REVISIONS

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355

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CENTRONICS
data computer corp.
HUDSON, NEW HAMPSHIRE U.S.A.

TITLE

ENGINEERING PRODUCT SPECIFICATION

355 MECH

SIZE	CODE IDENT	NUMBER	REV
A	50163	80002182 - 9001	X4

SCALE _____ DO NOT SCALE PRINT SHEET 1 OF 22

REP 8/78

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 SCOPE

This specification defines the criteria for the mechanical design of the mechanism for the M355, 400 cps dot matrix serial impact printer.

2.0 RELATED DOCUMENTS

A. Centronics Eng. Std. #001 - Environmental
B. Cen. Eng. Std. #002 & #003 - Electromagnetic Compatability
C. Centronics Eng. Std. #004 - Acoustics
D. Centronics Eng. Std. #011 - Regulatory
E. Centronics Eng. Std. #014 - Reliability
F. Eng. Prod. Spec., Orion #80002181-9001
G. Eng. Prod. Spec., 350 Power Supply, #80002150-9001
H. Eng. Prod. Spec., 355 Print Quality, #80002188-9001
I. Eng. Prod. Spec., 355 Ribbon, #80002189-9001
J. Eng. Prod. Sepc., Auto Sheet Feeder, #80002173-9001
K. Eng. Prod. Spec., 18 Wire Head, #80002191-9001
L. UL 114
M. CSA 22.2 #XX
N. VDE 0871, 0875 and 0730

3.0 DETAILED SPECIFICATIONS

3.1 MECHANICAL FRAME

3.1.1 Structure

The machine frame will provide the structural support for the printer's assemblies.

The frame consists of the following major components: right and left side plates, the platen, paper guides and paper pan, front and rear carriage guide bars, and a front cross-plate.

3.1.2 Side Plate

The left side plate will provide for mounting of paper movement stepper motor and for mounting an interlock switch which interfaces with the machine plastic top cover. (See Paragraph 3.14 below.)

3.1.3 Platen

The platen will be made of a solid steel bar, rectangular in cross-section measuring 27 x 12 mm (1.063" x .472"). Printing surface will be protected against paper abrasion by adequate plating.

The platen will be provided with a .024 inch (.6mm) deep recess located at both ends for the print head to aid paper feeding when head is in line with paper crimps of multipart forms.

3.1.4 Guide Bars

The front carriage guide bar will use .590" (15.0mm) dia. and the rear bar will use .472" (12.0mm) dia. steel. Both bars will have the proper surface finish (16 micro inch rms) and plating to insure a good wear surface and a better bearing life.

The parallel alignment accuracy between the guide bars and the platen must provide for carriage motion accuracy within .002" (.051 mm) in the horizontal plane and within .003" (.075mm) in the vertical plane in relationship with the platen over the printing range.

3.1.5 Bumpers

Bumpers will be provided at the ends of the front guide bar to guard against crashing of carriage against side frames at full velocity of 40 IPS with no damage.

3.1.6 Fasteners

The frame as well as the rest of the machine components shall be fastened together using good standard practices and shall be capable of shock and vibration test survival as described below, without loosening of fasteners or parts. All fasteners used shall be metric.

3.1.7 Finish

All metal parts shall have appropriate finishes to prevent corrosion. No cadmium or other hazardous finishes or plating will be used. Finish must be conductive to 1 Mho between any two points metal-to-metal on the mechanism. Finish must be compatible to prevent galvanic corrosion of dissimilar metal junctions.

3.1.8 Shock Mounts

The frame will be isolated from the cover system by grommets inserted in frame to reduce vibration and noise.

3.1.9 Grounding

Electrical continuity will be maintained, wherever possible, between metal parts of the mechanism to facilitate grounding. Threaded holes to bleed static charge to ground location will be located on each side of the mechanism. Base to be covered with conductive material for RFI/ESD requirement. Reference Section 2.0.

3.1.10 Plating

Those parts where possible wear is a consideration shall be suitably designed and lubricated or plated to enable the mechanism to meet its reliability requirements. Cosmetic finish must be uniform and stable with time.

3.2 CARRIAGE & DRIVE ASSEMBLIES

3.2.1 Structure

This will include the carriage and the components required to move it. Namely, the DC drive motor, the belt, pulleys, encoder disk and optical sensor. The carriage will be made of cast aluminum and designed to handle the cassette ribbon system (see Paragraph 3.8). It will be mounted on the front guide bar through sintered metal self-lubricated bearings. The surface finish of the bearings as well as the guide bars and the accuracy of fit between them must be such that when the carriage is driven, it will undergo smooth horizontal motion without undesirable movement such as chattering.

Force required to move the carriage will be less than 1,200 grams as assembled at a velocity of 2 IPS.

Clearance between the guide bars and bearings will be less than .0013 inches (.034 mm) in all directions.

3.2.2 Print Head Mounting and Penetration Control

The carriage will provide for mounting of the print head. This is done through a surface mounting system that allows the print head to be mounted by an operator without tools. The carriage will have a machined surface to support the print head when snapped into position. The plane described by the surface will be adjusted to 1.692 $\pm$ .002 inches (42.98 $\pm$ .05 mm) from the platen surface, thus providing parallel alignment accuracy as described in Section 3.1.4. This adjustment will be made with the penetration control lever at the minimum gap position. The heads are set during manufacturing to allow replacement without further adjustment.

3.2.2.1 Operation

The print head is located above the carriage, then it is gradually pushed down on the tapered edges of the carriage. In the meantime, the print head is simultaneously pulled back, compressing the urging springs and enabling the shoulder of the pin to engage the hole in the carriage. Then the print head is rotated until the rectangular shoulder seats into the rectangular slot.

3.2.2.2 Gap Setting

With a carriage surface to platen dimension of 1.692 $\pm$ .002 and with a print head wire tip to mounting plate dimension of 1.680 +.001, -.000, the gap setting will be .012 +.002,-.003 (.30 +.051,-.076 mm) without ribbon and paper. Operator will be able to adjust a gap of .012 $\pm$ .002 inches with the penetration control lever.

3.2.2.3 Spring Force

The head will be supplied with two pins, each bearing a spring and tapered washer to exert 3 to 5 pounds (1.3 to 2.3 Kg) holding force per spring. This will insure accurate contact between print head and carriage.

3.2.2.4 Head Removal

To remove the print head, it has to be pulled back and up. The urging springs will be compressed during this process.

3.3 CARRIAGE DRIVE

Drive system for the print head carriage shall consist of a closed loop servo system capable of bi-directional printing. Drive method will be a timing belt using a speed reduction system. One revolution of the motor will represent 1.33 inches (33.8 mm) of linear carriage motion.

3.3.1 Carriage Drive System Parameters

The carriage drive system will be driven bidirectionally by a DC motor. The parameters and performance criteria for the carriage drive system are as follows:

3.3.1.1 Gear Ratios

Motor Drive Gear Diameter - 25.87 mm
Intermediate Gear Diameter - 54.33 mm
Final Gear Diameter - 22.64 mm
Motor Pulley to Carriage Pulley Ratio - 1:2.1

3.3.1.2 Carriage Weight

Head Carriage Casting	250 gm.	(9 oz.)
Print Head Assembly (18 Pin)	400 gm.	(14 oz.)
Ribbon Shift Mechanism	60 gm.	(2.1 oz.)
Total Carriage Assembly Weight	710 gm.	(25.1 oz.)

3.3.1.3 Frictional Loading (F_L)

Carriage System Friction (at Motor) 224.0 gm. cm. (3.12 oz. in.)

3.3.1.4 System Load Inertia (J_L)

Total System Inertia (at Motor) 0.194 $\frac{gm.\ cm.}{sec^2}$ (2.70×10^{-3} oz. in. sec^2)

3.3.1.5 System Acceleration

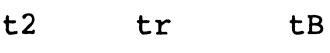
Motor Acceleration 5768.4 rad. sec^{-2}
Carriage Acceleration 3108 cm sec^{-2} (1223.6 in sec^{-2})
(= 3.17g)

3.3.1.6 Acceleration Time (t2)

t2 = 28.75 ms

Deceleration Time (tB)

tB = 28.75 ms



3.3.1.7 Run Time (tr)

Minimum Run Time tr min = 57 msec

3.3.2 Carriage Drive Motor

In order to satisfy the system performance parameters, the carriage drive DC motor will have ball bearings and be to the following specifications:

- Peak Torque	8 Kg. cm.	(oz. in.)
- Rated Torque	1.5 Kg. cm.	(oz. in.)
- Torque Constant	.95 Kg. cm. A^{-1}	(oz. $in.^{-1}$)
- Armature Inductance	13 mH	
- Armature Winding Resistance (at 25°C)	4.2 Ohms	
- Peak Current	10 A min.	
- Voltage Constant	9.6 V per 1000 rpm	

- Friction Torque .15 Kg. cm.
- Amature Inertia .184 Kg. cm. sec^{-2}
- Mechanical Time Constant 8.6 msec
- Electrical Time Constant 3.0 msec
- Power Rate 1.25 KW sec^{-1}
- Torque Inertia Ratio 3.4×10^4 rad sec^{-2}
- Thermal Resistance 3.5 $^oC\ W^{-1}$
- Thermal Time Constant 20 minutes
- Maximum Allow. Armature Temp. 155 ^oC
- Maximum Safe Operating Speed 3000 rpm
- Rotation Bidirectional
- End Play 0.0127 cm. (0.005 in)

3.3.3 Pulleys

Timing pulleys will be used for driving the timing belt. Both driving and idler pulleys will be friction-free running on ball bearings. The idler pulley will be adjustable so that it can serve as a tightener for the timing belt.

3.3.4 Carriage Drive Belt Tension

Belt tension will be set at point of manufacture such that 2/3 lbs. (300 grams) pressure will depress the belt 7 to 8 mm to prevent vibration problems affecting printing during carriage acceleration and change of direction. Belt deflection will stabilize to less than 1.5 mm over a one month period following installation under static condition.

3.3.4.1 Specification, Carriage Drive Belt

- Width .50" (12.7 mm)
- Strength (Tensile) 350 lbs min. (per the above stated width)
- Elongation 1% Average (under 5 to 100 lbs applied force).

3.3.5 Main Motor Belt

Belt tension will be set at point of manufacture such that 2/3 lbs. (300 grams) pressure will depress the belt 2 to 3.5 mm.

3.3.5.1 Specification, Main Motor Belt

- Width	.50" (12.7 mm)
- Strength (Tensile)	350 lbs min. (per the above stated width)
- Elongation	1% Average (under 5 to 100 lbs applied force).

3.4 PENETRATION CONTROL

The adjustment of the print head in relation to the platen to facilitate varying forms thickness is accomplished by an eccentric on the front guide bar. The eccentric is moved by means of a lever located on the right side chassis which protrudes through the body cover. A detent allows for fifteen (15) distinct adjustment positions. Head to platen gap variation for each position is .0018" (.046 mm) for a total gap adjustment of .025" (.6 mm).

3.5 OPTICAL ENCODER

The encoder will consist of a dual channel sensor and an optical disc encoder mounted on or integral with the DC motor shaft. The encoder disc design will have 400 slits around its circumference. The encoder disc design will enable quadrature sensing.

3.5.1 Encoder Resolution

The encoder shall be capable of supplying 1200 signals per linear inch of print head travel (1600 per motor revolution).

3.5.2 Encoder Mounting

Mechanical means for mounting the optical encoder will be provided on the motor.

3.6 CARRIAGE DRIVE OPERATION

The system will comply with the following requirements.

3.6.1 Print Speed

Printing speed of 400 cps at 40 ips bi-directional with logic seeking.

3.6.2 Carriage Movement

The carriage must be capable of accelerating from zero velocity to constant velocity and of decelerating from constant velocity to zero velocity as defined by the following parameters.

- Carriage Velocity	40 in/sec (1,016 mm/sec) ± 5%
- Acceleration Distance	.5 in. (12.7 mm)
- Deceleration Distance	.5 in. (12.7 mm)

3.6.3 Carriage Positional Accuracy

The true carriage position versus the carriage position as determined by a count of the optical encoder output must agree to within ±2 count or ±1/600 inch (±0.00167") over the print range. This measurement defines the maximum print head positional error allowed due to the motor belt/drive belt elongation and contraction between the drive motor and carriage assembly.

3.7 PAPER HANDLING SYSTEM

This system consists of a stepper motor drive, pin/tractor paper feeder, paper guide and top drive rolls. A paper insert guide directs the paper around the data input cables. An outlet guide guides the paper after it leaves the drive rolls. The system has push tractors below and pull rolls above the print line. The tractor feed is driven in unison with the drive rollers to enhance proper operation and accuracy requirements of this specification. Driver rollers will also keep the paper taut and snug on the platen to reduce the noise emitted by the paper. The following specifications apply to the system.

3.7.1 Stepper Motor

The stepper motor must be heat sunk to the side plate. It has the following specification:

Voltage, Rated	5 VDC
Current	1.92 Amps per Phase
No. of Phases	4 (Monofilar Winding)
Resistance	2.6 ±10% Ohm/Phase
Holding Torque	2 Kg. Cm.
Rotor Inertia	167 g. Cm^2
Steps/Revolution	48 (7.5°/Step)
Step Error	±5%
Rotation	Bidirectional
Inductance	6.9 MH ± 20%
Bearings	Ball Bearings on drive end. Sintered metal self-lubricating bearing on case end.

3.7.2 Paper System Performance

The system performance will comply with the following criteria:

Line Feed Time	50 msec maximum
Paper Slew	8 in/sec (203.2 mm/sec) minimum
Paper Movement - Fanfold	120 steps per inch (.00833 in/step)
Paper Movement - Cut Form	108 steps per inch (.00926 in/step)

Ramp Characteristics for line feed (1/6 inch, 120 steps per inch). All times in milliseconds.

Ramp Up	Ramp Down
6.0325	3.64
3.3345	1.755
2.522	4.29
2.4115	1.30
2.093	
1.9825	
1.9175	
1.820	
1.768	
1.703	
1.6705	
1.625	
1.5795	
1.5535	
1.521	
1.4885	
1.625	

Continuous running at 8 IPS not to exceed 20 minutes.

NOTE: SECTION 3.7.2 IS CURRENTLY THE SAME AS 350 SERIES. THE STANDARD 355 MECHANISM WILL DRIVE THE THREE BIN AUTO SHEET FEEDER, SPECIFICATION NUMBER 80002173-9001. SUFFICIENT DATA TO SPECIFY STEPPER MOTOR TORQUE IS NOT AVAILABLE AT THIS TIME AND THIS CRITICAL AREA MAY BE SUBJECT TO FUTURE CHANGE.

3.7.3 Computer Fanfold Forms

3.7.3.1 Paper Loading

The mechanism is rear loading for continuous forms. Paper is brought to the rear of the machine over the inlet guide and loaded into the tractors. The forms lever is moved to the 'LOAD' position which positions the movable paper guide up to the mouth of the drive rolls. Forward motion of the drive motor now loads the paper. The forms lever is now placed in the 'FORMS' position. A mechanical lock will be provided to prevent head motion while the forms lever is in the 'LOAD' position.

3.7.3.2 Forms Type

Total paper width is from 4.0 to 15.0 inches (100 to 381 mm). The system is designed to handle from single part 15 to 20 lb (56 g/m^2 to 70 g/m^2) paper to 6 part crimp pack. Maximum pack thickness .0204 in. (.52 mm). Paper qualifies and defined below in Section 3.7.3.4.

3.7.3.3 Line Registration

Line to line spacing error will be held within one sigma equal .004 inches (.1 mm) for single ply paper and within one sigma equal .005 inches (.13 mm) for 6 ply paper. Accuracy measurements will not be taken within 1.0 inch (25.4 mm) of the fanfold perforation line. Line spacing error is non-accumulative. Measurement is made using Pin 1 and Pin 6 firing in graphic mode and analyzing dot placement. Vertical motion between lines is 10 steps for fanfold paper and 9 steps for cut sheet paper.

3.7.3.4 Qualified Paper - Fanfold

The following list of computer forms has been tested and can be handled reliably on the mechanism at 65-70°F, 40-60% RH.

No.	Manufacturer	P/N	Ply	Forms/Box	Carbon (Non-Carbon)
1	Moore Business Forms	1L171412TC56	1	2,600	-
2	Moore Business Forms	1L111412TC45	1	2,600	-
3	Moore Business Forms	1L181412T	1	3,200	-
4	Moore Business Forms	4 8510	4	750	Carbon
5	Moore Business Forms	4A131412TQ51	4	850	Non-Carbon
6	Moore Business Forms	4K171482T76	4	800	Non-Carbon
7	Moore Business Forms	4L28851046	4	750	Carbon
8	Moore Business Forms	6 1482TQ	6	600	Non-Carbon
9	Moore Business Forms	6L041412TQ51	6	600	Non-Carbon
10	Moore Business Forms	6L091412T68	6	500	Carbon
11	Moore Business Forms	6L201412TM57	6	600	Non-Carbon
12	Royal Business Forms	1411P122G	6	500	
13	Royal Business Forms	1411F122G	6	500	
14	Royal Business Forms	1411P2000	1	2,500	

3.7.3.5 Paper-Out Switch

A normally open out of paper switch capable of dry circuit operation, will be incorporated into the paper path on the left tractor. Paper out is sensed approximately 2.83 inches (72 mm) from the last printed line.

3.7.3.6 Form Tear-Off Capability

The form tear-off capability will be at 1.08 inches (27.5mm) of the first print line. A column indicator will be marked on the tear bar. Tear-off to be at perforations only. Perforations to be preserved to tear bar within +1.5 to -.5 mm. Clear window to be defined in Secton 3.11.5.

3.7.4 Cut Sheet Forms

3.7.4.1 Loading

Cut sheets are loaded from the top of the printer. The forms lever is moved to the 'LOAD' position. This removes the tension between the drive rolls and the paper pan is moved to the mouth of the rolls to accept the paper. At this time, a mechanical stop intercepts the paper path. The paper is now inserted through the paper rolls to the stops for alignment. The forms lever is moved to the 'SHEET' position. The paper is now loaded by the reverse drive of the stepper motor.

3.7.4.2 Forms Type

Total forms width is from 4.0 to 12.0 inches (101 to 304.8 mm). Single part forms from 15 lb. to 20 lb. (56 g/m^2 to 70 g/m^2). Multipart forms up to 6 part with carbon, .0204 inches pack thickness (.52mm) maximum.

3.7.4.3 Line Registration

Line registration will be determined by the diameter of the rubber roller of 12.17 $\pm$ .05mm, which is measured with a low force micrometer.

3.7.4.4 Cut Sheet Handling & Restrictions

The center of the first line on the cut sheet which can be printed is below 1.08 inches (27.5 mm) from the top of the paper because of the distance between the drive rolls and the first printed line. The stops to which the form is loaded is 2.75 inches (70 mm) from the edge of the cutter bar. This distance subtracted from form length is the maximum the paper can be inserted with the reverse stepper drive. The drive rolls are driven 10% more than the tractor drive. When in cut sheet mode, paper moves at 108 steps per inch (1/6 inch LF = 18 steps).

3.7.4.5 Head Positioning

The print head will be positioned out of the paper path for paper loading.

3.8 RIBBON SYSTEM

The ribbon system consists of a standard disposable ribbon cassette with 1" wide ribbon, ribbon drive motor, ribbon shift mechanism and ribbon guides.

3.8.1 Ribbon Cassette

A standard disposable ribbon cassette will be designed to contain ribbon 1.0" (25.4 mm) in width and at least 70 yards (64 m) long. No mobius loop is required. THree tabs will be attached.

Optional color ribbon cassettes will be the same design as all black ribbon cassettes, except tabs will be removed for a color ribbon detect switch. By removing combinations of tabs, up to eight variations of multiple color ribbons can be detected.

3.8.1.1 Cassette Ribbon Jams

The maximum allowable failure rate is one jam per one hundred cassettes.

3.8.2 Ribbon Shift Mechanism

The ribbon shift system will be a sub-assembly that is mounted to the print head carriage assembly. The ribbon shift system will consist of a ribbon guide that drives the ribbon vertically across the nose of the print head under the motivation of a small stepper motor controlled by the printer controller.

The ribbon will be divided into four tracks. The top track defined as track number one, the bottom track as track number four. The ribbon shifts into track number two when the head is in the extreme left position. The shift mechanism requires a mechanical stop to find a reference position upon printer select and power up sequences.

The time to shift from track one to track four shall be equal to or less than 91 ms. The maximum duty cycle of ribbon shifting will not exceed 45%.

The ribbon shift system can be utilized with black only ribbon, when shifting is automatically controlled at the end of each print line or with color ribbon, where color relation is user system controlled.

(NOTE: Color ribbon and color control will be an option available on M355.)

3.8.3 Ribbon Life

Refer to Centronics Eng. Prod. Spec., 355 Ribbon, #80002189-9001.

3.8.4 Smear

Ink will not smear with normal handling of printed material.

3.8.5 Shield

The ribbon will be supplied with a plastic nose shield which will snap in place over the print head jewel for a clean hands installation.

3.8.6 Ribbon Drive Motor

Drive motor will be 12 VDC geared for a ribbon speed of 3 to 5.5 in/sec minimum.

3.8.7 Chemical Resistance

All plastic and elastomeric materials used in manufacturing the ribbon cassette or any other components used to handle ink or inked ribbon, must be resistant to chemical attack from substances used in Centronics ribbons. Most important of these substances are oleic acid, acetic acid and fatty amines.

3.8.8 Instructions

Instruction plate will be used to assist the operator in changing the ribbon.

3.8.9 Color Ribbon Detect Switches

The capability for three normally open, pressure sensitive switches will be provided on the mechanism to detect the color type of the ribbon cassette.

3.10 FIRST PRINT POSITION

3.10.1 Fanfold Paper

The first printed position for continuous forms is 0.375 inches (9.5 mm) nominal from the left sprocket hole center. Mechanical adjustment allows this position to change from 0.275 inches (7.0 mm) minimum to 0.475 inches (12.1 mm) maximum.

3.10.2 Cut Sheet Paper

In the cut sheet mode, the first print position is moved 1.09 inches (27.69 mm) to the right. A restricted area above the paper feed tractors disallows paper insertion in this area.

With paper to the left, but not in the restricted area, the first print position is approximately 0.62 inches (15.75 mm) from the left edge of the paper to the centerline of the first column of the first character.

3.11 COVER SYSTEM

3.11.1 Basic Dimensions

The basic printer external dimensions are 8.7 inches (221.1 mm) in height, including .7 inches (17.8 m) for the printer feet. 23.02 inches (584.7 mm) in width and 22.24 inches (565 mm) in depth. Dimensions do not include paper guides.

3.11.2 Base Cover

The base cover is molded plastic sufficiently ribbed to give structual integrity to the system. Power supply area to be of sufficient strength to withstand ten pound weight. Base will be molded charcoal brown.

3.11.3 Body Cover

Body cover is injection molded plastic, N190 or equivalent with minimum thickness of 0.125 inches (3.2 mm) except ribs, etc. Cover mounts to the base cover. Color is to be eggshell white, surface is textured.

3.11.4 Rear Cover

Cover is same material, color and texture of body cover. Cover hinges to the rear and must be removed to facilitate paper loading. Cover has provisions to ground the paper racks.

3.11.5 Top Cover

The top cover consists of a hinge smoked poly carbonate cover and the main top cover. The main cover is the same material, color and texture of the body cover. The cover shall snap in and out to facilitate replacement of ribbon cassette. Hinged smoked portion snaps in the closed (down) position.

3.11.6 Feet

Feet will be provided on the unit. They will have provisions to enable mounting the machine on the 350 Series print stand.

3.11.7 Cover Tolerances

Maximum gap variations between bottom and body covers to be .040" (1 mm) on the front and .060" (1.5 mm) on all other sides. These dimensions to be measured after thermal soak testing per Centronics standard.

3.11.8 Cover Strength

Covers will be designed to support the weight of the machine for shipping.

3.11.9 Cable Strain Relief

Provisions to be made for cable strain reliefs.

3.11.10 Cover/Mechanism Clearance

A minimum of .357" (9.1 mm) will be clearance between any cover and any part of the mechanism where possible. This is to allow for possible acoustic foam addition.

3.11.11 Plastics Used

All plastics used are to be flame retardant and UL and CSA approved.

3.11.12 Paper Wire Guide

The cover will have a provision to mount a wire guide to direct the paper in without interference with any wires or cables.

3.12 AUTO SHEET FEEDER (Optionally available on M355)

Provisions will be made for installation of auto sheet feeder. (Reference Eng. Prod. Spec. #80002173-9001). Drive for feeder to be provided by stepper motor defined in Section 3.7.1.

3.13 WEIGHT

The weight of the mechanism and cover system must be less than 45 lbs.

3.14 INTERLOCK SWITCH

An interlock switch is located under the smoked section of the top cover. The switch is actuated whenever the cover is raised or removed. The switch is a Hall effect type activated by a magnet in the top cover.

3.15 ACOUSTICAL NOISE

The design of the machine is to achieve a noise level of 60 dbA while printing rolling ASCII single part, 15 pound paper, 132 columns, 100% duty cycle. Measurements of the noise level will be taken in compliance of Centronics Eng. Std. #004.

4.0 ENVIRONMENTAL CONDITIONS

4.1 TEMPERATURE/HUMIDITY

The printer will meet the requirements as specified for a "Class B" product in Paragraph 3.0 of Centronics Engineering Standard 001.

4.2 ALTITUDE

As per Paragraph 4.0, Centronics Engineering Standard 001.

4.3 MECHANICAL SHOCK

As per Paragraph 5.0, Centronics Engineering Standard 001.

4.4 VIBRATION

As per Paragraph 6.0, Centronics Engineering Standard 001.

4.5 PHYSICAL STABILITY OF EQUIPMENT DURING SHIPPING & HANDLING

As per Paragraph 7.0, Centronics Engineering Standard 001.

5.0 SAFETY

The printer will meet the requirements as specified in Centronics Engineering Standard 011.

6.0 RELIABILITY PROVISIONS

6.1 DEFINITIONS

6.1.1 Mechanism Reliability Provisions

6.1.1.1 Failure

A failure is any stoppage or malfunction of a printer which is directly caused by the mechanism. This excludes stoppages or substandard performance caused by operator error, power failure, environmental conditions exceeding specified limits, or failures induced in the mechanism (secondary failures) due to malfunctions in other portions of the printer.

6.1.1.2 Mechanism Operating Time

The period of time during which the mechanism is either moving paper, or the print head carriage is in motion.

6.1.1.3 Duty Cycle

The measurement shall be based upon 25% duty cycle.

6.1.1.4 Mechanism Failure Rate

Mechanism Failure Rate (MFR) shall be calculated as follows:

$$MFR = \frac{\text{Total Number of Failures}}{\text{Total Mechanism Operating Time}}$$

6.1.1.5 Infant Mortality Period

This shall be defined as the first hour of Mechanism Operating Time.

6.1.1.6 Mechanism Useful Life

The duration of Mechanism Operating Time during which the failures generated are field repairable. Mechanisms which pass the Useful Life may be expected to generate failure types which require overall refurbishment or reconditioning of the Mechanism or repairs which cannot be performed by a properly trained and equipped field representative.

6.1.1.7 Mean Time to Repair (MTTR)

MTTR shall be calculated as follows:

$$MTTR = \frac{\text{Total Repair Time}}{\text{Total Number of Failures}}$$

6.1.1.8 Performance

Mechanisms shall conform to the following: