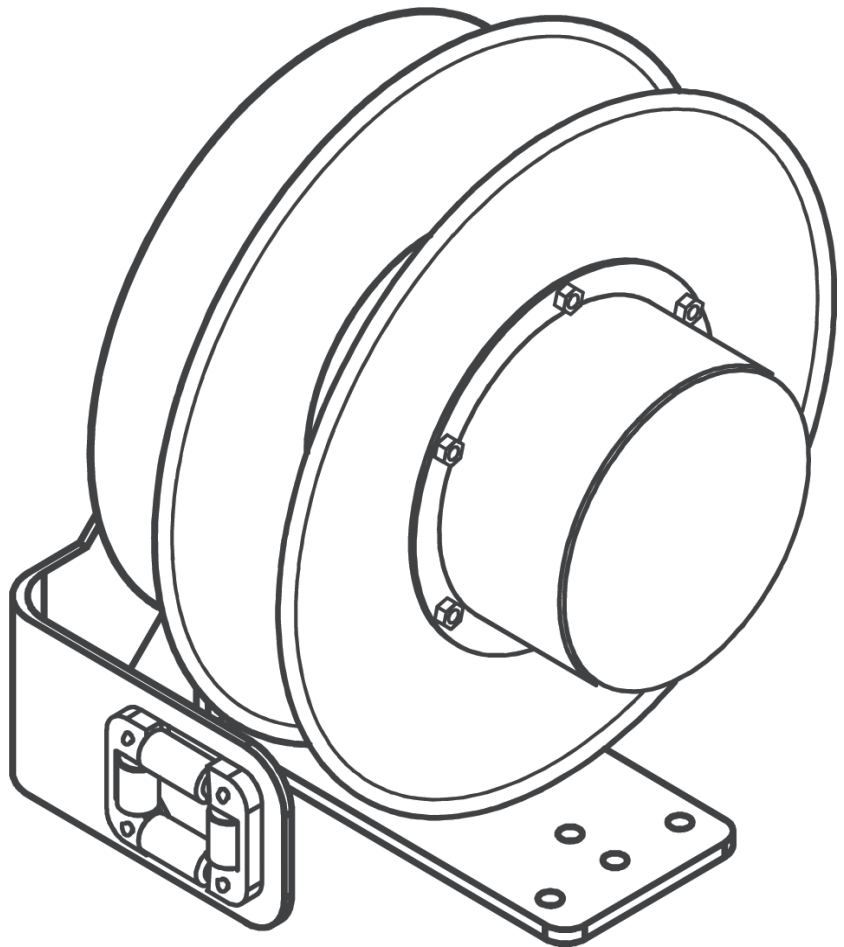




ReelTuff™ RTF Series Cord Reel Manual

Includes all models beginning in the KH's ORF and RTF
Retractable Power Cord Reel Series.



160 Elmview Avenue, Hamburg, New York 14075

Phone: 716-312-0088 - Fax: 716-312-0028
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KH Industries - Terms and Conditions of Sale

1. TERMS AND CONDITIONS OF CONTRACT. Except where otherwise provided in a written agreement duly executed by an authorized signatory of K & H Industries, Inc. ("KH"), all goods and services supplied by KH pursuant to the Confirmation of Order overleaf and these terms and conditions (the "Goods") are provided subject to the details set out in the said Confirmation of Order and to the terms and conditions set forth herein. KH's ACCEPTANCE OF AN ORDER IS EXPRESSLY CONDITIONED UPON BUYER'S ASSENT TO THESE TERMS AND CONDITIONS, AND BUYER'S ACCEPTANCE OF GOODS HEREUNDER SHALL BE DEEMED AN ACCEPTANCE OF THESE TERMS AND CONDITIONS. KH specifically rejects any terms and conditions in Buyer's order or in any other document from Buyer that in any way conflict with, reduce or affect these terms and conditions.

2. PRICES. Unless otherwise agreed in writing, all prices are quoted F.O.B. at KH's premises in Hamburg, New York, USA. All price quotes by KH will remain valid for thirty (30) days. Thereafter, prices are subject to change without notice to Buyer. Typographic, clerical and manifest errors in any offer are subject to correction by KH at any time. The minimum billing per order is \$100 plus freight charges, orders that do not meet this minimum will be subject to a \$25 service charge.

3. PAYMENT TERMS. Payment for all Goods shall be made in U.S. funds and prior to shipment (either by cash, banker's draft, cashier's check, check drawn on good funds, telegraphic transfer or approved credit card) or, at the sole discretion of KH, C.O.D., unless Buyer has applied for and been granted a line of credit by KH, in which case purchases can be made up to approved credit limits with payment therefore due net 30 days. Late payments shall be charged interest at the rate of 1.5% per month. KH is entitled hereunder to delay shipment until payment monies have cleared (e.g. check has become final; credit card charge has been authorized). Credit terms are subject to change or withdrawal at any time at KH's sole discretion, regardless of prior credit arrangements. KH reserves the right to require current financial information from any buyer with an open account as a condition of the continued extension of credit. Buyer shall promptly reimburse KH in respect of KH's costs, including reasonable attorneys' fees, incurred in the collection of any monies owed to KH by Buyer. For orders invoiced or shipped outside the United States, KH will require a confirmed, irrevocable letter of credit, payable at sight in United States funds, advised and payable on an acceptable US bank. Buyer shall be solely responsible for procuring any and all necessary export, import and/or other permits. Buyer's order shall constitute a representation that Buyer is solvent, and KH is relying upon such representation. If KH at any time reasonably believes that the Buyer is insolvent or that the Buyer's credit is impaired, Buyer shall be in material breach thereof and hereof and KH may, without liability to Buyer, withhold performance hereunder, change the payment terms and/or repossess Goods delivered.

4. ADDITIONAL COSTS & TAXES. All prices and quotations are exclusive of sales, use, excise, duty, VAT and all similar taxes and levies. All such charges shall be for the account of Buyer and, if not included in an original invoice, may be invoiced or added to Buyer's credit card payment, if any, by KH at a later date.

5. CHANGES; CANCELLATION OF ORDER. If Buyer cancels or changes the order, or any part thereof, for any reason, Buyer agrees to pay cancellation charges for all costs incurred by KH due to such cancellation, including without limitation, costs incurred by KH in the design, development or manufacture of special, custom-made or custom-designed Goods, or Goods altered at the request of Buyer (plus related profit, as reasonably determined by KH.) The costs shall include commitments made by KH to third parties for labor or materials for use in completing such order. KH's determination of cancellation charges shall be final and conclusive.

6. SHIPPING. Title in Goods and risk of loss or damage thereto shall pass to Buyer upon delivery thereof by KH to the carrier at FOB point. Goods shall be shipped in accordance with the information set out in the Confirmation of Order overleaf. Unless instructed otherwise by Buyer, KH may ship by any reasonable manner and routing. All shipping costs shall be for the account of Buyer. All shipments shall be insured for their full replacement value and all such insurance shall be for the account of Buyer. All orders are subject to KH's current shipping and handling charges. KH shall not be liable or otherwise responsible for defaults or delays in delivery by carrier. Shipping dates set out on the Confirmation of Order are approximations only, subject to, inter alia, factory schedules and inventory. If any shipment of Goods is delayed due to any act or omission of Buyer, KH may charge Buyer reasonable storage fees in relation thereto, including without limitation, storage costs, insurance costs and cost of money. Unless otherwise agreed by KH in writing, KH, in its sole discretion, may make partial shipments of any order, for which pro rata payments shall be due and payable as indicated on the invoice issued pursuant thereto. KH reserves the right not to ship to Buyer if Buyer's account is overdue.

7. ACCEPTANCE OF GOODS. Buyer acknowledges that it has a duty to inspect Goods immediately upon receipt. Goods will be deemed accepted by Buyer unless notice of lawful rejection has been delivered in writing to KH within ten (10) business days after receipt thereof. Any

notice of shortage must be delivered in writing to KH within three (3) business days after receipt thereof by Buyer. Any notice of damage to Goods must be delivered in writing to KH and the relevant carrier within three (3) business days after receipt thereof by Buyer.

Authorization from KH must be received by Buyer in writing prior to the return of any Goods by Buyer hereunder, and Buyer shall be solely responsible for adequate packing and pre-payment of freight with respect thereto. For the avoidance of doubt, KH shall not be obligated to accept any unauthorized return of Goods, any Goods inadequately packed or Goods for which freight has not been fully pre-paid by Buyer.

8. RETURNED GOODS. KH may, at its sole option, agree to accept unused and merchantable Goods from Buyer, subject always to a re-stocking charge of 20%. Buyer agrees that it shall not return any Goods prior to receiving written authorization from KH so to do. Any and all returned Goods shall be shipped freight pre-paid and risk of damage or loss shall remain vested in Buyer until the relevant Goods are received, inspected and accepted by KH. For the avoidance of doubt, KH is not obligated to accept any returned Goods pursuant to this paragraph. Custom manufactured Goods are non-cancelable/non-returnable.

9. RE-CONDITION & REPAIR. Before shipping any Goods to KH for repair, Buyer shall contact KH for Return Merchandise Authorization (RMA) and shipping instructions. With respect to any repairs by KH, Buyer shall be solely responsible for payment of freight charges, replacement parts, and labor costs at KH's then current prices. Any repairs to any of the Goods performed by Buyer or by third parties [pre-approved by KH] shall be carried out in strict accordance with the applicable repair manual(s), if any, published by KH from time to time.

10. LIMITED WARRANTY; EXCLUSION OF OTHER WARRANTIES; LIMITATION OF REMEDIES; INDEMNITY. KH warrants the Goods to be free from defects of materials or workmanship, under normal and proper use and service, for a warranty period of one (1) year from the date of shipment (as such date is shown in KH's records)(the "Warranty Period"). If any of the Goods proves to be defective in any material respect within the Warranty Period, such defective Good(s) shall be promptly returned to KH, F.O.B. KH's factory, shipping charges prepaid, by the Buyer, and if the same is determined by KH to be defective in any material respect and covered by the terms of the warranty provisions set forth in this Section 10, it will be replaced or repaired, at the exclusive election of KH, free of charge. If Buyer believes any of the Goods are defective in any material respect during the Warranty Period, Buyer shall immediately cease using such Good(s) and notify KH in writing of such non-conformity or defect, specifying in reasonable detail the nature thereof.

Notwithstanding the foregoing, KH is not responsible for, and shall have no obligation to replace or repair any Goods which: (i) have been used, operated and/or installed other than in strict accordance with KH's written instructions and/or policies, if any; (ii) have been installed, operated or used in an improper, abnormal or inappropriate manner, as reasonably determined by KH; (iii) have been damaged due to the negligence of another party; (iv) have been damaged due to an accident, natural disaster, extreme weather, or other act of God; (v) have been serviced, repaired or altered by anyone other than KH or a third party approved by KH to service or repair the defective or damaged Goods, and provided further, that all such service, repair and alterations by approved third parties must be completed in accordance with the applicable repair manual(s) for the defective or damaged Good, if any; or (vi) have been used in a manner or for a purpose for which the Goods were not designed.

No warranty is made with respect to any defects in the Goods due to plans or instructions supplied to KH by or for Buyer. THE LIMITED WARRANTY SET FORTH IN THIS SECTION 10 IS MADE AND ACCEPTED BY BUYER IN LIEU OF ALL OTHER WARRANTIES WITH RESPECT TO THE GOODS, WHETHER EXPRESS OR IMPLIED, MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. THE LIMITED WARRANTY SET FORTH IN THIS SECTION 10 IS BUYER'S SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTS OR DAMAGE TO THE GOODS, AND ALL OTHER REMEDIES ARE EXPRESSLY DISCLAIMED.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, KH IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION OF THE GOODS, OR UNDER ANY OTHER LEGAL THEORY, INCLUDING BUT NOT LIMITED TO LOSS OF USE; LOSS OF REVENUE; LOSS OF ACTUAL OR ANTICIPATED PROFITS (INCLUDING LOSS OF PROFITS ON CONTRACTS); LOSS OF THE USE OF MONEY; LOSS OF ANTICIPATED SAVINGS; LOSS OF BUSINESS; LOSS OF OPPORTUNITY; LOSS OF GOODWILL; OR LOSS OF REPUTATION.

Buyer acknowledges that the Goods may be used in inherently dangerous activities and, accordingly, expressly bears the risk of injury damages and other harm to Buyer, and its employees, contractors, representatives, and other third parties arising out of use of the Goods in such inherently dangerous activity(ies). Buyer agrees to indemnify and hold KH harmless from and against any claims, awards, damages or other costs incurred by KH, including reasonable attorneys' fees incurred by KH in connection with same, arising out of the use of any Good(s) in inherently dangerous activities. While KH uses reasonable endeavors to ensure the accuracy and quality of its publications, sales literature and other printed materials, from

time to time errors might occur in that regard. KH therefore does not guarantee the accuracy or completeness of any publication or other informational materials.

11. INTELLECTUAL PROPERTY. The purchase by Buyer of any Goods hereunder does not grant to, convey or confer upon Buyer or Buyer's customers, or upon anyone claiming under Buyer, a license or any other legal interest, express or implied, under any patent right, trademark, copyright or other intellectual property right, whether registered or not and whether pending or not, in any jurisdiction, of KH covering or relating to any of the Goods or any combination or process in which any of the Goods might be or are used.

Buyer understands and agrees that KH does not warrant that the Goods are free of claims of patent, trademark, trade secret or copyright infringement by a third party. KH hereby disclaims any such warranties or indemnification for such infringement(s) or intellectual property rights. Any rights not expressly granted herein are reserved by KH.

12. FORCE MAJEURE. KH shall not be liable for any failure to perform under the Confirmation of Order or these terms and conditions if it is unable to obtain parts or supplies at reasonable prices or through usual and regular sources on a timely basis, or due to any interruption of transportation, government regulation, labor disputes, strikes, riots, war, civil commotion, fire, flood, accident, storm, or act of God, or other cause beyond KH's reasonable control that renders it impractical for KH to perform.

13. ARBITRATION. Buyer agrees that the laws of the State of New York, without regard to principles of conflict of laws, shall govern the agreement between KH and Buyer with respect to all sales of Goods, and any dispute of any sort that may arise in connection with these terms and conditions and the sale of Goods to Buyer by KH (a "Dispute"). All Disputes shall be submitted to final and binding arbitration, the proceedings of which shall be located in Buffalo, New York, and conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association (the "Rules") by one arbitrator appointed in accordance with the Rules. Notwithstanding the foregoing, Buyer acknowledges that KH may, in its sole discretion, elect to commence an action in a court of competent jurisdiction located in Buffalo, New York (without resorting to commencing arbitration proceedings as specified above) to enforce Buyer's failure to timely pay any and all amounts due to KH for the purchase of Goods (a "Financial Default"). In connection with the foregoing, in the event KH elects to commence an action against Buyer in connection with a Financial Default, Buyer specifically acknowledges and irrevocably consents to the jurisdiction of a court of competent jurisdiction located in Buffalo, New York, waives objection to the laying of venue of any such action or other legal proceeding in Buffalo, New York, waives personal service of process in such action, and consents to the making of service of process in each such action by registered mail, directed by KH to the last known address of Buyer showing in the records for KH, service to be deemed complete five (5) days after the mailing thereof.

Other than a Financial Default (in which case KH may, in its discretion, elect to commence a lawsuit against Buyer in a court of competent jurisdiction located in Buffalo, New York), all Disputes shall be resolved exclusively by arbitration. Any award made by the arbitrator shall be final, binding and conclusive on the parties for all purposes. Any fees or charges of the arbitration and any cost of arbitration, including the cost of personal attorneys of each participant, shall be the sole responsibility of each party to the arbitration; provided, however, in the event of a Financial Default, KH may recover all costs and expenses incurred by it (including its attorney fees) in seeking payment or enforcement of these Terms and Conditions as a result of the Financial Default, including whether KH commences an action or initiates arbitration proceedings.

14. GENERAL. This agreement will be governed by and construed in accordance with the laws of the State of New York. The application of the United Nations Convention for the International Sale of Goods, if it would otherwise apply, is hereby expressly excluded. These terms and conditions and the Confirmation of Order overleaf set out the entire agreement between KH and Buyer relating to the Goods and supersede any prior agreement, arrangement, purchase order, correspondence, communication, advertising or representation concerning the Goods. This agreement may not be modified or amended except by a written instrument duly executed by authorized signatories of the parties. If any provision of this agreement is held to be invalid or unenforceable, that provision is to be given effect to the maximum extent permissible and the remaining provisions of this agreement will remain in full force and effect. Notices hereunder shall be delivered in writing by registered mail to the addresses of the parties overleaf, or as notified to the other party from time to time. If any term, provision, or covenant of these terms and conditions is held to be invalid void, or unenforceable, the remainder of these terms and conditions shall remain in full force and effect and shall in no way be affected, impaired or invalidated. Each shipment of Goods shall be considered a separate transaction between Buyer and KH. In the event of any default by Buyer, KH may decline to make further shipments. If KH elects to continue to make shipments of Goods subsequently ordered by Buyer after a default, such subsequent shipments shall not constitute a waiver of default by KH or in any way affect its legal remedies for any such default.

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- 1.2 Operational Warnings
- 1.3 Maintenance Warnings
- 1.4 Electrical Rating
- 1.5 Labels

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- 2.2 Mounting (w/ or w/o Pivot Base)
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RECORD

The catalog number of the reel and the serial number of the reel are required when ordering replacement parts or discussing the reel with the factory. Please record this information now in the spaces provided below.

CATALOG NO. OF REEL _____

SERIAL NO. _____

DATE INSTALLED _____

1.1 Electrical Warnings

1.1.1 Properly ground equipment before use in accordance with both the National Electric Code and local electrical codes and ordinances.

1.1.2 Disconnect electrical power from the cable reel before performing any service functions.

1.1.3 Do not use cable reel for loads greater than the current rating listed on the label and voltage greater than 600V. The ampacity (current) rating of the cable must be in accordance with the National Electric Code.

1.1.4 Electrical wiring on the reel must be done by a qualified electrician. These reels are provided with a full feeder cable.

1.2 Operational Warnings

1.2.1 Exercise care when handling the cable reel during normal operation. This cable reel has a rotating spool powered by springs under tension.

1.2.2 Do not allow the cable to retract without restraining the retraction speed.

1.2.3 Do not disassemble the spring motor for any reason.

Serious personal injury could result. This cable reel is equipped with springs under tension. Contact the factory for assistance:

Call: 1-716-312-0088

1.3 Maintenance Warnings

1.3.1 Do not use cable different from that for which the reel is intended. Changes in diameter, weight per foot, length of cable or flexibility will affect the operation of the reel.

1.3.2 Mounting hardware and fasteners should be installed to maintain tightness under vibration and checked periodically to assure tightness.

1.3.3 Overhead installation mountings should be such that the reel is not suspended by bolts in tension. A safety chain or cable is strongly recommended to minimize damage and/or possible injury in the event of mounting failure.

1.3.4 **WARNING:** Modification of this equipment may cause excessive wear and will void the warranty. Contact the manufacturer regarding changes or modifications of equipment which could affect reliability or safety.

1.0 Safety

1.4 Electrical Ratings

1.5.1 Reels Equipped with or without Cable

1.5.1.1 All RTF Series reels with or without cable are rated and should not be used at voltages and or amperges above the rating on the reel. Please consult the factory prior to making any changes in volts and amps of cable, as change could affect reliability or safety.

(See Section 1.3.4)

* Denotes these cables are welding cables.

SOW-A (90°C) or SOOW-A (105°C)			
Cable AWG / # of Cond.	Ampacity	Cable AWG / # of Cond.	Ampacity
16/2	10.0	12/2	20.0
16/3	10.0	12/3	20.0
16/4	8.0	12/4	16.0
16/5	8.0	12/5	16.0
16/6	7.0	12/6	16.0
16/7	7.0	12/7	14.0
16/8	5.0	12/8	14.0
16/10	5.0	10/2	25.0
16/12	5.0	10/3	25.0
14/2	15.0	10/4	20.0
14/3	15.0	10/5	20.0
14/4	12.0	10/6	20.0
14/5	12.0	6/1*	95
14/6	12.0	4/1*	150
14/7	10.5	2/1*	200
14/8	10.5	1/1*	250
14/10	7.5	1/0/1*	350
14/12	7.5	2/0/1*	450

Table 1

1.5 Labels

1.5.1 Every cable reel is marked with a label on the base which includes the KH Industries name and logo, the product catalog number and the individual product serial number, NEMA rating, Amps, Volts, Watts and Cable Footage.

1.5.2 The maximum cable footage, amperage and voltage rating for every cable reel supplied without cable is marked on the KH Industries Identification Label. The actual cable installed should not differ from what is indicated on the KH Industries label. If the cable must be different please consult the factory prior to installing the cable to ensure the change will not affect the reliability of the reel or the safety of the people working with the reel.

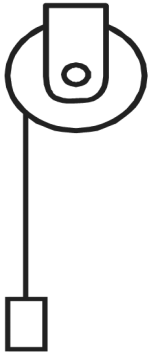
2.0 Installation

2.1 Application Types

2.1.1 Stretch Applications



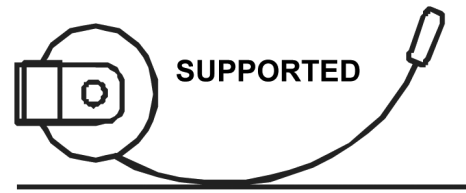
2.1.1.1 The cable is suspended without any intermediate support. Stretch reels generally require a line pull equal to two times the weight of the cable, which allows approximately 10% sag at full extension. On long applications where sag cannot be tolerated, it is sometimes desirable to put supports at intervals of 5 to 10 feet.



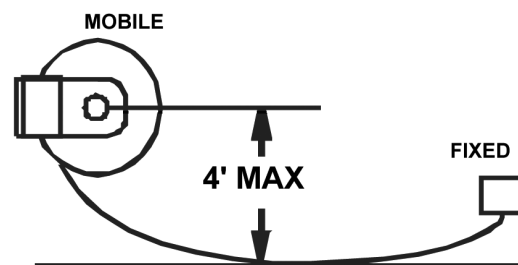
2.1.2 Lift Applications

2.1.2.1 The cable is lifted vertically in lift applications. The reel is normally designed to handle only the total weight of the cable. Some lift applications may require ball stops to control the length of cable to be retracted.

2.1.3 Drag Applications



2.1.3.1 The reel is mounted on a stationary object and is required to drag the cable over the surface to the reel. The cable is supported by the ground or some type of cable tray. A ball stop may be required.



2.1.4 Retrieve Applications

2.1.4.1 The reel is Mounted on the moving object and winds up or pays out the cable as the machine approaches or moves away from the fixed end. Retrieve applications can be elevated up to 4 feet from the cable support surface.

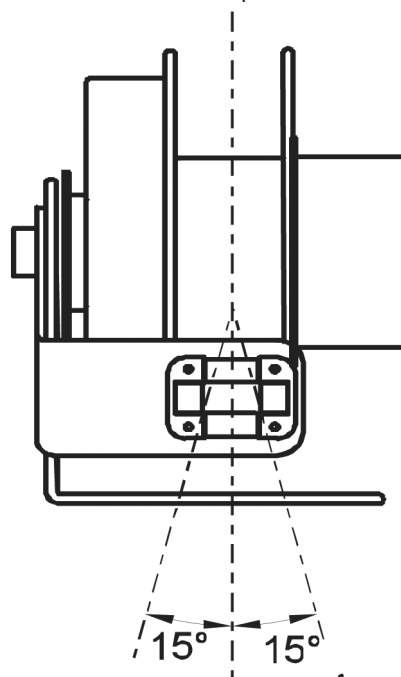
2.2 Mounting

2.2.1 Standard Mounting

2.2.1.1 The reel may be mounted by bolting the base to any flat surface which is structurally sound enough to support it and the forces of winding and unwinding the cable.

2.2.1.2 The spool drum must rotate on a level horizontal axis.

2.2.1.3 Position the guide arm so that cable payout is perpendicular to the face of cable roller guide. The total cable deflection should not exceed 15° to either side of the center line of the spool.



2.2.1.4 If deflection is constant to either side of the reel and operation is impaired re-mount the reel.

2.2.1.5 If the angle of deflection exceeds 15° a Pivot Base should be used, otherwise excessive cable wear and unreliable operation will result.

2.2.1.6 A safety chain or cable is recommended for all overhead installations. Attach the safety chain using the 0.39 hole provided in the base. (See figure 2.3 on Page 7)

Fig. 2.2 Cable Deflection with Roller

2.0 Installation

2.2.2 Pivot Base Mounting

2.2.2.1 All RTF Series Cable Reels can be furnished with a pivot base to allow the reel to rotate and keep the extended cable perpendicular to the application.

2.2.2.2 The PVB Pivot Base has the ability to rotate up to 345°. Travel can be limited to 90°, 180°, or 270° by installing an additional roll pin in the appropriate available hole. This Pivot Base is not suitable for applications requiring continuous rotation.

2.2.2.3 A pivot base is required in carousel or loop-track applications.

2.2.2.4 When a pivot base is used, the reel must be mounted horizontally ("ceiling" or "floor" mounted).

2.2.2.5 The Roller Guide should be mounted so the cable will travel perpendicular to the axis of rotation. This will guard against the cable twisting and ensure effective swivel action from the pivot base.

2.2.2.6 Selection of mounting holes should be such that the spool center is in line with the center point of the pivot base.

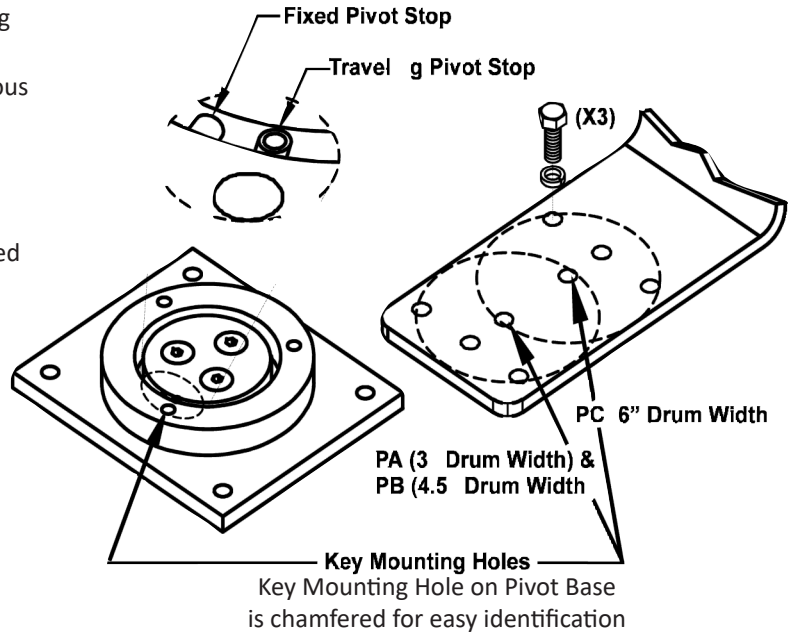


Fig.2.2.2

2.3 Roller Guide

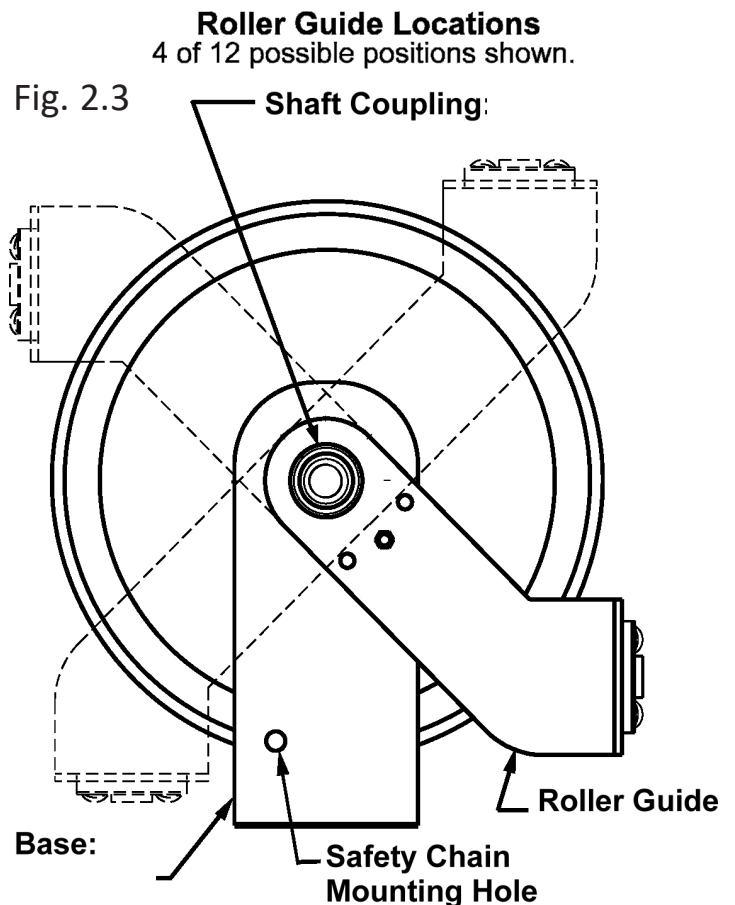
2.3.1 All RTF Series units are equipped with a roller guide. The function of the guide is to center the cable on the spool and to help the reel wrap cable more evenly.

2.3.2 The cable should not bear against either end of the spool during winding as this will tend to inhibit level winding of the cable.

2.3.3 The guide should be secured at the best of twelve possible positions so that a minimum change of direction occurs at the guide; otherwise, cable life will be reduced.

2.3.4 The guide is shipped installed on the reel. The guide must be aligned per application and secured prior to making any electrical connections.

2.3.4.1 Mount the roller guide to the reel over the entrance coupling on the frame. Secure using the provided 5/16-18 hex head cap screw, including the spring-type lock washer. Torque this screw to 15 ft-lbs.



2.4 RATCHET

2.4.1 Ratchet Lock

2.4.1.1 The ratchet lock can be engaged or disengaged, depending upon the application.

2.4.2 Operation with Ratchet

2.4.2.1 The ratchet pawl is spring loaded. It is designed to function in all acceptable mounting configurations.

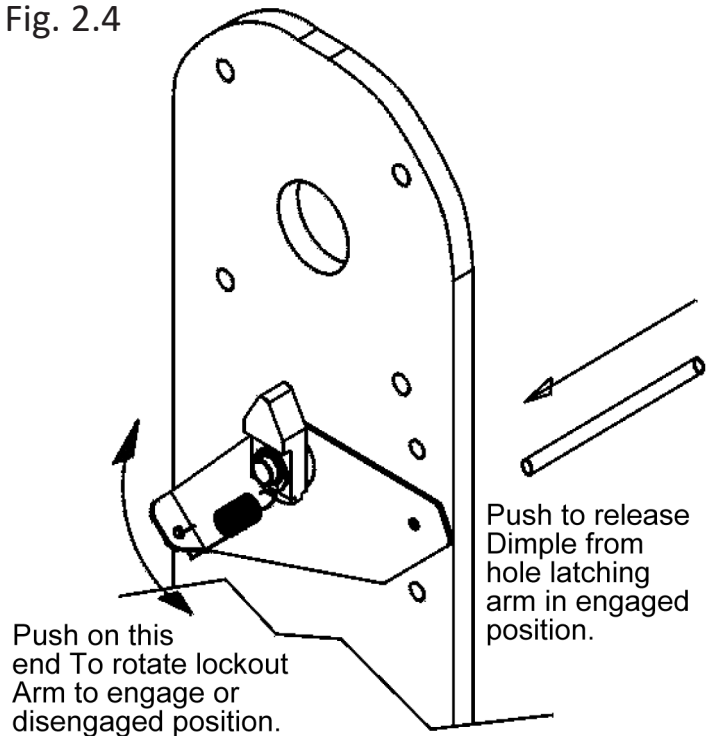
2.4.2.2 A slight pull on cable will disengage the ratchet.

2.4.3 Operation without Ratchet

2.4.3.1 Disengage the ratchet by pivoting the lock-out bar to the lower position. This will remove the ratchet pawl from the path of the ratchet plate. Locate the dimple on the lock-out bar in the hole provided.

2.4.3.2 **WARNING:** Do not engage the ratchet abruptly. Sudden engagement may cause excessive shock loads to the ratchet pawl.

Fig. 2.4



2.5 Cable Installation

2.5.1 Either of two methods for installing cable on the reel may be used. The first method is to simply lay the cable out straight along the path of travel and wrap onto the reel. The second method requires using a support for the cable being wrapped (see Figure 2, page 9). In either method, it is important that the cable not twist or loop.

2.5.2 Remove the (6) nuts securing the slip ring cover. Remove cover and gasket. Reinstall (2) nuts finger tight to hold the flange in place.

2.5.3 Loosen the set screw (1/8" Allen Wrench) at the base of the slip ring stack and remove the slip ring.

2.5.4 Strip the cable jacket back approximately 10" from end of cable and thread it through the cable entrance watertight into the drum of the reel. We recommend a cable-tie on 16 AWG, 2 and 3 conductor cable (see Figure 1 on page 9).

2.5.5 Install the rubber grommet, gripper ring, and the watertight nut. Tighten the nut to secure the cable.

2.5.6 Extend the conductors out of the drum. Reinstall the slip ring stack, being sure to engage the drive pin making sure point of set screw engages 1 of the 2 holes on the shaft and tighten the set screw. On 6" deep spool drums, we recommend connecting the 1-6 leads to the brush post terminal before installing the ring on the shaft. (See Sections 4.4 and 4.5)

2.5.7 Strip and insert cable leads into the appropriate brush

post terminals and torque screws to 5in-lbs. (See page 9 for Color Code Chart used by factory. Figure 3 illustrates Slip Rings, and Figure 3a illustrates Welding Rings.) All weld cable lead ends should be tinned for optimal performance (Fig. 3A)

2.5.8 **CAUTION:** The green conductor **MUST** be connected to (GND) Ring (ring closest to the brush post base) in order to ground the reel. Be sure that the bottom brush (dedicated ground) and the green wire at the top terminal block have continuity. (On Welding Reels, all conductor welding cable ends require tinning per NEC.)

2.5.9 Perform a continuity check to verify circuits.

2.5.10 Replace the cover gasket if damaged.

2.5.11 Remove (2) nuts. Install gasket and cover. Re-install and tighten nuts (6).

2.5.12 Wrap new cable on drum spool.

2.5.13 Adjust spring tension by following the procedure in Section 2.6.

2.0 Installation

COLOR CODE CHART					
Cond. No.	Base Color	Tracer Color	Cond. No.	Base Color	Tracer Color
1	Green	--	7	White	Black
2	Black	--	8	Red	Black
3	White	--	9	Green	Black
4	Red	--	10	Orange	Black
5	Orange	--	11	Blue	Black
6	Blue	--	12	Black	White

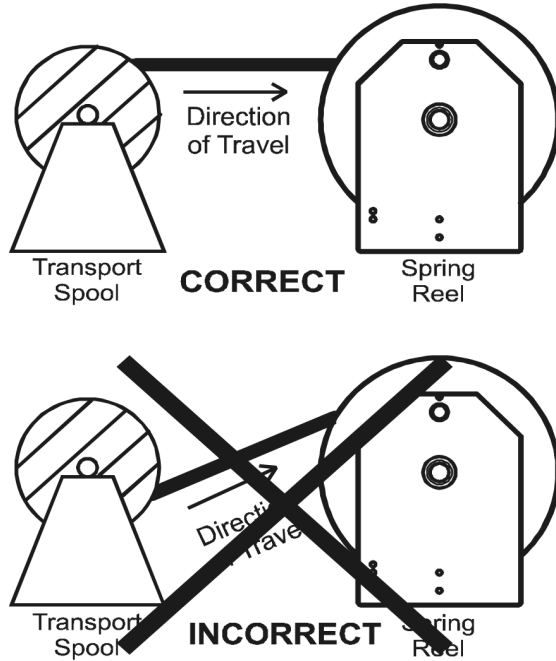


Figure 2

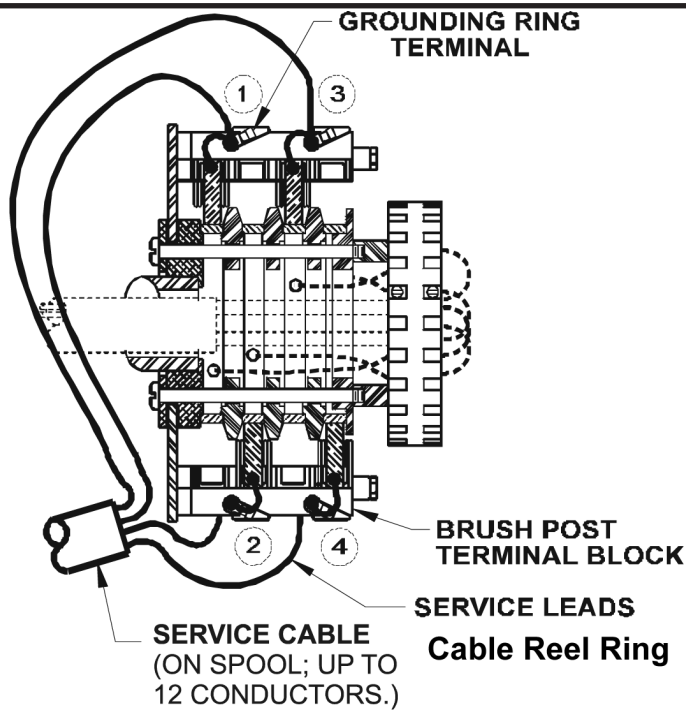


Figure 3

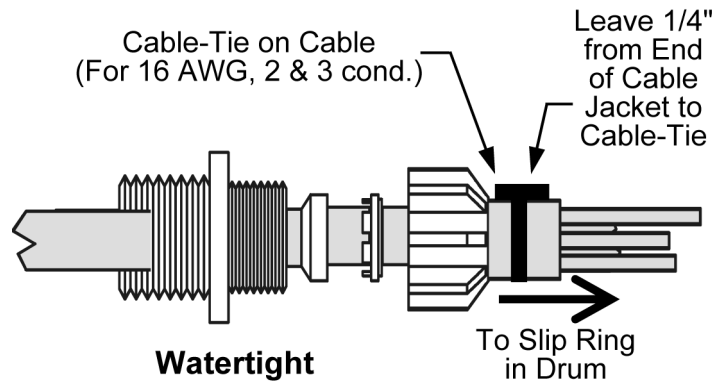
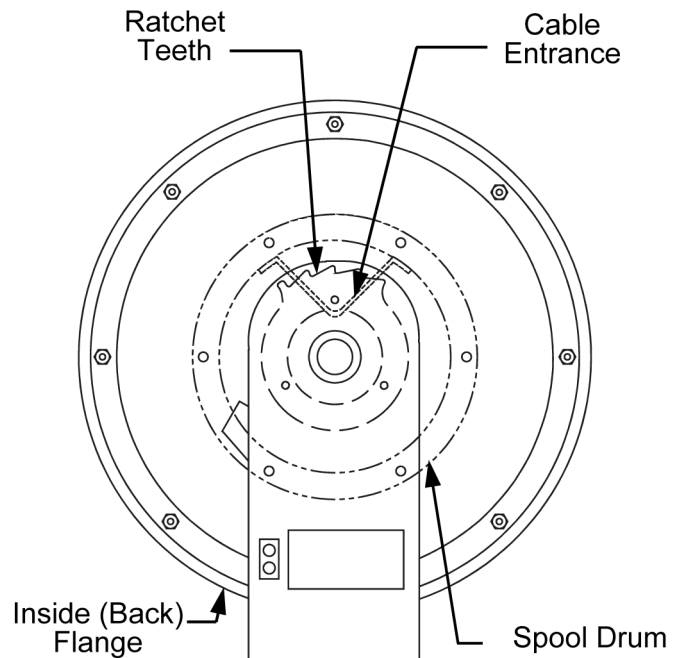


Figure 1



Proper Drum Orientation

Figure 4

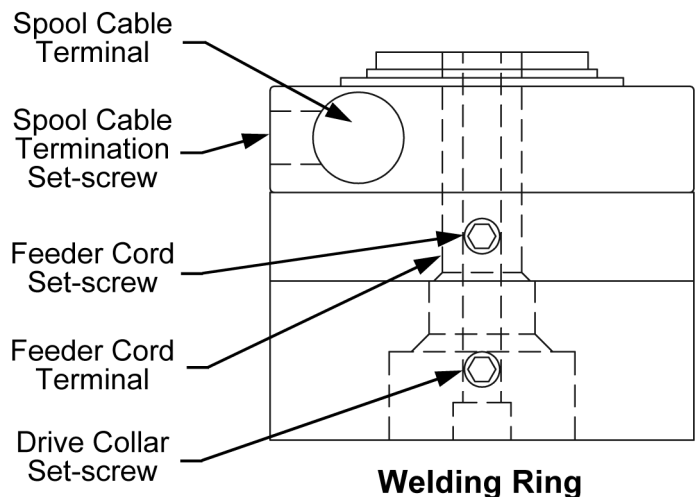


Figure 3a

2.6 Spring Tension Adjustment

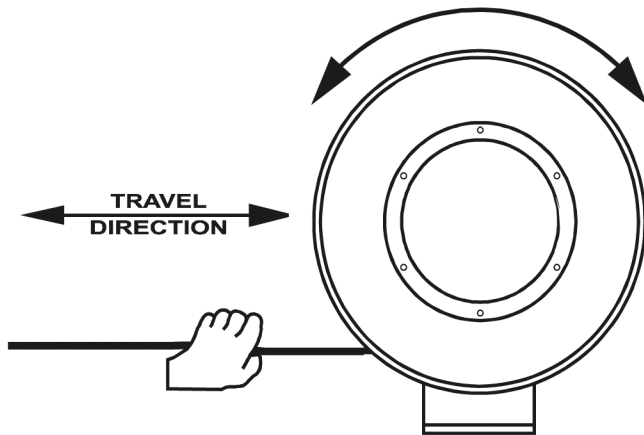
2.6.1 **WARNING:** Do not allow cable to retract without

restraining the retraction speed. Walk the cable back to the reel during the spring tension adjusting process. Always maintain two full cable wraps on drum at maximum cable extension, size cable length accordingly.

2.6.2 To assure that the cable will retract properly and operate under the correct tension, the reel should be tested. Install cable on drum but do not connect the free end of cable. Securely mount reel before testing.

2.6.3 Pull the cable out the intended travel distance and allow it to rewind. This procedure should be repeated five (5) to ten (10) times in order to set the spring. Walk the cable back to the reel during the spring tension adjusting process.

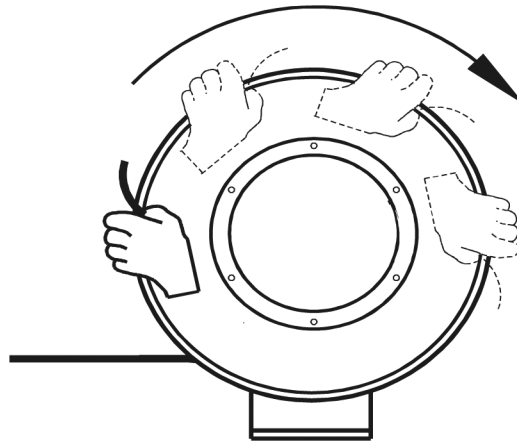
Rotate Spool while holding Cable to test the Spring Tension



Viewing from Slip Ring Cover

2.6.4 With all the cable wound on the reel, grasp the end of the cable and rotate the drum and cable together in a clockwise direction in order to pre-tension the spring. The number of pre-tension turns is determined by cable size and footage. Usually, two to three turns is sufficient, but additional turns may be used if testing indicates that the cable will not fully retract as desired with just two turns (see Note 2.6.5).

Adding Spring Tension



Viewing from Slip Ring Cover

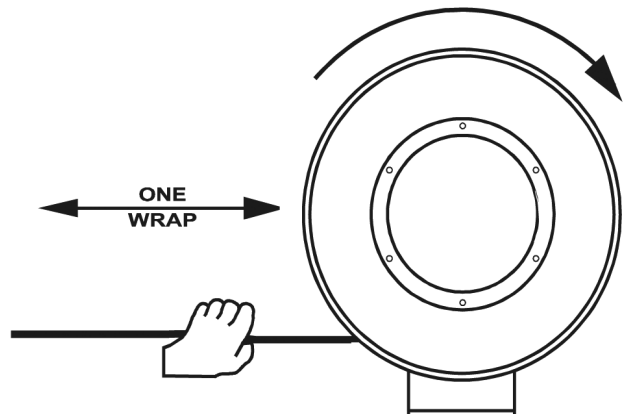
2.6.5 Feed the end of the cable through the cable guide and pull the cable out the required length. Note: Total number of spool revolutions, including pre-tension turns, must not exceed the limits in the following table:

Spring model designation stated in reel description on invoice and packing slip.					
No. of Turns	Models w/#	Motor #	No. of Turns	Models w/#	Motor #
23	J	PR89	30	K	35001
23	JP	PR89P	60	KS	35002
46	JS	PR89S	30	KP	35003
Consult the factory or your representative if number of spool turns is not within parameter.					

2.6.6 Repeat steps 2.6.3 to 2.6.5, if necessary, to add tension.

To decrease tension, rotate drum and cable counter-clockwise.

Adding Spring Tension



2.0 Installation

2.7 Power Connections

(For Welding Reels See Section 2.5 and Figure 3a.)

2.7.1 Provide power source with over-current protection to prevent overheating of the reel and cable.

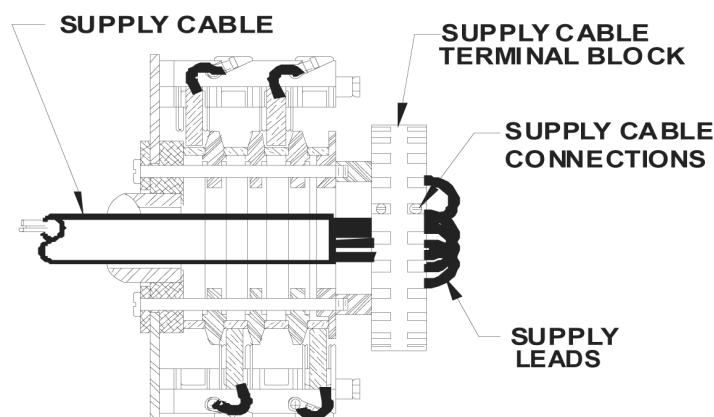
2.7.2 Connect the supply cable to the terminal ring at the top of the slip ring. Wire according to Color Code Chart on page 9.

2.7.2.1 Be sure the GREEN (ground) wire is connected to the green wire slip ring using the top terminal block.

2.7.3 Slide the supply cable back through the shaft to eliminate excess slack at the terminal block. Failure to do so may cause Ring to short out due to excessive wear on insulation of the supply lead(s).

2.7.4 Be sure the supply leads will not come in contact with the slip ring cover or the reel shaft.

2.7.5 If a supply cable entrance watertight is used, be sure gland size is correct for cable diameter. Tighten to seal and to prevent cable pullout. The watertight needs to have 1" NPT thread.



3.0 Operation

3.1 Do not exceed the voltage or amperage rating of the cable. Overheating, fire, damage to equipment or personal injury could result.

3.2 Do not allow cable to retract without restraining retraction speed.

3.3 Operate the reel within the cable size and length and spring tensioning limits for which it was intended.

3.3.1 Keep two wraps of cable on the reel at maximum extension to avoid excessive tension on the cable and to prevent pullout of cable from entrance watertight.

3.3.2 The spring should not be wound to the last two turns at maximum payout to avoid over-stressing the spring(s), thus reducing its life or damaging the reel.

3.4 Keep the reel and cable clean to avoid excessive wear and damage.

3.5 Arrange for maintenance service if damage is found on the cable or reel.

3.6 Cable should be fully retracted when not in service to maximize spring life.

4.0 Maintenance

4.1 **WARNING:** Be sure power is off for maintenance.

4.2 Lubrication

4.2.1 All components requiring lubrication are lubricated for life at the factory. Additional lubrication is not required.

4.2.2 Do not apply any lubricants or solvent cleaning agents to slip ring, brush or insulator surfaces.

4.3 Inspections

4.3.1 Periodically check the reel for any loose or missing

fasteners. Tighten or replace as necessary.

4.3.2 The slip ring assembly should be checked periodically as follows:

4.3.2.1 Clean to remove dust and dirt from the slip ring housing area and all slip ring assembly and brush surfaces.

4.3.2.2 Brushes should be centered on slip rings and brush springs should be seated in terminal post grooves. Terminal screw connections should be tight. Check for excessive brush wear. Replace brushes as necessary.

4.3.3 Inspect cable for damage or wear which would make it unsafe to use.

4.4 Slip Ring Replacement

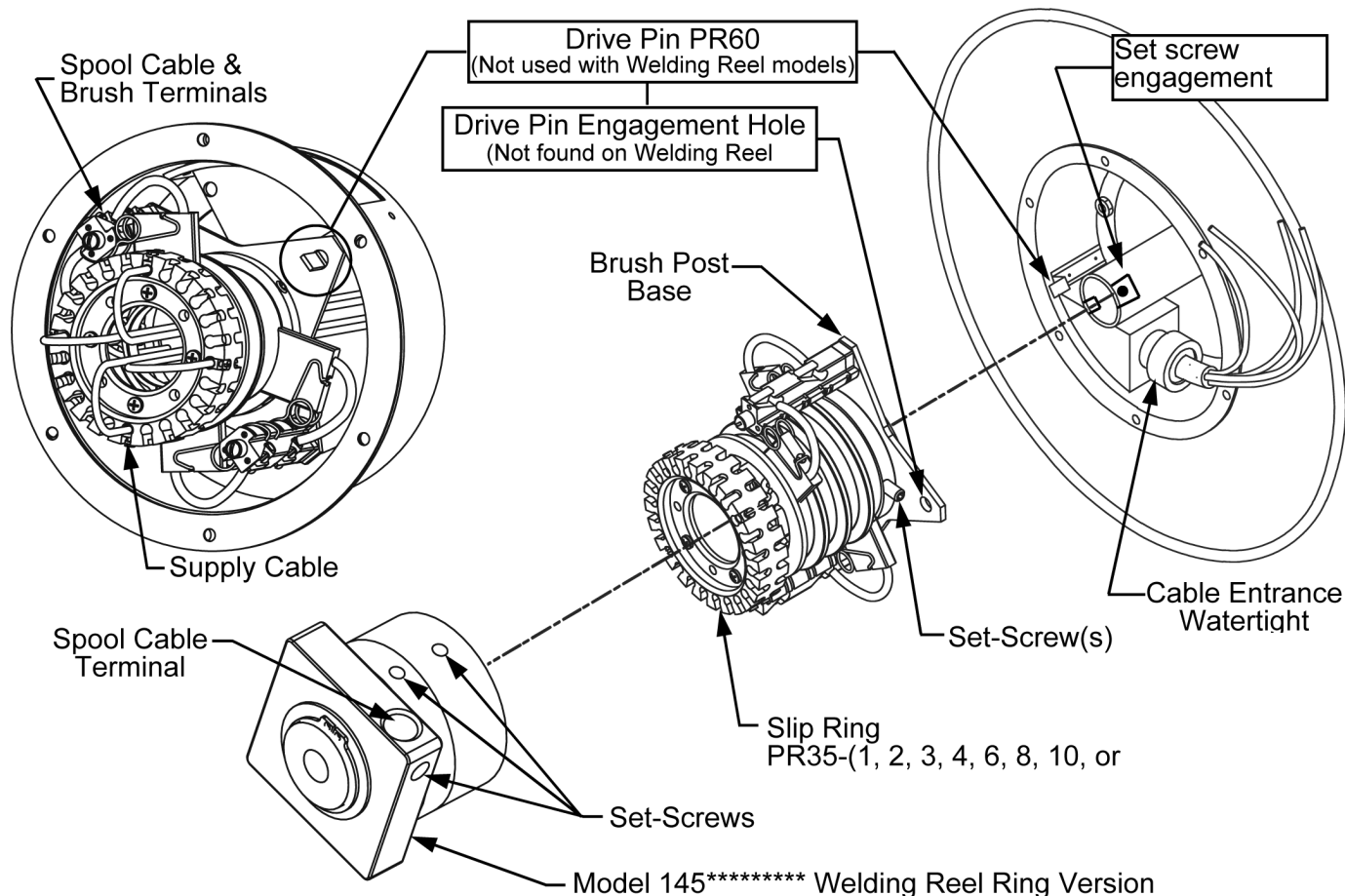
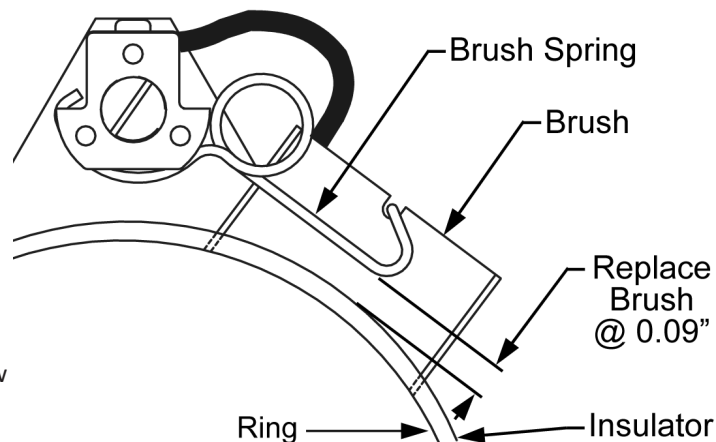
4.4.1 The slip ring assembly should be replaced, not rebuilt, if it becomes damaged.

4.4.2 Follow steps 4.5.5 through 4.5.8 to remove the slip ring assembly.

4.4.3 Carefully and thoroughly clean the inside of the reel drum and the slip ring cover.

4.4.4 Follow steps 4.5.5 through 4.5.8 in reverse order to install the new slip ring stack.

4.4.5 Replace cover Gasket if damaged.



4.5 Cable Replacement

- 4.5.1 Replacement cable should be the same size and length as existing cable. Any variations to cable specifications should be pre-approved by the factory.
- 4.5.2 Disconnect all electrical service to the reel before replacing the cable. Follow Lock-Out/Tag-Out procedures as outlined by OSHA.
- 4.5.3 Disconnect the terminal outboard end of the cable and allow cable to retract onto spool. Ensure all spring tension is off by manually rotating the spool.
- 4.5.4 Remove the cable from the spool by looping it over the spool flange and slip ring cover. Make sure the cable end is through the cable guide.
- 4.5.5 Remove the six (6) nuts holding the slip ring cover. Remove cover and gasket. Reinstall (2) nuts finger tight to hold the flange in place.
- 4.5.6 Loosen the supply cable terminal screws (set-screws on Welding Reel Ring) and release the supply cable leads from the terminal block of slip ring.
- 4.5.7 Loosen the brush post terminal screws (set-screws on Welding Reel Ring) and release the cable leads.
- 4.5.8 Use 1/8" Allen Wrench to loosen the set screw and remove the slip ring stack.
- 4.5.9 Remove the watertight nut, gripping ring, bushing and the cable to be replaced.
- 4.5.10 Obtain the replacement cable of the correct size and length and strip the cable end to match the old cable.
- 4.5.11 Carefully and thoroughly clean the inside surfaces of both flanges and the drum.
- 4.5.12 Follow instructions 2.5.4 through 2.5.13 to install the replacement cable, taking care to avoid twisting the cable while winding it onto the reel. Care should also be taken to match the color coded cable leads. (For additional information on wiring, see Section 2.7 Power Connections.)

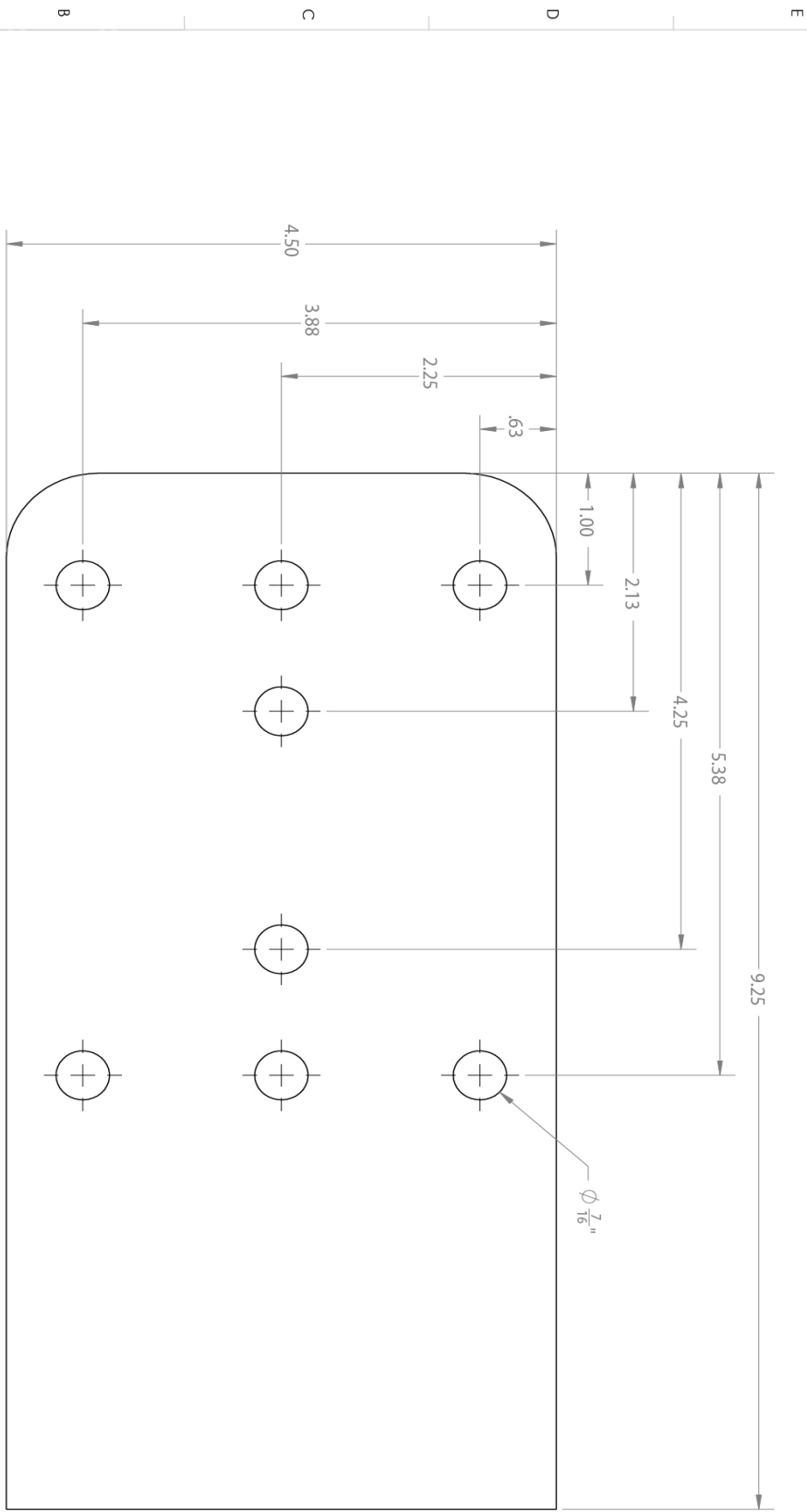
4.6 Spring Motor Replacement

- 4.6.1 CAUTION: Do not open the spring motor or personal injury may result.
- 4.6.2 The spring replacement process is determined by the spring configuration and cannot be performed in the field. The entire spring motor assembly must be replaced as a unit. Contact KH industries to identify spring.
- 4.6.3 Disconnect all electrical power to the reel before beginning any maintenance or service.
- 4.6.4 Remove the slip ring from the shaft by following the procedure outlined in Section 4.4.
- 4.6.5 Remove the (4) nuts in the bottom of the drum. This may require removing the watertight in order to access all nuts. Lift the cable, drum, and front flange together and set aside.
- 4.6.6 Remove the shaft coupling.
- 4.6.7 Remove the spring motor by unscrewing the shaft from the mounting base.
- 4.6.8 Remove packing material from the replacement spring motor and attach it to the mounting base.
- 4.6.9 Re-assemble spring reel in reverse order with the new spring motor. Note the following:
 - A. Replace gaskets as needed.
 - B. Ratchet must be in the deactivated position (see figure for Section 2.4).
 - C. Shaft must be fully seated on base before installing coupling and watertight.
 - D. Reactivate ratchet to ensure proper alignment.
 - E. Verify drum and ratchet teeth orientation per Figure 4, page 9.
- 4.6.10 Reassemble the reel by following the instructions in Section 2.5.6 through 2.5.11; refer to Color Code Chart on page 9.
- 4.6.11 Adjust spring tension by following the procedure in Section 2.6.

Troubleshooting

PROBLEM	POSSIBLE CAUSE	SOLUTION
Reel will not retract cable but has some tension.	<ol style="list-style-type: none"> 1) Improper pretension. 2) Incorrect reel for application (lift vs. stretch) 3) Improper cable or cable length installed. 4) Cable guide adjustment. 	<ol style="list-style-type: none"> 1) See Sec. 2.6 Spring Tension Adjustment. 2) Verify application vs. reel selection. 3) Install correct cable type and length. 4) Check guide alignment (see Sec. 2.2 and 2.3)
Reel does not have any spring tension.	<ol style="list-style-type: none"> 1) Broken spring. 	<ol style="list-style-type: none"> 1) Verify application and duty cycle. Replace spring motor assembly.
Ratchet will not activate.	<ol style="list-style-type: none"> 1) Broken ratchet pawl spring. 2) Lock-out option arm deactivated. 	<ol style="list-style-type: none"> 1) Replace ratchet pawl spring. 2) Activate lock-out arm (See Sec. 2.4)
Ratchet will not deactivate.	<ol style="list-style-type: none"> 1) Over-extension of reel. 	<ol style="list-style-type: none"> 1) Manually rotate reel spool to deactivate ratchet. Do not over-extend. (Guide adjustment may prevent lock-up when over-extended.)
Cable wraps improperly (uneven wrapping, wraps above or jumps flange).	<ol style="list-style-type: none"> 1) Reel mounting not level. 2) Cable retraction rate too high. 3) Cable guide out of adjustment. 4) Improper cable or cable length installed 	<ol style="list-style-type: none"> 1) Mount reel on level surface. 2) Maintain steady retraction rate. 3) Properly adjust cable guide (see Sec. 2.2 and 2.3). 4) Install correct cable type and length (See Sec. 1.5 and 2.5).
Cable twisting or knotting.	<ol style="list-style-type: none"> 1) Improperly installed cable. 2) Cable rubbing on or bending around fixed object. 3) Excessive spring tension. 4) Inadequate anchoring of cable. 	<ol style="list-style-type: none"> 1) See Sec. 2.5 Cable Installation. 2) Check roller guide for function and cable payout path (see Sec. 2.3). 3) Verify application vs. reel selection. Also check pretension. 4) Adjust anchoring method i.e. and strain relief.
Open or intermittent circuit.	<ol style="list-style-type: none"> 1) Inadequate connection. 2) Loss of brush contact to slip ring. 3) Cable defective. 	<ol style="list-style-type: none"> 1) Check all termination points. 2) Check brush wear, spring tension & alignment. 3) Perform continuity check on cable termination points.
Circuit trips and/or pitted burned rings or brushes.	<ol style="list-style-type: none"> 1) Inadequate amp rating of reel selection. 	<ol style="list-style-type: none"> 1) Verify application requirements vs. reel & cable rating (see Sec. 1.5).
Circuit arcing.	<ol style="list-style-type: none"> 1) Amp or voltage above rating of reel. 2) Excessive carbon dusk accumulation. 3) Water or moisture in slip ring. 4) Loss of brush to ring contact. 	<ol style="list-style-type: none"> 1) Verify application requirements vs. reel & cable rating (see Sec. 1.5). 2) Clean dust from inside slip ring. 3) Check gasket seal. 4) Replace brush and/or brush spring.

REVISIONS			
REV.	DESCRIPTION	DATE	NAME
-	INITIAL RELEASE	11/81/2012	CG
A	TITLE BLOCK UPDATE	12/19/2022	CG



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