the ticket stock while the FLAIR terminal requires an interrupted stripe in the middle:



The PAT terminal requires a stripe positioned at the left on the thermal side of the ticket stock as shown in the figure below:



WAVE / PAT / FLAIR paper combines all three styles:





6. Paper Certification Process

In order to minimize the risk for damages and high maintenance costs for the thermal printers used in our terminal system Scientific Games has introduced a certification procedure for the thermal paper used in the printers.

The certification gives our customers a guide to suppliers capable of producing paper with acceptable quality which can be used without causing technical problems and high maintenance cost.

Costs for damages caused by unsuitable paper quality are not covered by Scientific Games warranty or maintenance agreements therefore it is recommended that our customers use only approved printer paper.

The certification is time limited to two years, after that recertification is needed.

The certification procedure consists of two steps whereby both the thermal paper manufacturer and the paper converter are certified separately.

All tests needed for certification as well as the paper and transportation are to be paid by the supplier.

7. Printer Paper Manufacturing Process

7.1. Thermal Paper Manufacturing

Thermal paper manufacturers normally get the base paper from the paper mill. The manufacturer then processes the paper with different chemicals to make it sensitive to heat. The paper is then distributed on large rolls to the paper converters.

7.2. Paper Converter

The paper converter prints background text and logos on the paper, slits (cuts) the paper and winds the paper onto rolls that fit in the printer.

8. Test Procedures

8.1. Test for Thermal Paper Manufacture

For new untested paper at least 50 km is required, however to complete the full test 55 km of paper is used since the test is stopped shortly before the end of the roll.

Scientific Games will issue a certificate if the test is passed. The certificate is valid up to two years provided the manufacturer does not change the production process.

After two years a 5 km recertification test is needed. Depending on the result Scientific Games can extend the certificate for two more years, withdraw the certificate or recommend a longer test. The procedure will be decided on a case by case basis.

8.2. Test for Paper Converter

For new untested paper at least 35 km is required, however to complete the full test 38 km of paper is used since the test is stopped shortly before the end of the roll.

Scientific Games will issue a certificate if the test passes. The certificate is valid up to two years provided the manufacturer does not change the production process and the thermal paper is still approved.

After two years a 5 km recertification test is needed. Depending on the result Scientific Games can extend the certificate for two more years, withdraw the certificate or recommend a longer test. The procedure will be decided on a case by case basis.

Some examples of changes in the manufacturing or conversion processes which would require recertification:

- Different ink or ink supplier
- Printing layout changes on front or back side
- Change of printing method

8.3. Test Parameters

Crucial factors for judgment of the paper quality are:

- How paper affects printer lifetime
- Print quality achieved after ending the test

A precise measurement and microscopic inspection of the print head is performed before starting the test. During test the printhead and printer mechanism are checked, measured and cleaned of dust (but not residue accumulated on the glass surface of the head) after 5 km and every 10 km thereafter.

8.4. Test Report

A report is provided for the supplier after test completion. The report will give overall information about the behavior of printer paper and mechanics, according to the conditions mentioned above. The report will include the following information:

- *General specifications* (materials features according to Appendices 1 and 2)
- *Test printing* (features of the print)
- *Microscope inspection of thermal head* (mechanical wear or influence)
- *Dot resistance measurement*
- *Conclusions*
- *Appendices* (protocol, dot resistance diagrams, density and PCS measurements, photographs from microscopic inspection)

8.5. Test Duration

Testing time is dependent on the length of the test however 3 to 5 km per week throughput is typical.

8.6. Certified Thermal Paper Manufacturers

The following manufacturers of thermal printer paper have been approved by Scientific Games:

Appleton
825 E Wisconsin Avenue
P.O. Box 359
Appleton, WI 54912-0359
USA

Résiste™ 600-3.1	Issue Date:	2011-02-10
Résiste™ 600-3.1 V2	Issue Date:	2011-05-16

8.7. Production Test

Appendix 3 describes paper used by the Factory for production testing. This paper is not suitable for field use.



APPENDIX 1 FACE MATERIAL SPECIFICATIONS

Base Weight:	70 – 110 g/m ² ISO536
Calliper:	80 – 120 µm ISO534
Brightness:	> 80 % ISO2470
Smoothness:	NTC* > 300 Sec. ISO5627
Smoothness:	TC** > 500 Sec. ISO5627
Image Density:	> 1.30 O.D.***
Dynamic Sensitivity:	> 1.25 O.D.
Print Contrast Signal:	> 75 % at 630 nM

* NTC = Non top coated paper

** TC = Top coated paper

*** Optical density, Macbeth standard

APPENDIX 2 DURABILITY AND STORAGE

A2.1 Coated surface

The paper must resist the following conditions for the time intervals specified below:

Water Immersion

- 24 hr (An imaged sample is immersed in distilled water at room temperature for 24 hours, then examined)

Oil / Grease

- 24 hr (Vegetable oil is applied to an imaged sample and examined after 24 hrs at room temp)

PVC

- 40°C – 24 hr (Place imaged sample against thin, dry PVC film in 40°C Oven under 7# weight and examined after 24 hours)
- Room Temp - 24 hr (Place imaged sample against thin, dry PVC film at room temp under 15# weight and examined after 24 hours)

Whole Milk

- 12 hr (Sample is immersed in whole milk at room temp and examined after 12 hours)

Butter

- 24 hr (An imaged sample is coated with a thin layer of butter and examined after sitting at room temp for 24 hours)

Alcohol

- 2 hr (An imaged sample is immersed in 50% Vodka and 50% distilled water at room temp – for 2 hrs, then examined)

High Heat / Humidity Image Stability

- 80 degree C – 4 hrs (Imaged sample is placed in high heat / high humidity chamber at 80 deg C for 4 hours)

Hand Lotion

- 24 hr (an imaged sample is coated with Lubriderm hand lotion and examined after sitting at room temp for 24 hrs)

After exposure to the above conditions the Density and Print Contrast Signal must still be within the limits specified in Appendix 1. The barcode must meet Grade C or better using a Laser Vision Systems Integra 9500 Barcode Quality Station.



A2.2 Storage

5 years at 20 °C, 47 ± 5 % RH

A2.3 365 day validity

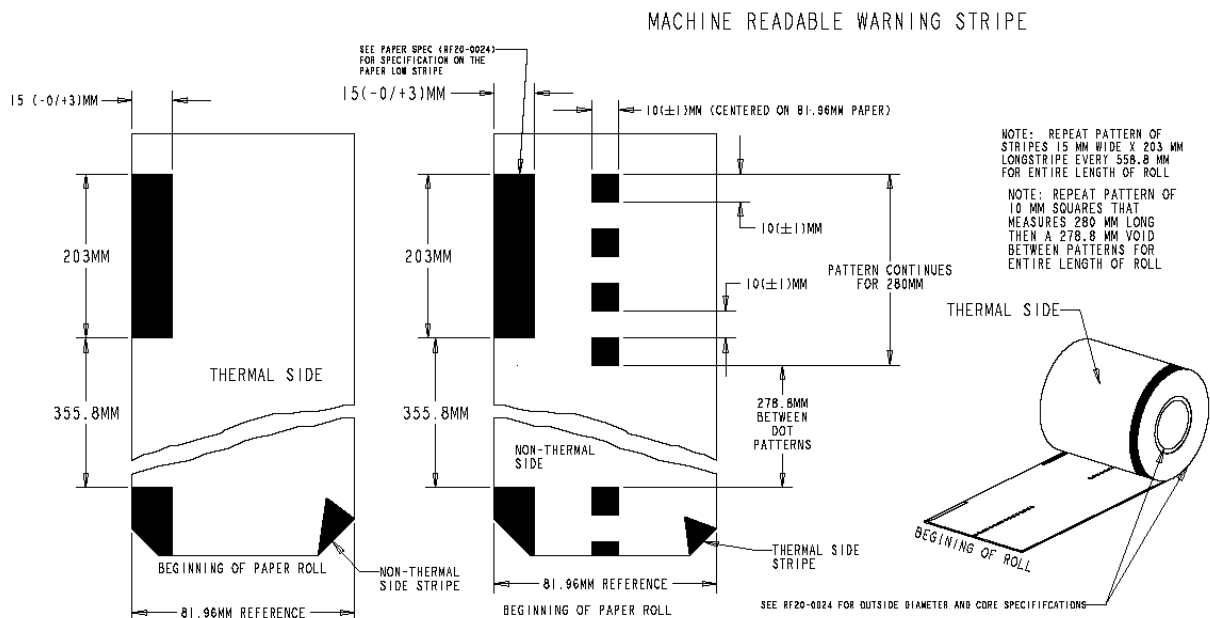
Minimum 1 year legibility while withstanding environmental and chemical exposures such as dashboard heat on a 100 degree day or beverage spills.

A2.4 Shelf Life

Minimum 3 year shelf life (when stored in the proper environment).

APPENDIX 3 PRODUCTION TEST PAPER

The following drawing specifies paper to be used for production test of WAVE / FLAIR / PAT in the factory only:



NOTE: NOT TO SCALE

THE DATA DEPICTED ON THIS DRAWING IN PART OR IN WHOLE IS BEING FURNISHED FOR PROCUREMENT OF MANUFACTURING ONLY AND NO OTHER USE IS AUTHORIZED WITHOUT SCIENTIFIC GAMES EXPRESS WRITTEN CONSENT				SCIENTIFIC GAMES INTERNATIONAL 1500 BLUEGRASS LAKES PARKWAY ALPHARETTA, GA, 30004			
DRWN BY	T. MADDOX	DATE	27-Jun-12	CHECKED		DATE	
REV	ECO	REVISIONS	DATE	APPV	ALL UNITS METRIC	PRODUCT: COM	SCALE: NONE SIZE: B SHEET: 1/1
C	101321	REVISE VIEW ORIENTATIONS, ADD CAD MODEL CORRECT STRIPE NOTE	07/26/12	TJM			
B	101316	CHANGE PATTERN DISTANCES AND PAPER WIDTH	07/16/12	TJM	TOLERANCES NOTED ABOVE		
A		RELEASE	08/27/12				
DESCRIPTION: PAPER WARNING STRIPE WAVE/FLAIR/PAT TEST							PART NUMBER: RF20-0013-06 REV: C