

System Engineer's Kiosk Printer Deployment Applications Notes for ITK38 Printers (ANITK10A.PDF)

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1 Paper Supply

A well-designed paper supply is critical to the printer's system reliability. It must function smoothly and be repeatable after the paper replenishing operation.

1.1 Paper Supply Options

The paper supply, for the ITK38, can be from several sources. These are:

- 1- an on mechanism paper roll holder
- 2- an externally mounted paper roll holder
- 3- an external supply of fan-folded, registration marked, paper.

1.2 Internal 6”/8” Diameter Paper Roll Holder

This paper roll holder mounts to the chassis of the printer and can accommodate up to an 8” diameter roll of paper. This is approximately 1170 feet (357 meters) of 3.4 mil (86 micron) paper. An alternate roll location is provided to minimize the printer profile when a 6” diameter or smaller roll of paper is used. It can include an optional low paper sensor that signals when the diameter of the roll reduces to approximately 2.4”. This is approximately 54 feet (16.5 meters) of 3.4 mil (86 microns) paper. A short (18”) cable assembly is used to connect the low paper sensor to a connector on the rear panel of the printer chassis. The paper roll is loaded onto the holder, from the top, and requires approximately 1” of clearance (2” for the alternate 6” diameter location) above the roll for loading. Refer to sections: 4.2; 4.3; 4.4.

Note: this holder can be removed from the printer and mounted externally.

1.3 Externally Mounted 10” Diameter Paper Roll Holder

This externally mounted paper roll can accommodate a 10” diameter roll. It holds approximately 1830 feet (560 meters) of 3.4 mil (86 micron) paper. It can also include a low paper sensor. This sensor is adjustable, with a range of adjustment between 3.75” and 7.20” in diameter. This is approximately 178 feet (54 meters) to 900 feet (274 meters) of 3.4 mil (86 microns) paper. A small cable assembly (ATX-AC8) is used to connect this low paper sensor to a connector on the rear panel of the printer chassis. This external paper roll holder can be mounted to a shelf or vertical wall in the kiosk via mounting holes in its base and back plate. Refer to sections: 1.6.1; 1.6.2

1.4 External Fan-Fold Paper Holder

An optional paper holder (ATX-FFPHLP) is used to hold a box, or a stack of fan-folded paper. This paper source is not specifically limited in capacity. A typical box of 8.5” x 11” paper is approximately 2500 sheets, however, a taller box could hold more.

This holder includes a low paper sensor. The sensor monitors the weight of the paper supply. It is adjustable, within a range of 300 to 1000 sheets of 8.5” x 11”x 3.4 mil (86 microns) paper. A small cable assembly (ATX-AC8) is used to connect this low paper sensor to a connector on the rear panel of the printer chassis.

This paper supply is typically placed behind and below, or directly below the printer. This source of paper has several advantages. Due to its fan-fold format the entire mass of the paper supply does not need to be moved to dispense paper. Only the weight and friction of the paper pulling, along the paper feed path, is the external load presented to the printer. This can be an advantage if a very large capacity paper supply is needed. Also, the flat format paper delivers a non-curved document to the user. This may be important in some applications. Refer to sections: 1.6.4; 1.6.5

Using registration marked paper with perforations, does require more system level care. The paper/registration mark sensor **must** be adjusted to cut behind the perforation. Cutting in front of the perforation causes the leading edge of the paper to have a “door like” attachment with the hinge being the perforation. This can get caught in the cutter and cause jams. Training of maintenance personnel is essential to insure that every time paper is loaded they verify that the cutting is being done behind the perforation.

1.5 External Paper Supply Factors

An externally located paper supply must be organized to provide:

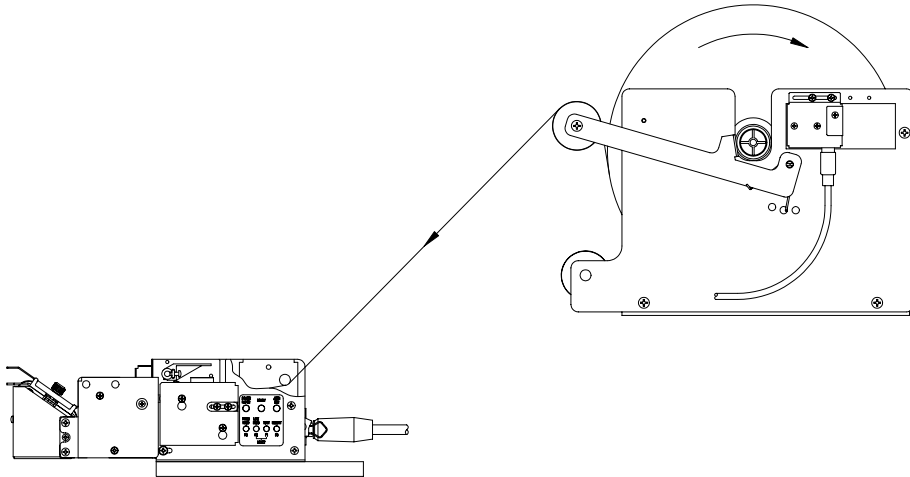
- 1- a paper delivery path that is located in-line to the printer and securely mounted to maintain this over time.
- 2- a non-binding paper flow path that is free of abrupt path changes that could cause excessive paper pulling loads or document separation in the case of perforated, fan folded supplies.
- 3- a uniform paper delivery system that is free of abrupt paper load changes.
- 4- repeatable paper delivery operation after the paper replenishing operation.

A well designed paper delivery system is critical to achieving reliable printer system operation.

1.6 External Paper Supply Examples

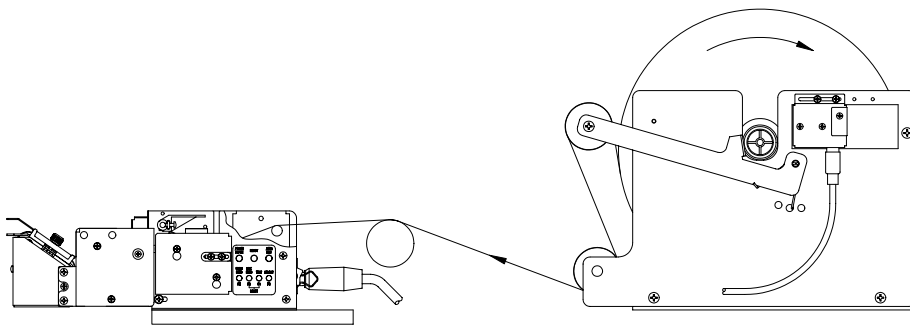
1.6.1 External Paper Roll mounted above the printer.

The figure below shows a simplified paper path that is used when the paper roll holder's location is above the printer. This position allows full movement of the dancer arm without the need to employ the fixed guide roller (on the bottom of the roll holder).



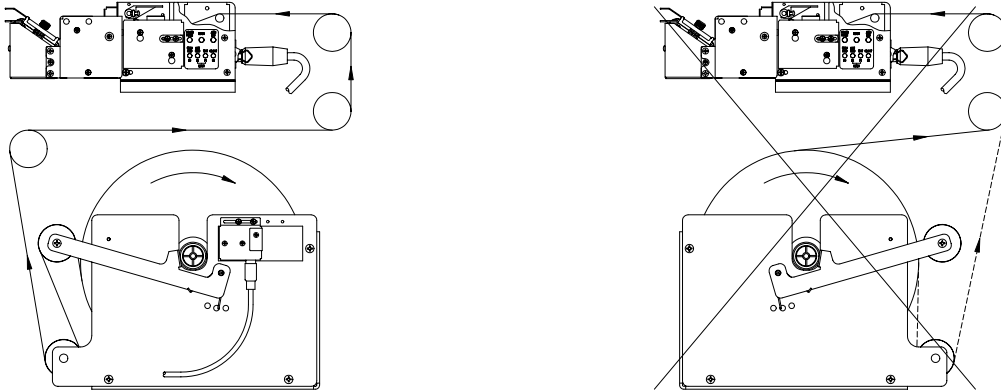
1.6.2 External Paper Roll mounted in-line or below the printer.

The figure below shows a paper path that is used when the paper roll holder's fixed guide roller is used. Care should be taken to keep the printer cables from interfering with the free movement of the paper into the printer.

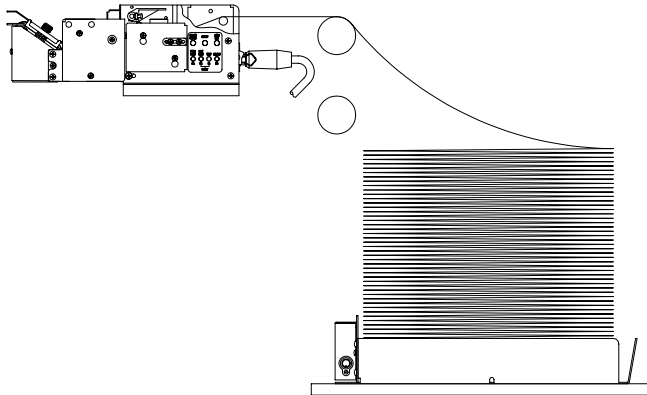


1.6.3 External Paper Roll mounted under the printer.

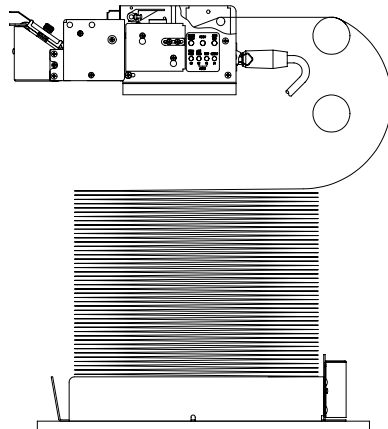
The figure below left shows a paper path that results when an external paper roll is placed under the printer. This arrangement requires a more complex paper path, employing several rollers to guide the paper to the printer. It should be thoroughly tested before deployment. The figure below right shows the roll holder rotated 180°. This requires that the paper be loaded and routed without employing the dancer roller and results in the paper advance motor having to absorb very high inertial loads. **This condition must be avoided.**



1.6.4 External Fan-Folded Paper holder mounted below the printer.



1.6.5 External Fan-Folded Paper holder mounted under the printer.



1.7 Formula for Calculating Paper Roll Capacity

The following formula is useful for calculating the length of paper supplied on a roll.

$$L = \frac{(OD^2 - ID^2) * \pi}{48 * T}$$

Where:

L	=	Length of Paper	(Feet)
OD	=	Outside Diameter of Paper Roll	(Inches)
ID	=	Inside Diameter of Paper Roll	(Inches)
T	=	Thickness (Caliper) of Paper	(Inches)

1.8 Host Low Paper Monitoring

The host system should monitor the low paper status. This information should be used to control the printer as required under this condition. Typically all documents in process would be completed and then the printer would be taken off line. Service personnel would be notified to replace the paper supply before the printer actually runs out of paper. This will eliminate paper out downtime and as importantly prevent the printer from running out of paper in the middle of a printed document. Based on the low paper capacity point the host system can choose to count down from the low paper point until the almost completely out point. This could be calculated from the low paper trigger point and the knowledge of the document size being printed. For low paper trigger points, on the various paper supplies, refer to these sections: 1.2; 1.3; 1.4. Counting past the low paper trigger point makes the assumption that the host detected the transition through this point. If this point was transitioned through and then the system had under gone a power cycle this counting scheme could fail. To circumvent this contingency the printer's internal document counter, that is available in the printer's status information, can be used as a power cycle detector. This counter is reset to zero at power up (or printer reset). If the host system detected a zero document count after it had been non-zero it could conclude a reset or power cycle had taken place. At this point, it can be assumed that the low paper counted reference point has been lost and the system shut down rather than allowing it to continue on and run out of paper while printing a document.

1.9 Printer Low Paper Monitoring

If the host system chooses not to monitor the low paper the printer has parameter settings that enable printer reaction to the low paper condition (see the ITK 38 User's Manual for the EEPROM parameter information). The printer can be made to react to the low paper condition in several ways. Most typically that would be to complete the document in process and the stop (go offline). Note, that the host can monitor the low paper with this selection made, however, by selecting it, it is implied that the host choose not to be in charge of shutting down the print process as suggested above.

2 Paper Output

2.1 Output Paper Delivery Challenges

Delivering a document directly to the user poses several challenges that need to be managed. These Output Paper Delivery Challenges are:

- 1- the potential for pulling on the document as it is being printed or during the cut operation
- 2- the potential for a temporarily blocked output slot during the delivery of the document
- 3- the need to manage a re-delivery of a document when the output path is temporarily blocked
- 4- the need to prevent paper litter of untaken documents
- 5- the need to prevent untaken documents from reaching the wrong hands
- 6- the need to supervise the removal of a document (document not taken sensing)

2.2 Printer Paper Output Delivery Options and the Deployment Output Organizational Techniques

The ATX 38 printer has several paper delivery output options. These options, in conjunction with proper deployment techniques, will address the needs of any application and will produce a reliable paper delivery system.

These Options and Techniques are:

- 1- Output Paper Isolation Chamber Technique
- 2- Cut and Drop Output Option
- 3- Tearbar Paper Separation Output Option
- 4- Cutter with Jam Resistant Output Option
- 5- Cutter with Disposing Transport-Presenter Option

2.2.1 Output Paper Isolation Chamber Technique

If the output document's definition is simple, for example, all documents are the same size, then the first two Output Delivery Challenges (see 2.1) can be addressed by simple output paper delivery path geometry. This is done by delivering the document into an isolation chamber placed between the user and the printer's output. This output isolation chamber protects the document from user interference until it is printed, cut and dropped.

The ITK 38 output options that fit this technique would be the Cut and Drop Output, the Cutter with Jam Resistant Output, or Cutter with Transport-Presenter. This form of paper output protection is adequate for many applications.

The Cut and Drop output is one that is used in conjunction with this technique as it is the simplest, and in combination with the isolation chamber, provides document protection during the delivery. The other printer output types have also been used in conjunction with the output isolation well technique, however, for this application technique, do not provide much additional benefit.

If, however, the delivered document's requirements are more complicated, or require higher form delivery supervision, for example: delivering the document directly through the enclosure wall of the kiosk, detection of the document taken (not taken), management of a temporarily blocked output, preventing paper litter, etc., then the transport-presenter is better choice for the application.

2.2.2 Cut and Drop Output Option

This option is for applications where a document is to be printed, cutoff and dropped into an output isolation well, as noted above. This isolation geometry is used to prevent the pulling or blockage interference of the document during its print, cut and delivery cycle. After it is cut (and dropped) it then becomes accessible for removal by the user.

The cutter, in this output configuration, has an attached static eliminator to facilitate the elimination of static charge, built up during the printing process, and allows freer dropping of the document into this isolation chamber. The static charge build up is inversely proportional to the humidity conditions. Low humidity conditions can create very challenging paper delivery circumstances. Generally, the static eliminator on the cutter is all that is required to reduce the static charge to a level that will insure successful dropping of documents into this open isolation chamber. However, in some cases, this may need to be combined with thermal paper that is coated with an anti-static agent. More mechanically complex chambers, such as those with baffles, added to restrict outside access, may require additional static eliminators be placed in the isolation chamber itself. Given that the document, under this technique, is not mechanically being delivered, by the printer, to the user, the application's circumstances that could negatively influence the paper's delivery (low humidity creating static cling forces, the enclosure's fans creating negative back pressure on the paper, etc.) must be considered. The application's engineer must evaluate this delivery system under all expected operating conditions.

This form of output can be configured to provide protection for Output Delivery Challenges -1- and -2- (see section 2.1). A well-designed isolation chamber, sized to accommodate the maximum document expected, with properly deployed static discharge elements, can be deployed for delivering

documents safely and indirectly to the user. It is one of the most mechanically simplified output delivery techniques.

2.2.3 Tearbar Paper Separation Output Option

A tearbar paper separation option is available. This option provides the user a tear off edge, in place of a paper cutter, to accomplish paper separation. Using perforated paper stock is recommended when the tearbar option is selected. This option also employs an anti-jam chamber similar to that used with the Cutter with Jam Resistant Output below.

This type of output provides only a modest level of protection for the Output Delivery Challenge -2- (see section 2.1). It would not typically be used for delivering documents directly to a user at a kiosk. It may, however, be applied where the document is delivered to a system operator, for example an airline or rental car counter person. This output is the most mechanically simplified form of output having no cutter or presenter components.

2.2.4 Cutter with Jam Resistant Output Option

This option employs a forward anti-jam protection chamber. As the document is being printed/delivered, if the output is inadvertently blocked, a controlled buckling of the paper into this jam chamber occurs. When this buckling is detected, printing is temporarily halted to prevent the occurrence of an output paper delivery path jam (paper wrinkle jam). After a delay, printing is resumed expecting that the blockage was inadvertent. If the blockage is cleared the printing is completed. After several unsuccessful delivery attempts, the printer will stop and report this as an error.

This form of output only provides a modest level of protection for the Output Delivery Challenge -2- (see section 2.1). This type of output would not typically be used for delivering documents directly to a user at a kiosk. It may, however, be applied where the document is delivered to system operator, or as part of some other system of output delivery system.

2.2.5 Cutter with Disposing Transport-Presenter Option

The Disposing Transport-Presenter is the most versatile output option available. The ITK38's Disposing Transport Presenter can be operated as a non-disposing or disposing transport-presenter. The non-disposing mode is the default mode for this option. To operate the transport-presenter in disposing mode a printer parameter option that defines a disposing operation must first be enabled (refer to the ITK38 User Manual for these options).

2.2.5.1 Cutter with Non-Disposing Transport-Presenter Operation

The standard, non-disposing mode of the Transport-Presenter provides isolation of the user from the document. It can store any reasonable sized document in its loop storage chamber while maintaining a small printer mechanical footprint. The transport-presenter holds the document, in its loop chamber, to prevent user disturbance of the document (pulling on it) while printing and until it is cut. It also has a unique slip paper drive, which protects against paper wrinkling, and jamming, if the output slot is blocked during the document delivery cycle. These two levels of user output isolation are required for most remote kiosk applications.

The Transport-Presenter is designed to deliver the document to the user directly through the enclosure wall of the kiosk. Mounting of the Transport-Presenter away from the output wall of the kiosk enclosure can create a potential paper jam pocket in this forward area (see section 2.4). This circumstance should be avoided. The Transport-Presenter needs to be in control of the document, at all times, in order to accomplish its intended function.

Fan-folded, perforated paper stock can be used with Transport Presenters, however, intermediate perforations within the body of the document ***are not recommended***. These intermediate perforations have a tendency to fold preventing normal looping formation and can cause paper jams.

The non-disposing transport-presenter mode addresses the first three Output Deliver Challenges (see section 2.1) and with host software managing the document delivery or with the support of the

printer's selectable document purge options (EEPROM parameter), the fourth challenge can be substantially managed. Its compact mechanical profile and the ability to safely deliver the documents, through the wall of the enclosure, directly to the end user, are the reasons this output option is used in most kiosk applications.

2.2.5.2 Cutter with Disposing Transport-Presenter Operation

The optional, disposing mode of the Transport-Presenter provides all the functions of the non-disposing mode with the additional ability to retract an untaken document for discarding inside a disposal chamber within the kiosk. In this mode a Disposing Transport-Presenter can avoid litter or prevent a document with sensitive information from reaching the wrong hands.

The Cutter with Disposing Transport-Presenter operated in dispose mode offers the highest level of output delivery function. When supported with a dispose chamber it addresses all Output Deliver Challenges (see section 2.1).

2.3 Transport-Presenter Deployment Requirements

2.3.1 Loop Storage Chamber

Both the standard or disposing transport-presenter's paper loop can store any reasonable size document during the print and cut cycles. Loop formation space must be allocated, below the printer, to store the maximum expected document without interference. The loop clearance, below the transport-presenter's sheet metal base, is:

0" for documents up to 7" long

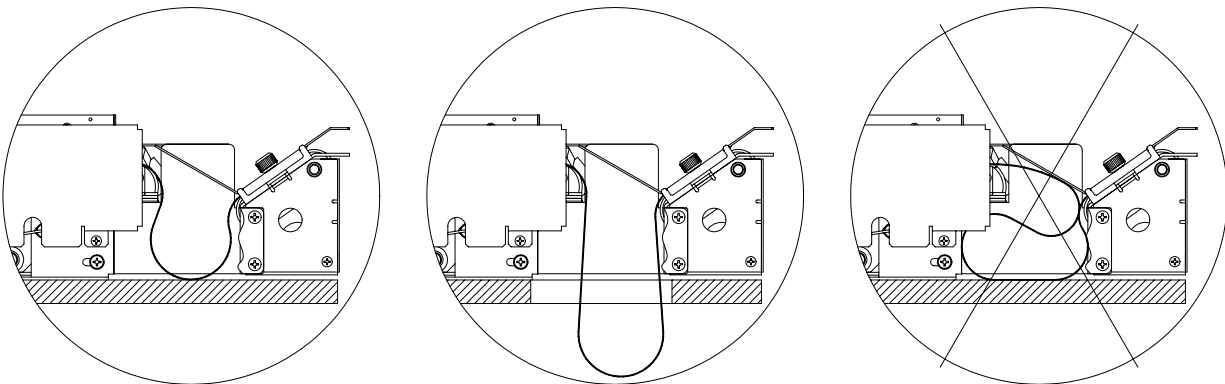
and ~1/2" for each additional inch of document length longer than 7":

Clearance $\approx (\text{Doc_Length}'' - 7'') * 0.5''$

Note: for Doc_Length'' < 7'', Clearance = 0''.

For example, an 11" document will require 2.0" of clearance, a 17" document will require 5.0" of clearance. For a large size loop chamber, some chamber to paper loop interference can be tolerated (a slight radial tire look to the formed paper loop), however, this must be evaluated, by the system application engineer. Loop formation interference can cause paper jams or unreliable document delivery (presentation).

The following figures show the formation of the paper loop. The left most figure shows a loop being formed without a cutout under the Loop Storage Chamber. This configuration can handle a document of approximately 7.0 inches (178 mm) without loop chamber interference. The center figure shows the most flexible configuration where a cutout (see section 4) provides loop formation clearance for the largest document to be printed. The right most figure shows **significant loop chamber interference that must be avoided**

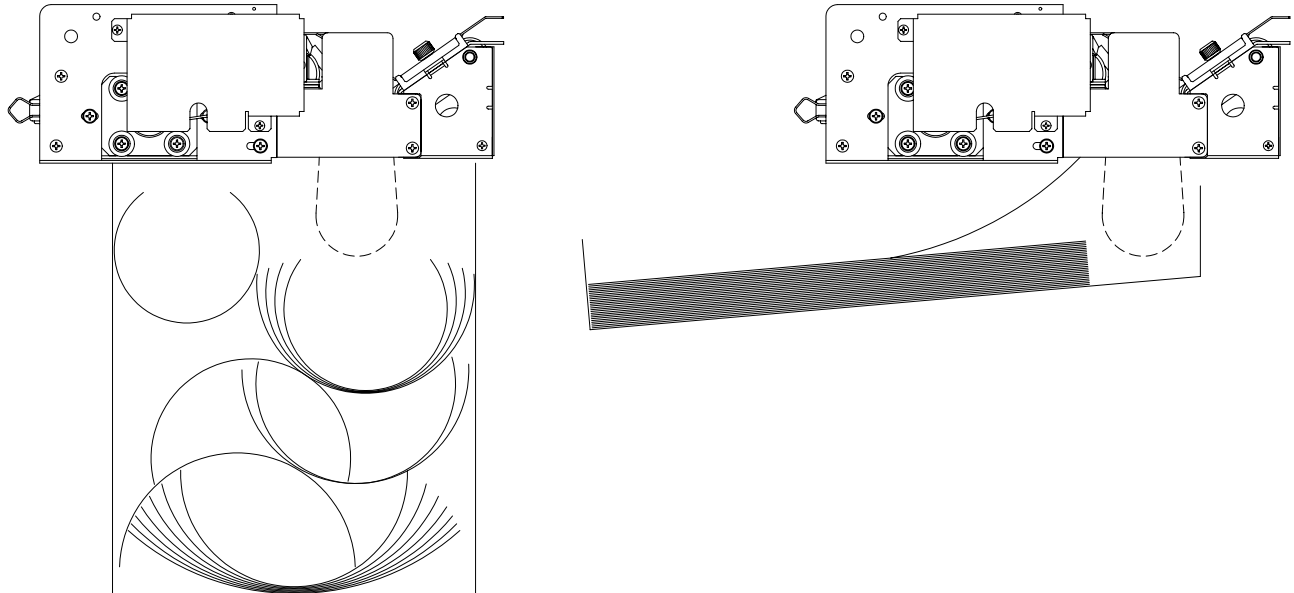


2.3.2 Dispose Storage Chamber

If the Disposing Transport-Presenter operation is to be used by selecting this operation, in the printer's option (EEPROM parameter) to enable disposing, then both a loop storage chamber and an access to the disposed document chamber area for retracted documents *must* be provided.

The disposed document storage chamber must be sized to provide adequate space for the expected usage. If the space is not adequate, or it is left to overflow, it can cause the normal delivery of documents to jam. Disposed documents that have a curl (as from a roll paper supply) tend to fall and stack uniformly when the paper roll is large. However, as the roll is depleted and the curl tightens, stacking becomes more random and loose, requiring a greater space for fewer documents (see below left). On the other hand, flat paper (as from a fan folded supply) can be made to stack a large quantity of documents in a small chamber with proper guidance and location of the disposed document (see below right).

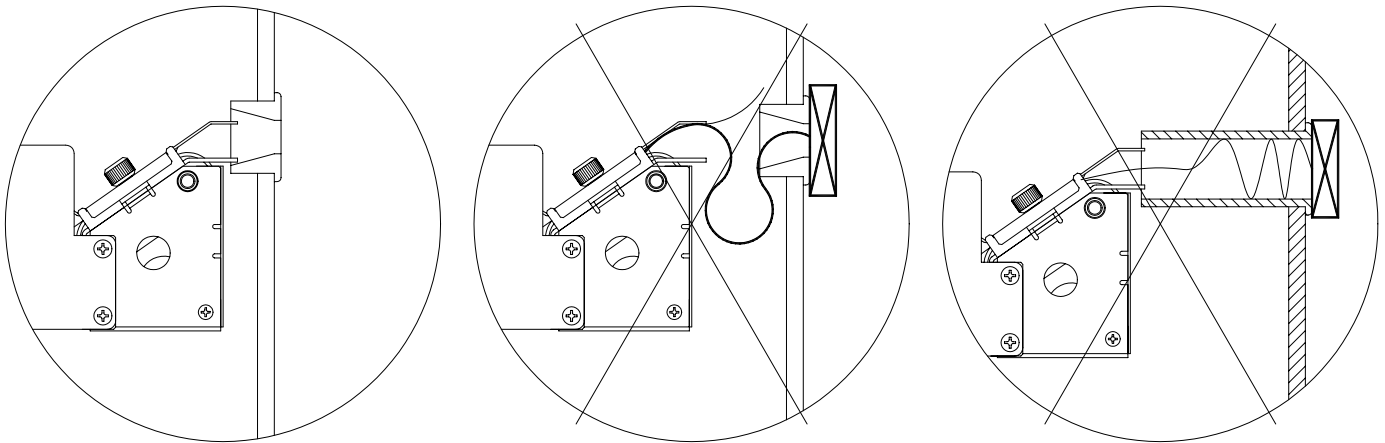
Keep in mind that the movement of paper through any system will result in the generation of static charges. This may not be evident during humid conditions but could cause paper to cling or hang-up in the drop chute when the humidity is low. For this reason, the use of static elimination devices in the dispose drop chute should be considered.



2.4 Output Slot

The kiosk document output slot should be designed to produce a smooth, well-aligned, snag-free delivery of the document from the printer to the user. Allowance should be made for the tight curl that occurs at the end of a roll of paper. A long exit path or one with even modest curves or gaps could be a problem when the curl of the paper is ignored. The distance between the transport-presenter and the document output slot should be kept short to minimize the possibility of paper jams occurring beyond the control of the printer. Consider a mounting arrangement that allows adjustment for any slight misalignment of the printer to the output slot.

The figures below show some dos and don'ts with regard to the output slot. The figure on the left shows a simple exit bezel placed in close proximity to the transport presenter. The center figure shows the same bezel with an open area, between the bezel and the transport presenter, leaving a portion of the paper un-guided. This gap can easily cause the edge of a curled document to snag and prevent it from exiting the kiosk. Additionally, if the document was within the bezel and the exit temporarily blocked, the document could be driven into this open area, leave the control of the transport presenter, jamming the output. The figure on the right shows a longer exit slot with excess clearance for the paper. Although this arrangement may seem desirable, under some conditions, it too can result in paper jams if the output slot is blocked.



3 Printer System Component Mounting

The printer, with its associated system components, cables, paper supply path, paper storage area, output delivery scheme, paper re-supply scheme, etc. need to be planned such that the completed mounting arrangement will be accurate and repeatable to insure that the system will perform reliably.

3.1 Printer Mounting

The printer should be securely mounted in the kiosk to maintain its alignment with the output slot and external paper supply, if used. A means of aligning the printer with the kiosk output slot should be considered. One method of doing this is to mount the printer to a sub-plate with slots sized to compensate for the production tolerances associated with the kiosk design.

3.2 Printer Access

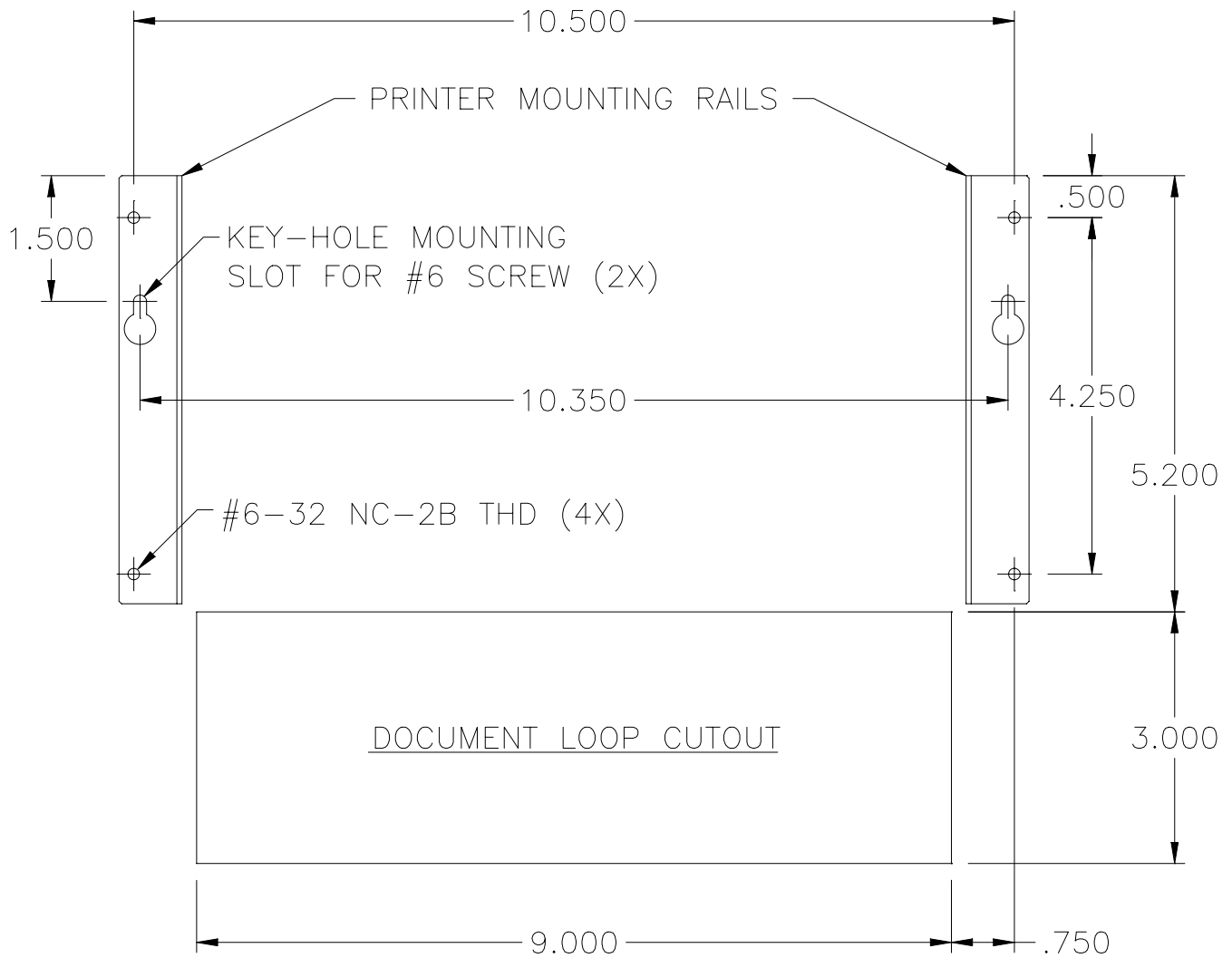
Consideration should be given to printer access early in the design stage of the kiosk. Easy access should be provided for the power switch, switch and display panel, printhead lever and the loading of paper into the printer. This can easily be achieved by mounting the printer on a sliding shelf or drawer so it can be pulled out of the kiosk for paper re-supply, setup or maintenance.

3.3 Cable Placement

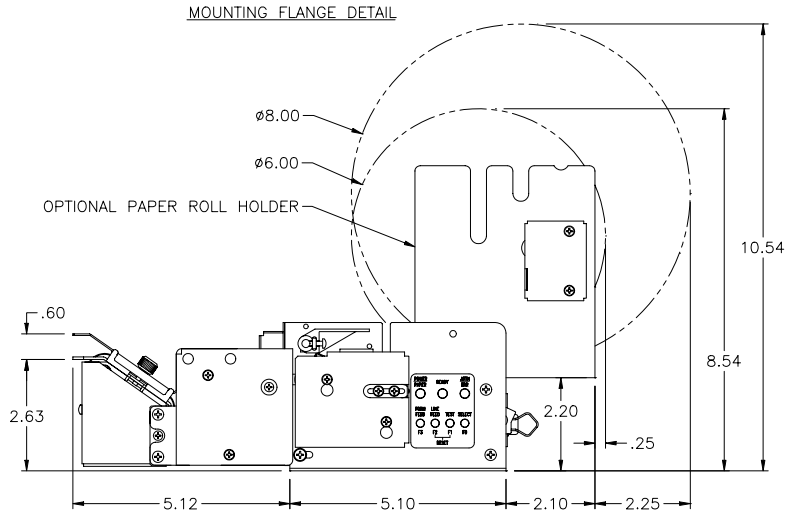
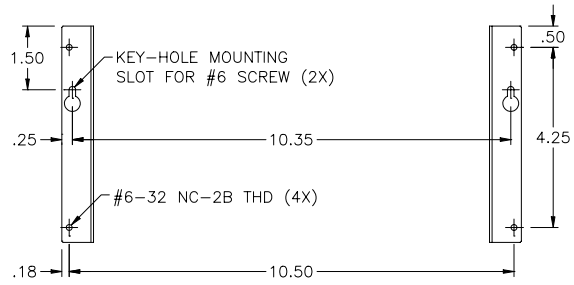
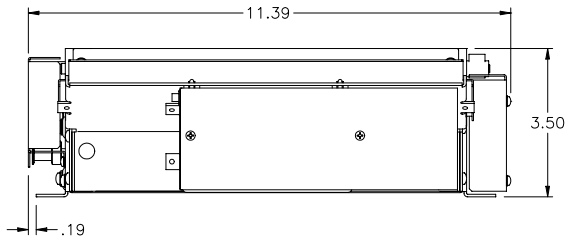
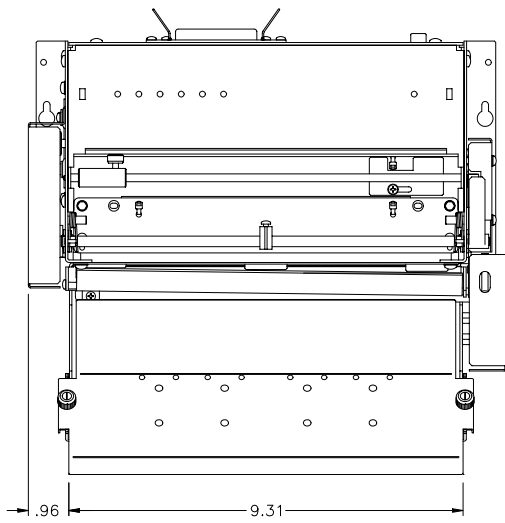
All cables (printer related and other system components) should be routed and secured to prevent them from interfering with the movement of paper through the system.

4 Appendix

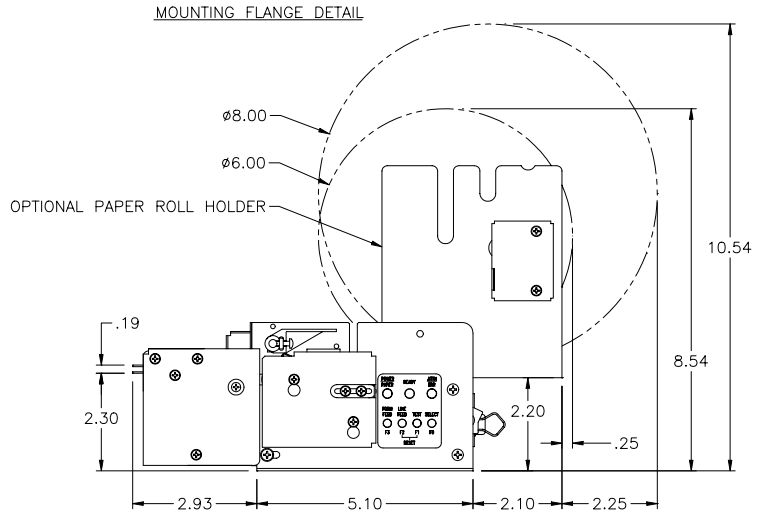
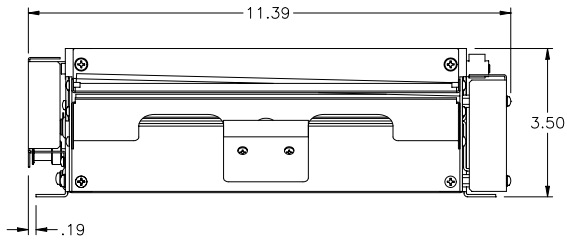
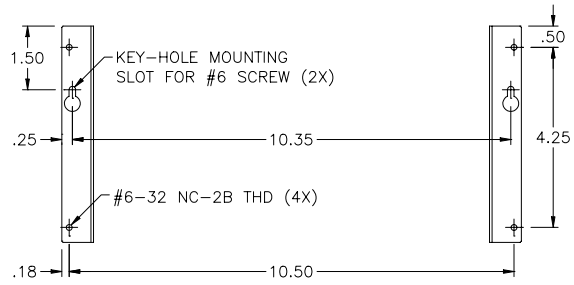
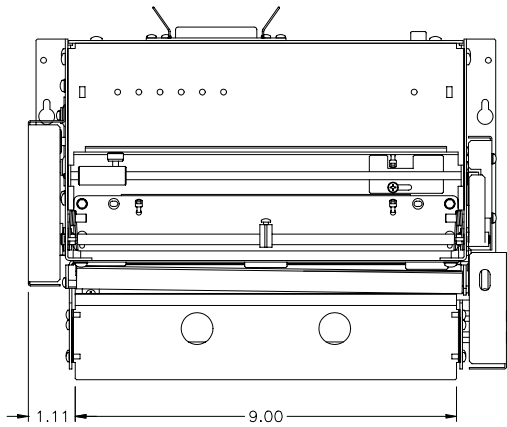
4.1 ITK38 Mounting Hole and Loop Cutout Locations



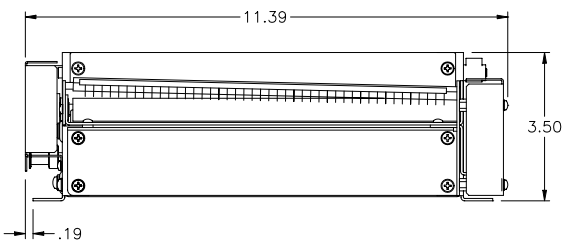
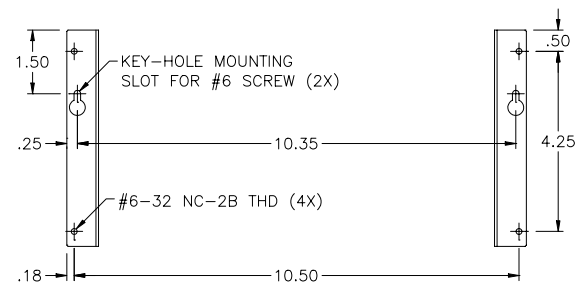
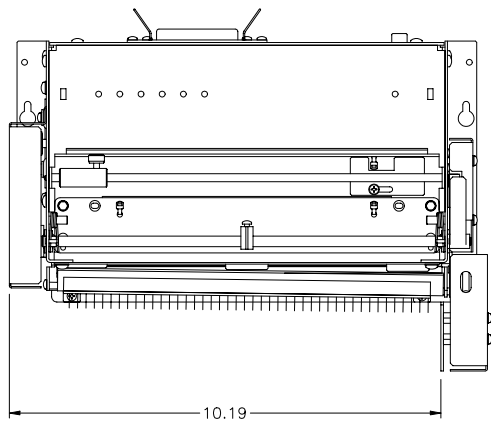
4.2 ITK38 w/Disposing Transport Presenter Option Dimensional Drawing



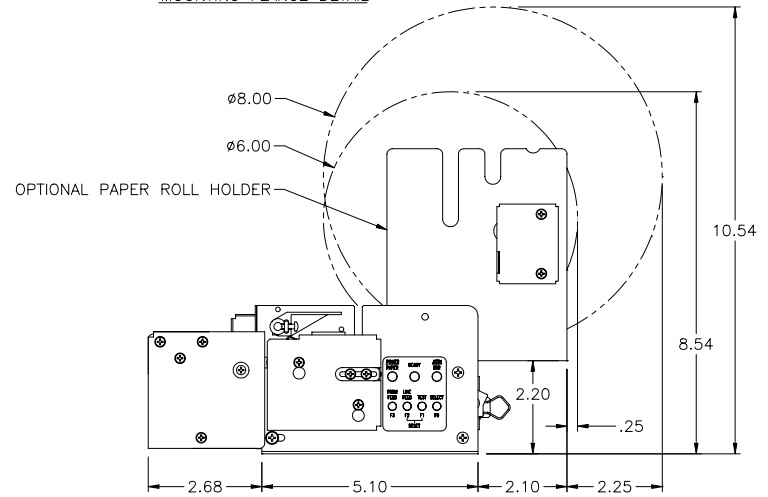
4.3 ITK38 w/Cutter with Jam Resistant Option Dimensional Drawing



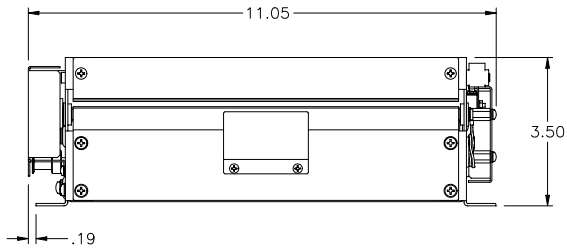
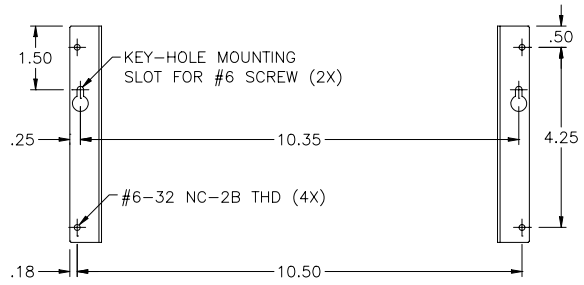
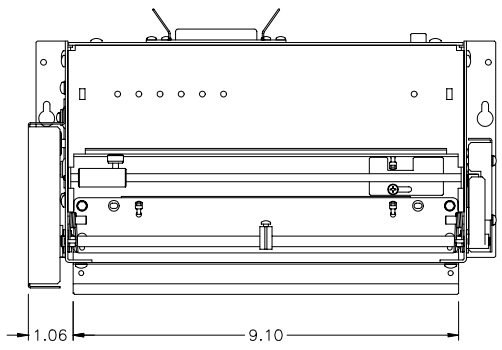
4.4 ITK38 w/Cut and Drop Option Dimensional Drawing



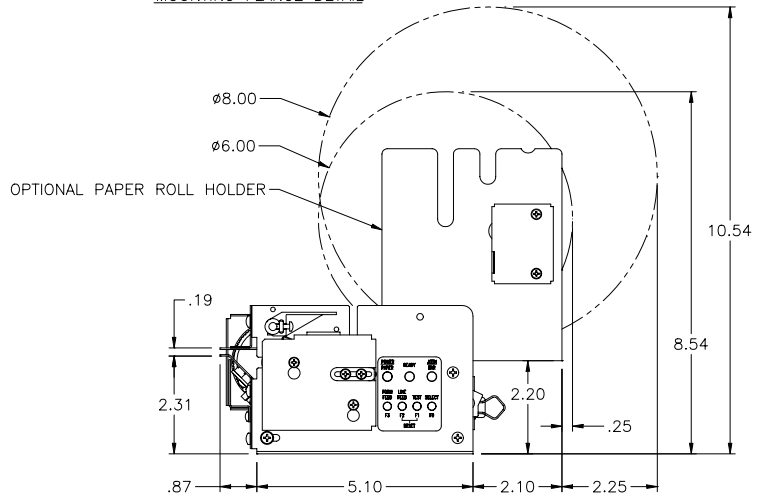
MOUNTING FLANGE DETAIL



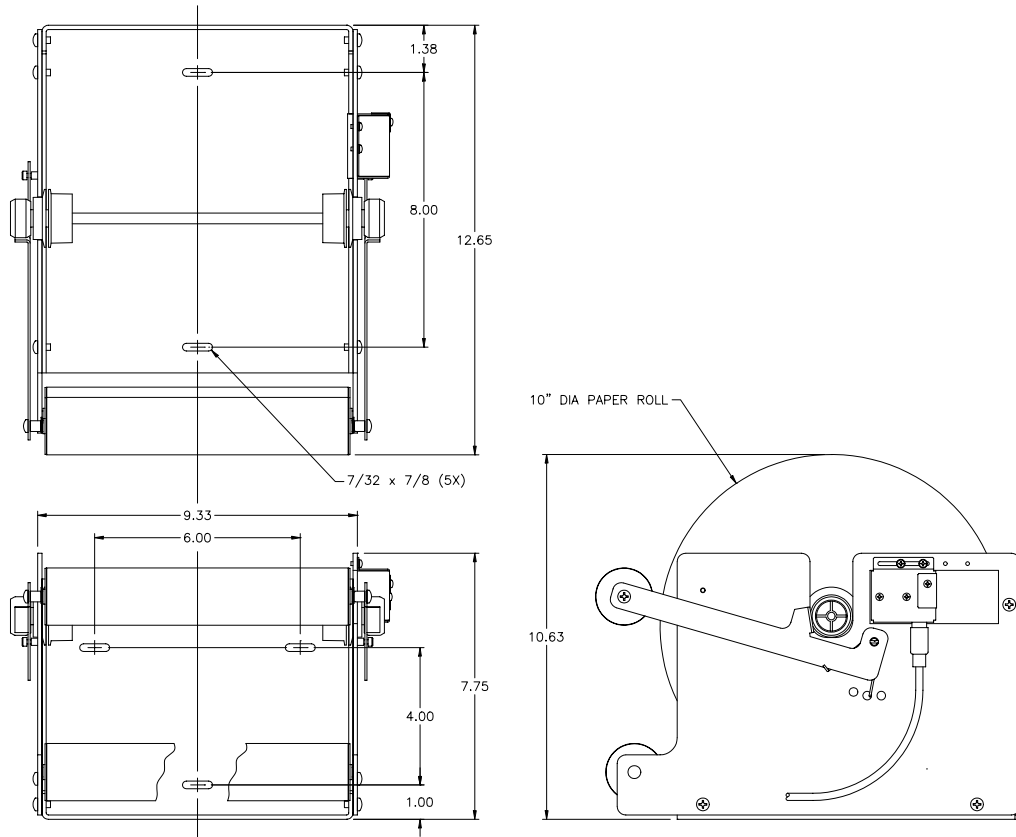
4.5 ITK38 w/ Tearbar Option Dimensional Drawing



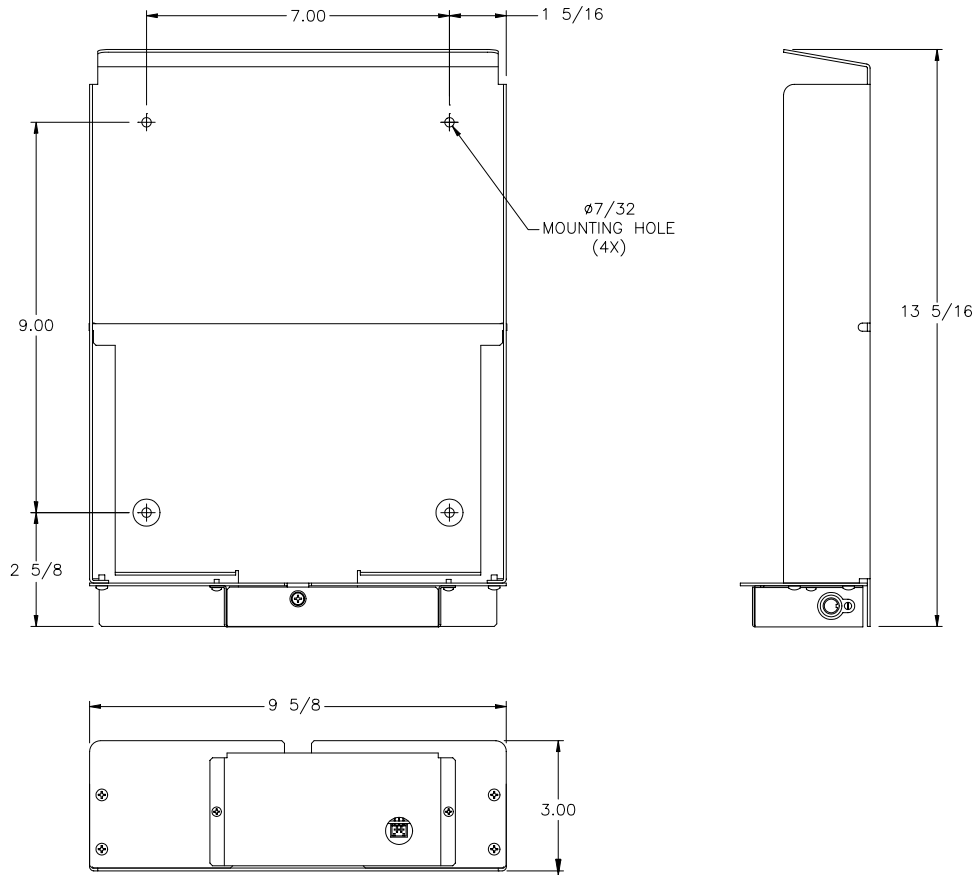
MOUNTING FLANGE DETAIL



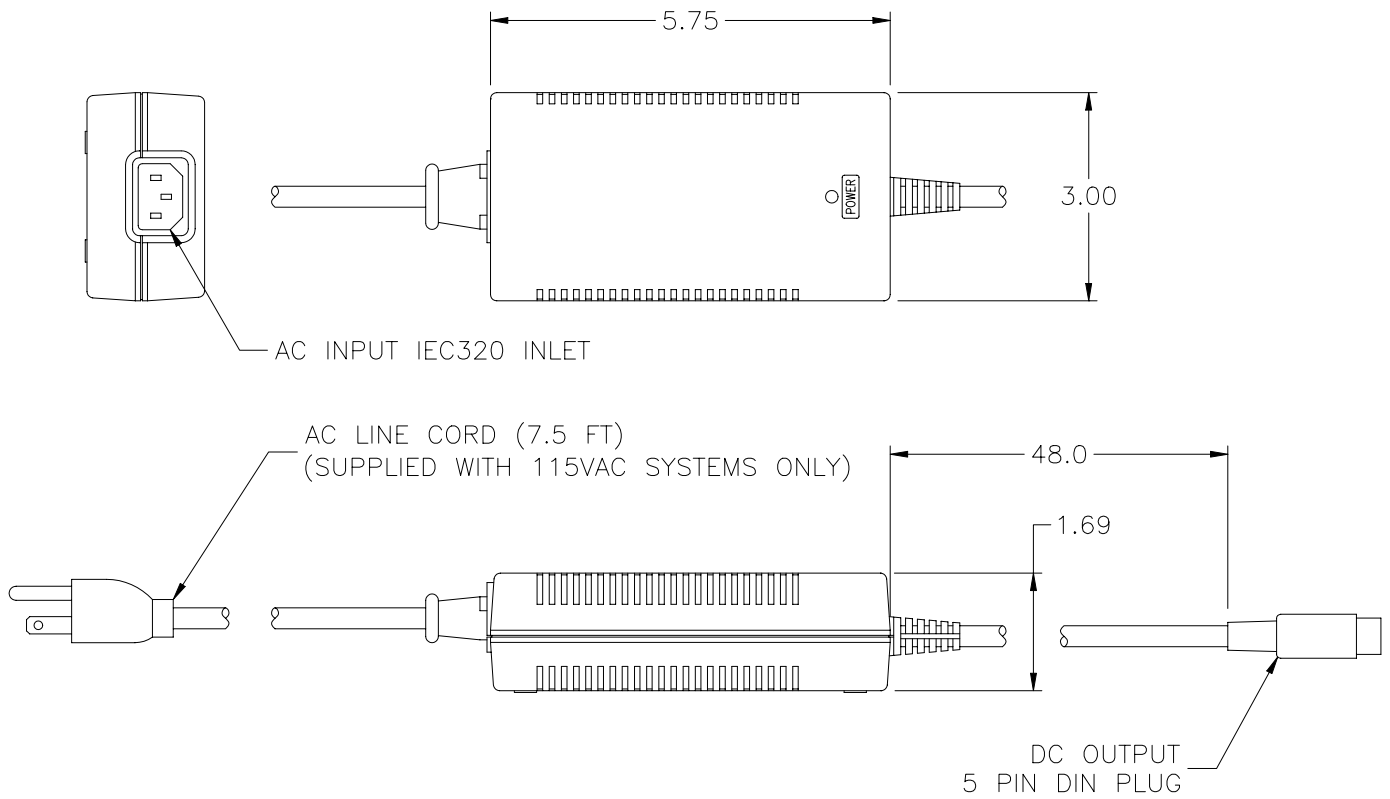
4.6 External 10" Roll Paper Holder Dimensional Holder



4.7 External Fan-Folded Paper Holder Dimensional Drawing



4.8 60 Watt Power Supply Dimensional Drawing



4.9 130 Watt Power Supply Dimensional Drawing

