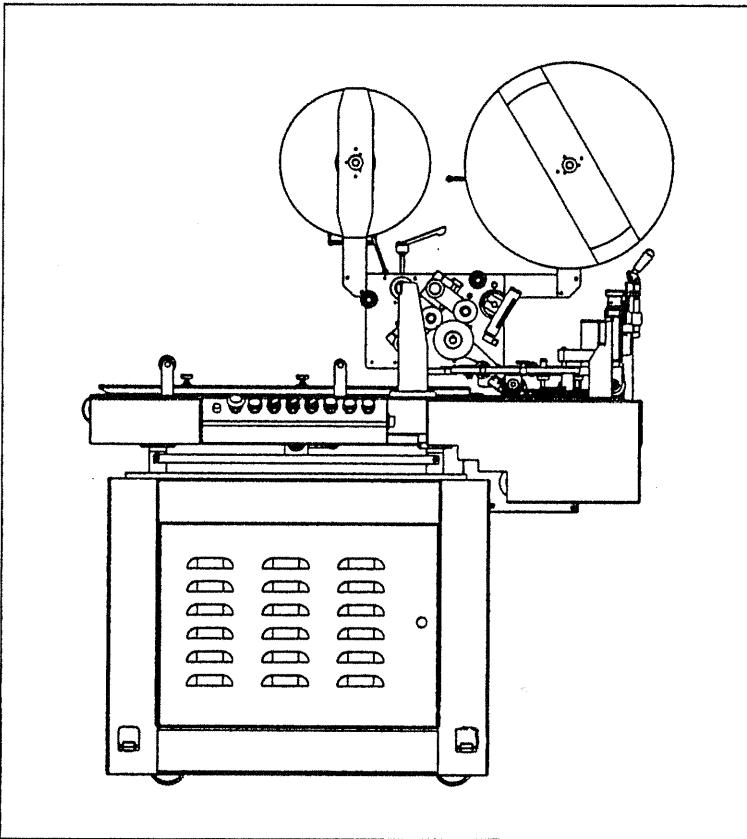


Kirk-Rudy, Inc.

Instruction and Parts Manual

KR527 Tabber



Manufactured by Kirk-Rudy, Inc.

Before using this machine, all operators must study this manual to understand and follow the safety warnings and instructions. Keep these instructions with the machine for future reference. If you have any questions, contact your local Kirk-Rudy, Inc. Distributor.

Manual

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1 Important Safety Instructions

Intended Use Statement: The KR527 Tabbing System is designed to apply and fold a pressure sensitive tab around the edge of a mailing in order to seal the piece along one edge. A stepper motor is used to index the web over a stripper plate, which separates the tab from the backing paper. One or more tabs can be applied to a piece in a single pass. The system is made up of two major components - the base and head. The tabbing base carries the product underneath the head where a tab is peeled off and applied. Beam switches on the base detect product leading and trailing edges, which start the tabber stepper motor. A fiber optic system senses the gap between tabs to stop the stepper motor. Components on the base then fold the tab around the edge of the mailing. Usage for other purposes may lead to an unsafe condition.

SAVE THESE INSTRUCTIONS. Read all instructions before using this product.



WARNING

- * NEVER OPERATE THE MACHINE WITHOUT ALL GUARDS OR SAFETY DEVICES IN PLACE.
- * ALWAYS TURN POWER OFF WHEN MAKING ADJUSTMENTS.
- * ALWAYS DISCONNECT THE POWER SUPPLY BEFORE ANY MAINTENANCE OR SERVICE WORK.
- * NEVER START THE MACHINE WITHOUT FIRST CHECKING ALL PERSONNEL ARE CLEAR OF MOVING PARTS.
- * KEEP FINGERS CLEAR OF ALL MOVING PARTS.
- * NEVER REMOVE THE PRODUCT FROM THE MACHINE WHILE MACHINE IS RUNNING.
- * SHOULD MISFED PRODUCT JAM THE MACHINE AND STOP IT FROM RUNNING, ALWAYS PRESS THE STOP BUTTON BEFORE CLEARING PRODUCT. IF THE STOP BUTTON IS NOT PRESSED AND THE JAM IS CLEARED, THE MACHINE WILL BEGIN RUNNING.
- * IT IS NOT RECOMMENDED THAT LOOSE CLOTHING, JEWELRY AND LONG HAIR BE WORN WHILE OPERATING THIS MACHINERY.
- * ALWAYS USE AN EXPERIENCED ELECTRICIAN WHEN TROUBLE-SHOOTING ELECTRICAL PROBLEMS.
- * CHANGES OR MODIFICATIONS TO THIS UNIT NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

2 SPECIFICATIONS

	<u>ENGLISH</u>	<u>METRIC</u>
ELECTRICAL REQUIREMENTS		
Base Main Power Input:	120 VAC 1 Phase, 50 – 60 Hz, 10 Amps	

MAXIMUM OPERATING SPEEDS

Single tabbing:	30,000 pieces / hour
Double tabbing:	25,000 pieces / hour

Note: Speeds are dependent on material (product) being fed.

PHYSICAL SIZE

Length:	47"	119.38 cm
Width:	33"	83.82 cm
Height:	33"	83.82 cm
Weight:	475 lbs.	215.7 kg
Shipping:	600 lbs.	272.4 kg

PRODUCTS

Tabs (Pressure sensitive, perforated):	0.750" – 1.00" dia	19.05 mm dia
Materials: Minimum:	3.50" x 5.00"	88.9 mm x 127 mm
Maximum:	8.50" x 11.00"	228.6 mm x 304.8 mm
Thickness: single sheet	20 lbs.	

3 INSTALLATION

3.1 UNCRATING AND UNPACKING



WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

Note: Some boxes are located inside the base cabinet.

Uncrating

1. Position crates near installation site.
2. Remove crate top and sides.
3. Locate accessories box and verify all items are present.
4. Remove metal strapping and securing blocks.
5. Use a forklift to lift machine off skid. Be sure to position the forks in a centrally located position.
6. Machine is on casters and can be rolled inline with feeder base.
7. Adjust the height of the tabber base using the leveling legs.
8. Roll takeaway conveyor into place.

Note: A forklift should be used to lift machine from pallet.

The Base is mounted on rollers, which easily allows you to move to the location of installation.

3.2 ACCESSORIES AND SPARE PARTS

The accessories and spare parts are packaged and located inside the base cabinet. The box should be opened and checked against the enclosed packing list.

3.3 COMPONENT DESCRIPTION

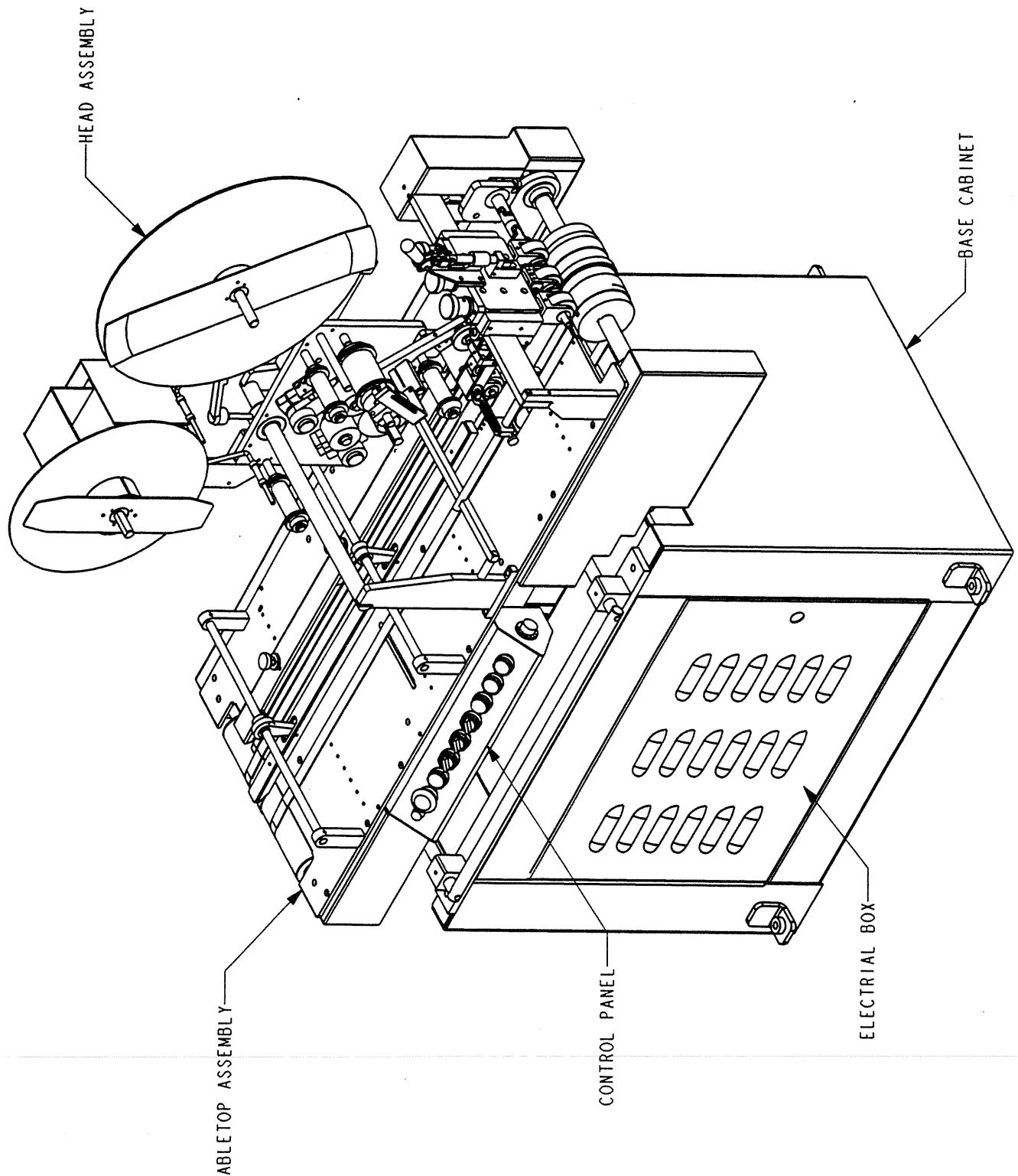


WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

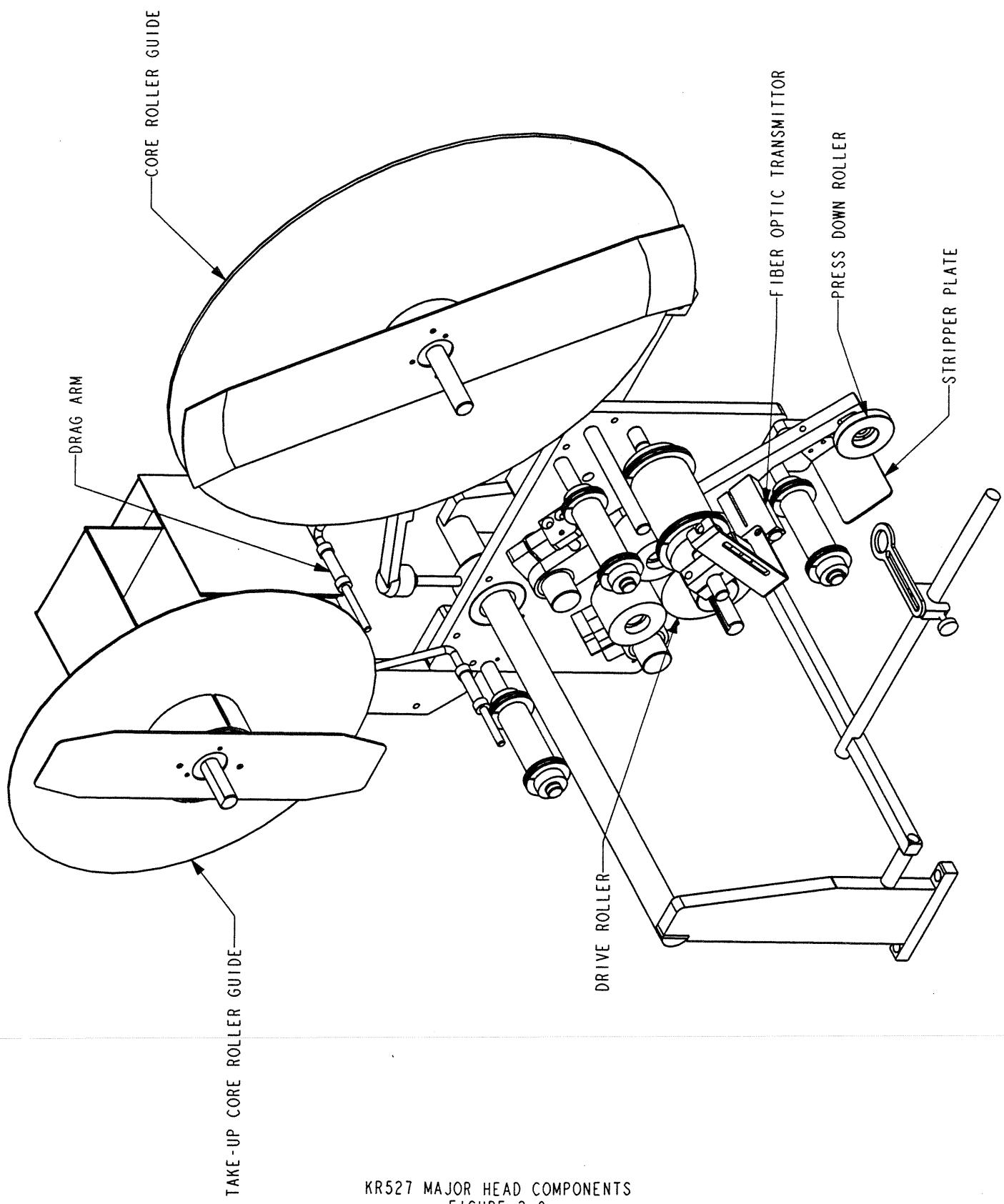
Head Assembly (see Figure 2.0)

1. Core Roller: This roller is used for holding the roll of tabs. The core roller shaft has a drag system to control the roll, as it is unwound. The front and rear core roller guides are removed quickly by holding the rear guide stationary and twisting the front guide approximately 30 degrees right or left. The three screws attaching the roller guide do not have to be removed when adding new rolls of tabs or removing waste.
2. Drag Arm: When pushed down this spring loaded arm releases the drag on the core roller shaft.



KR527 TABBER MAJOR COMPONENTS
FIGURE 1.0

FG000132•



KR527 MAJOR HEAD COMPONENTS
FIGURE 2.0

3. Web Pinch Rollers: These rollers pinch the web onto the drive roller to prevent slippage and to eliminate any slack in the web.
4. Fiber Optic Transmitter and Receiver: This system is used to sense the gap between tabs. It is used to stop the stepper motor.
5. Stripper Plate: Tabs are peeled off the web when it is dragged over the stripper plate.
6. Press Down Roller: Tabs are rolled onto the piece by the press down roller.
7. Drive Roller: The web is pulled through by the drive roller.
8. Take-up Arm: Slip clutch assembly. Takes up scrap.
9. Take-up Core Roller: The leading edge of the web is attached to the core roller by wrapping the backing paper around the roller one time and then placing the curved rod into the grooves of the take-up core roller.
10. Securing Handle: Tightening this handle secures the head to the head support shaft.

Base (see Figure 3.0)

1. Vacuum Tabletop – A high volume vacuum pump is connected to a manifold mounted underneath the center tabletop. A series of holes in this tabletop allow the vacuum to pass through, which holds the piece down onto the belts.
2. Crank – The crank on the backside of the base can be used for back and forth adjustment of the tabletop. This makes for quick adjustments when changing to different size products.

3.4 TABBER SETUP

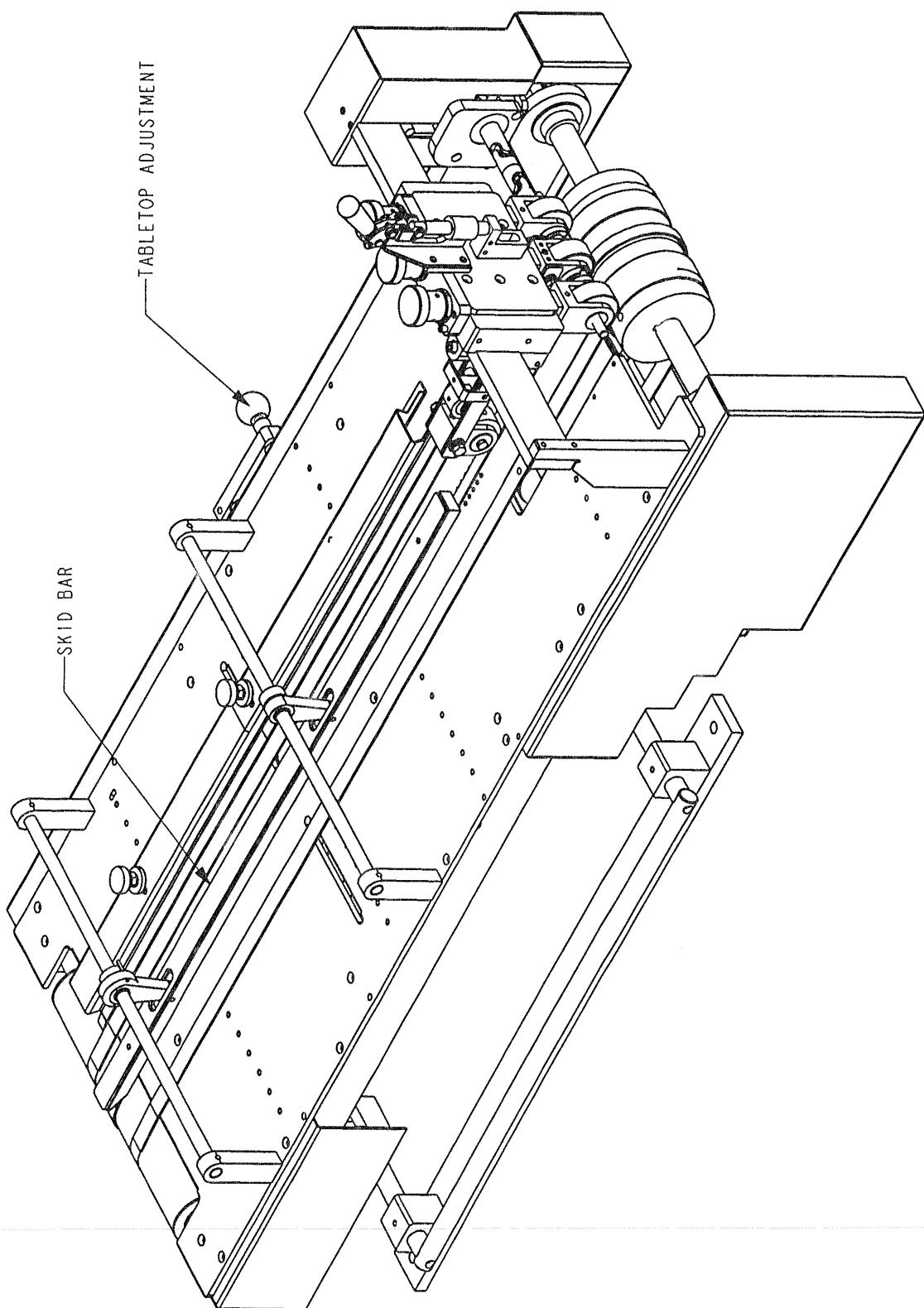


WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

Base Assembly

1. Turn the main power and blower on.
2. Feed one piece to be tabbed to the infeed of the tabber.
3. Adjust Tabber side guide, which is opposite tabbed side of mail piece.
4. With the speed knob set at 7-8, jog product down the machine until the leading edge reaches the press down roller. The press down roller supports the edge to be tabbed. The outside edge of the drive roller must be set 1/16" inside the outside edge of mail piece.
5. Material Support: Position so outside edge of product overlaps material support spring approx. 1/16". Spring is positioned to guide product into channel folder without touching channel folder.
6. Channel Folder: Position so outside edge of product slides along inside edge of channel folder.
7. Spring Steel Hold Down: Adjust spring steel for minimum drag.
8. Outfeed Pinch Roller: Adjust the height of the pinch roller for the product to be tabbed.

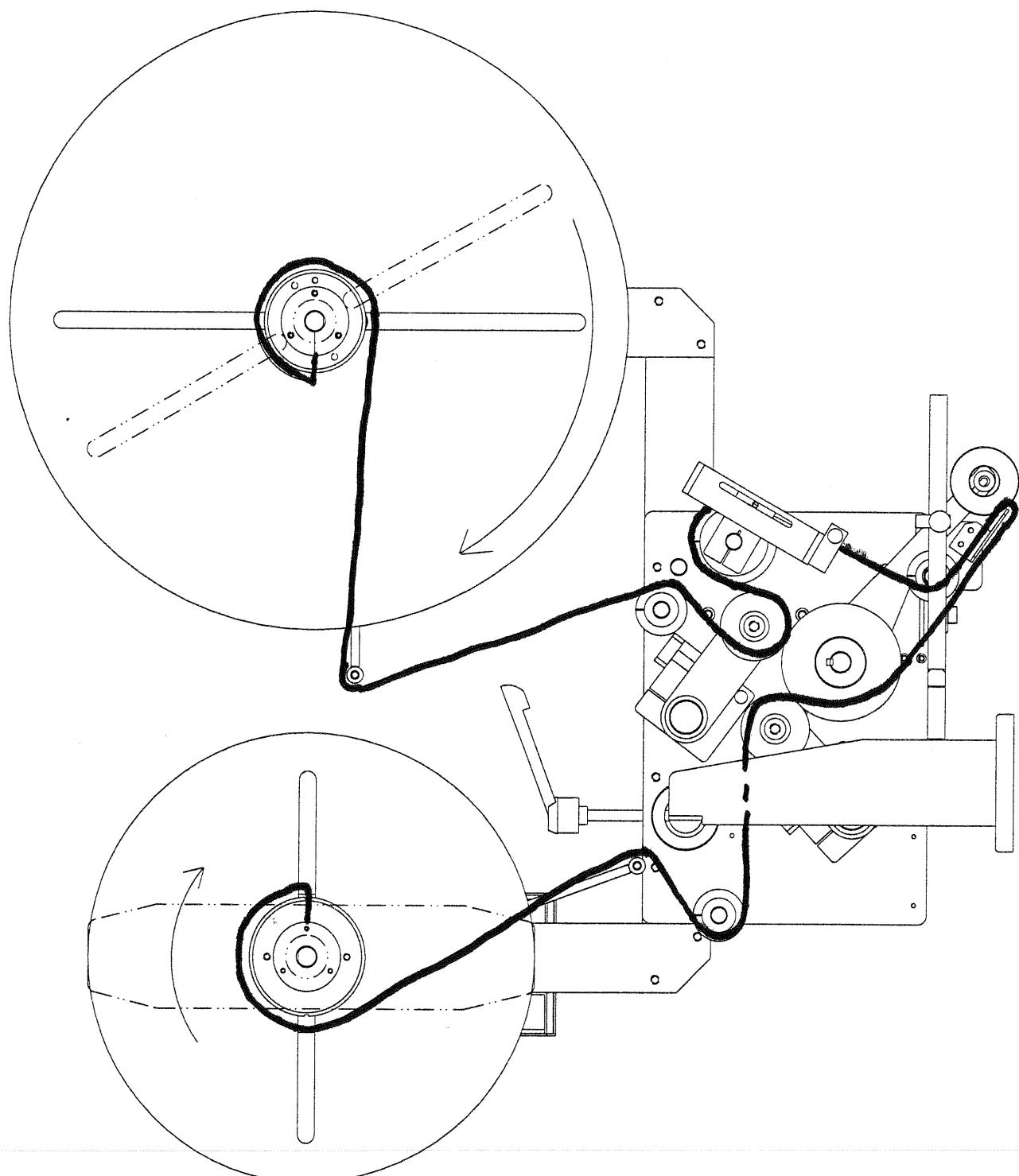


KR527 MAJOR BASE COMPONENTS
FIGURE 3.0

9. Place a perforated tab on the edge of a mailing piece. The perforation should be aligned with the edge of the piece. Run a piece through the machine to be sure the tab is folding properly.

Head Assembly

1. Position tabber head over the lower drive roller such that the outside edge of the upper press down roller is aligned with the outside edge of the lower press down roller.
2. Stripper Plate: No adjustment required.
3. Upper Press Down Roller: Adjust the height of the press down roller to the height of the piece to be tabbed. The roller should only spin as a piece is between the upper press down roller and lower press down roller. Be certain the press down roller does not “bounce” or “jump” as product travels under it.
4. Remove retaining ring and place a roll of tabs onto the core roller.
5. Web tabber as shown in Figure 4.0.
6. Secure the leading edge of the web onto the take-up roller underneath the salvage clip.
7. Fiber Optic Sensor: An infrared beam is passed through the web to a receiver for detecting gaps between tabs. The infrared beam can be seen as a red dot on the web between the transmitter and receiver. The red dot indicates the approximate location of the label stop point over the stripper plate. Adjust the fiber optic system so that not more than 1/16" of tab overhangs the stripper plate. The fiber optic system used on the KR527 Tabber can be set to detect the leading edge of the tab or the backing paper of the trailing edge of the tab. The change in the amount of light reaching the sensor as a tab passes through the beam activates a switch that stops the stepper motor.



KR527 WEBBING PATH
FIGURE 4.0

4 OPERATING INSTRUCTIONS

4.1 BASE / HEAD - ELECTRICAL OPERATION



WARNING

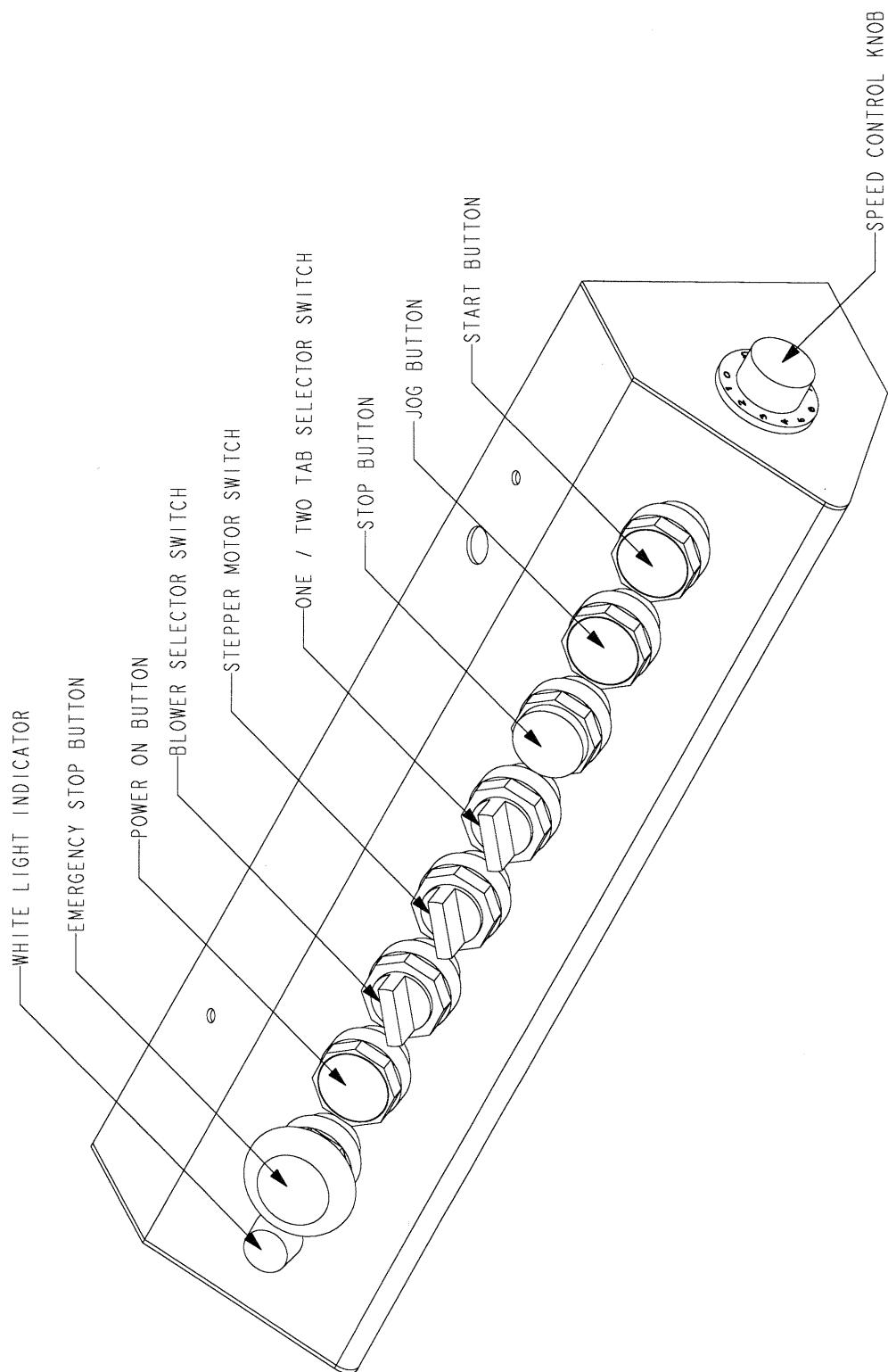
Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

Controls (see Figure 5.0)

1. White Indicator Light: If light is on, main power is on. If light is off, main power is off.
2. Emergency Stop Button: This is a latching switch. To turn power on, unlatch emergency stop. Press button to turn machine power off. White indicator light will turn off when power is off.
3. Power On Button: Press button to turn machine power on. Emergency stop button must be unlatched. White indicator light will turn on when power is on.
4. Blower Selector Switch: When the switch is turned to the right, power is supplied to the high volume vacuum pump. This pump draws a vacuum through holes in the tabletop, which holds the product onto the conveyor belts.
5. Stepper Motor Selector Switch: When the switch is turned to the right, power is supplied to the stepper motor. This motor controls label feed.
6. One / Two Tab Selector Switch: When the switch is turned to the left, one tab is applied per piece. When the switch is turned to the right, two tabs are applied per piece.
7. Stop Button: Depressing the stop button will stop the main drive motor. If tied to the feeder base stop circuitry, this button will also stop the feeder base main drive motor.
8. Jog Button: When the main power is on, depressing the jog button will start the main drive motor. As soon as the jog button is released, the main drive motor will stop.
9. Start Button: When the main power is on, the start button will start the main drive motor. Always be sure personnel are clear of moving parts before starting the main drive motor.
10. Speed Control Knob: Sets the speed of the main drive motor.

Operation

1. Product Detect Beam Switches (Connected by manufacturer): Connect the two product detect beam switch plugs into the connectors coming from the electrical box of the tabber base.
2. Fiber Optic Label Sensor (Connected by manufacturer): Connect the fiber optic label sensor plug into the connector coming from the electrical box of the tabber base.
3. Conveyor: Connect the takeaway conveyor plugs into the connectors on the outfeed of the tabbing base. Note: Applies to KR bases only.
4. Connect the takeaway conveyor plugs from the tabber into the feeder base plugs. The tabber base is now connected into the stop circuitry of the feeder base. Note: Applies to KR bases only.



KR527 CONTROL PANEL
FIGURE 5.0

Note: For feeder bases other than Kirk-Rudy, connect the takeaway conveyor plug into the base as usual. Wire the tabber base into the stop circuitry of the feeder base by connecting the feeder base stop wires to the S-402-CCT socket provided.

5. Plug the tabber base into a 120VAC, 15 amp circuit.

5 MAINTENANCE

5.1 BELT REPLACEMENT PROCEDURE

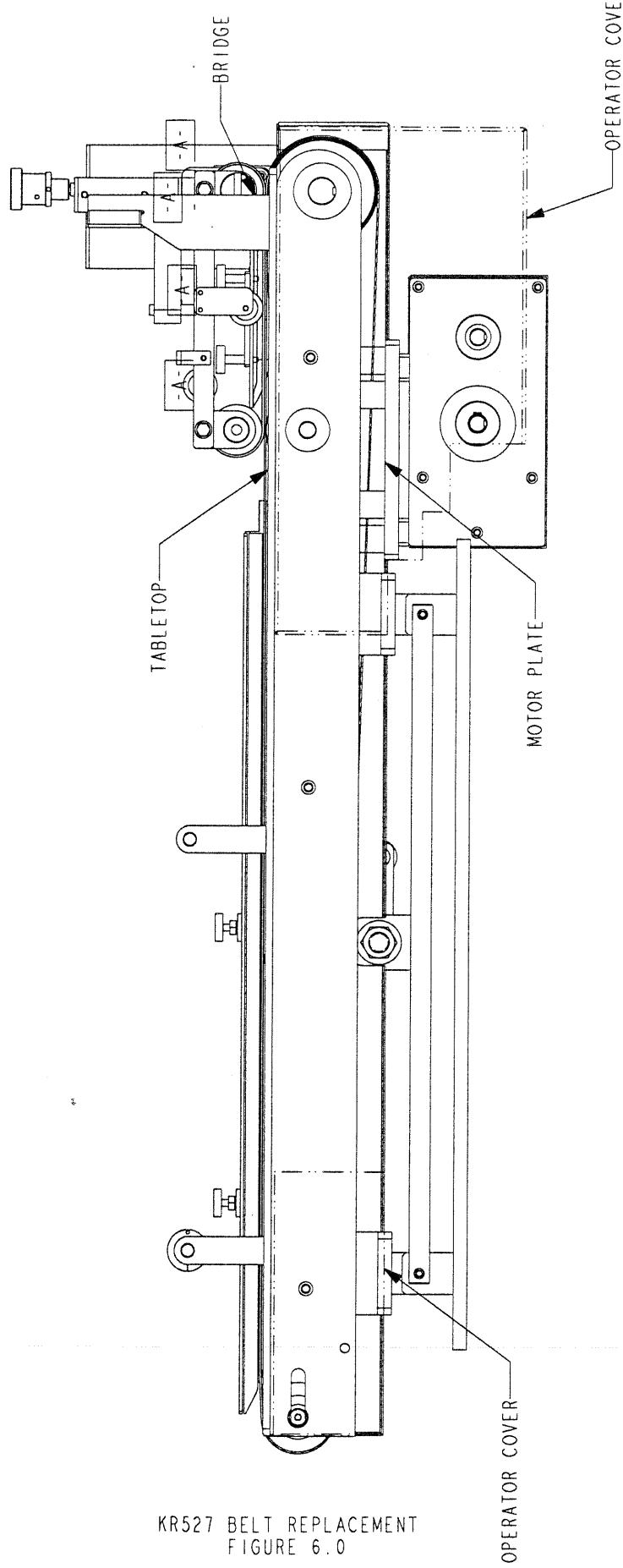


WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

(See Figure 6.0)

1. Remove covers on operator's side.
2. Remove 2 1/4-20 x 5/8 flat head screws from bridge, located under tabletop.
3. Remove 2 10-32 x 1/2 flat head screws that secure control panel. Allow panel to rest on top of electrical cabinet.
4. Remove 1/4-20 x 5/8 flat head screw from cross shaft posts, located under tabletop.
5. Remove 2 1/4-20 x 1/2 cap screws from head bracket on operator's side.
6. Remove 2 1/4-20 x 3/4 cap screws from motor plate and remove 2 spacers.
7. Remove 4 1/4-20 x 1 3/4 cap screws holding frame to cross plate and remove spacers.
8. Remove old belts and install new belts.
9. Reassemble in reverse order.



KR527 BELT REPLACEMENT
FIGURE 6.0

6 PARTS LISTS AND DIAGRAMS

Diagrams are shown in order as indicated below. Sub-assemblies are indented under the main assembly.

6.1 DIAGRAMS

DRAWING #	DESCRIPTION
533854-01	Assy, Tabber
ECN6301	Assy, Tabber Head
532095-01	Assy, Roller Arm
532096-01	Assy, Guide Roller
532097-01	Assy, Guide Roller
532098-01	Assy, Pivot Arm
532749-02	Assy, Sensor Mount
532969-01	Assy, Stripper Plate
532975-02	Assy, Unwind Wheel
532974-02	Assy, Feed Arm
533112-01	Assy, Rewind
503531-A	Assy, Hub
527651-1A	Assy, Rewind Wheel
533108-02	EG Assy, Web Tkup Arm
533109-01	EG Assy, Slip Clutch Shft
533111-01	Assy, Rewind Retainer Wing
533127-01	Assy, Rewind Motor
533113-01	Assy, Drive Motor
533115-01	Assy, Mounting Frame
533118-01	Assy, Head Plate
532316-01	Assy, Tabber Base
531577-01	Assy, Bridge
531938-01	Assy, Top Belt
538007-01	Assy, Drive Shaft & U-Joint
531578-01	Assy, Tabletop
531579-01	Assy, Slide Frame
531580-01	Assy, Channel Folder
531581-01	Assy, Motor Mount
531924-01	Assy, Skid Bar
533855-01	Assy, Control Panel

DRAWING NO. 533854-01

ITEM #	PART #	DESCRIPTION	REV	DATE	DESCRIPTION	ECN	RD	BY
			10					
1	1	527657 DOOR, TABBER						
2	1	527658 W/D MNT, TABBER BASE CABINET						
3	1	520899-1 W/D MNT, ELECTRICAL BOX 527						
4	1	532316-01 ASSY, TABLETOP 527						
5	1	533855-01 ASSY, CONTROL PANEL						
6	1	ECN6301 ASSY, TABBER HEAD						

SCALE 0.075

1 XXX
REVISIONS WHERE USED

KRK - RUDY INC.
KENNESAW, GEORGIA

DRAWING # 533854-01

PRINTED ON 12-12-98 BY 10:00 AM

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NOT TO BE COPIED OR REPRODUCED
EXCEPT AS AUTHORIZED IN THE AGREEMENT
OF PURCHASE, RUDY INC.,
ATLANTA, GA, USA

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REVISION: 1

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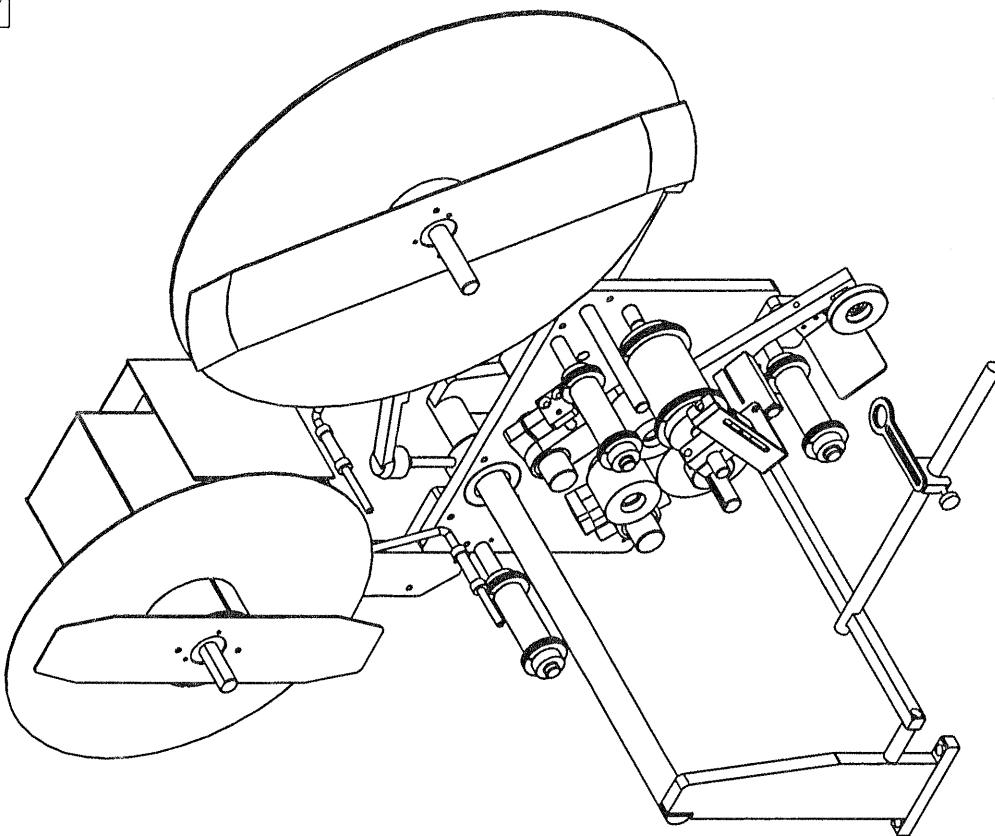
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2	2	5332096-01 ASSY, GUIDE ROLLER					
3	1	5332097-01 ASSY, GUIDE ROLLER					
4	1	5332098-01 ASSY, PIVOT ARM					
5	1	5332749-02 ASSY, SENSOR MOUNT					
6	1	5332969-01 ASSY, STRIPPER PLATE					
7	1	5332975-02 ASSY, UNWIND WHEEL					
8	1	5333112-01 ASSY, REWIND					
9	1	5333113-01 ASSY, DRIVE MOTOR					
10	1	5333115-01 ASSY, MOUNTING FRAME					
11	1	5333118-01 ASSY, HEAD PLATE					

1 \$27
REQ'D WHERE USED

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CHECKED BY:	DATE: 16 - Apr - 98	.xx	.xxx	AN6.		MODEL: 527	TITLE: ASSY, TABBER HEAD
TRACED BY:	MASTER	.01	.005	.5	FINISH: N / A	SHEET NO: 1 OF 2	DRAWING #: ECN6301
REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED							
ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY							

REV NO	DATE	DESCRIPTION	ECN NO	BY
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		TITLE:
		ASSY, TABBER HEAD
SCAFL	MATERIAL:	
T JG	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	N/A
0 . 180	.01	.005
	.XXX	.ANG.
		.5
	HEAT TREAT:	N/A
CHECKED BY:	DATE	MODEL:
	6 - Apr - 98	527
TRACED BY:	MASTERED	SHEET NO.
	M	20F2
		DRAWING #
		ECN6301
		ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY

ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	100116	BUSHING, SLEEVE 1.000					
2	1	100410	WASHER, BRASS TW100					
3	1	102212	COLLAR 1.000					
4	1	102559	SHIM, .312X.500X.030					
5	1	102659	SHIM, 1.000X1.500X.015					
6	1	102704	SPRING, COIL					
7	2	103106	BEARING, FLAT .375					
8	1	105445	DOWEL, PIN .375X1.000					
9	1	107201	BOLT, SHOULDER 3/8X1-1/2					
10	1	506292	CLAMP, ROLLER					
11	1	506293	BRACKET, CLAMP SPRING					
12	1	527641	BRACKET, ROLLER					
13	1	527650	STUD, PINCH ROLLER					
14	1	527685	ROLLER, PRESS DOWN					
15	1	527685-A	ASSY, PRESS DWN ROLLER					
16	1	532094-01	ASSY, SWING ARM & ROLLER					
17	1	532783-01	ASSY, SWING ARM					
18	1	532784-01	ASSY, SPRING CLAMP					

REQ'D		527
WHERE USED		
ASSY, ROLLER ARM		
DRAFTING # 532095-01		
PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE OCULATED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 3044 USA		
THRO' ANGLE PROJECTION		
NOTE: 527		
TITLE:		
SHEET NO. 10F		

DRAWN BY: N JG SCALE 0 .500 MATERIAL: N / A

CHECKED BY: DATE 3 - Nov - 97 DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

.XX	.XXX	ANG.
.01	.005	.5

HEAT TREAT: N / A

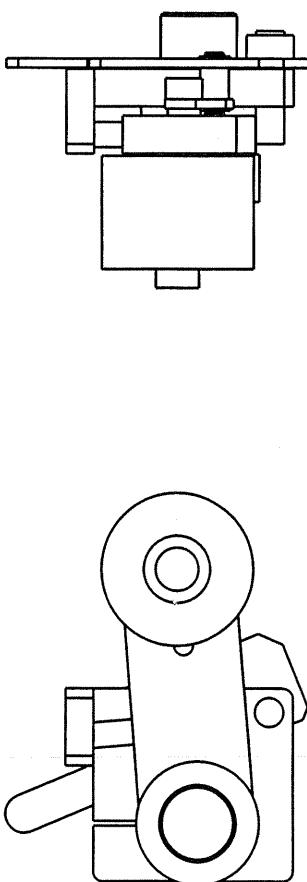
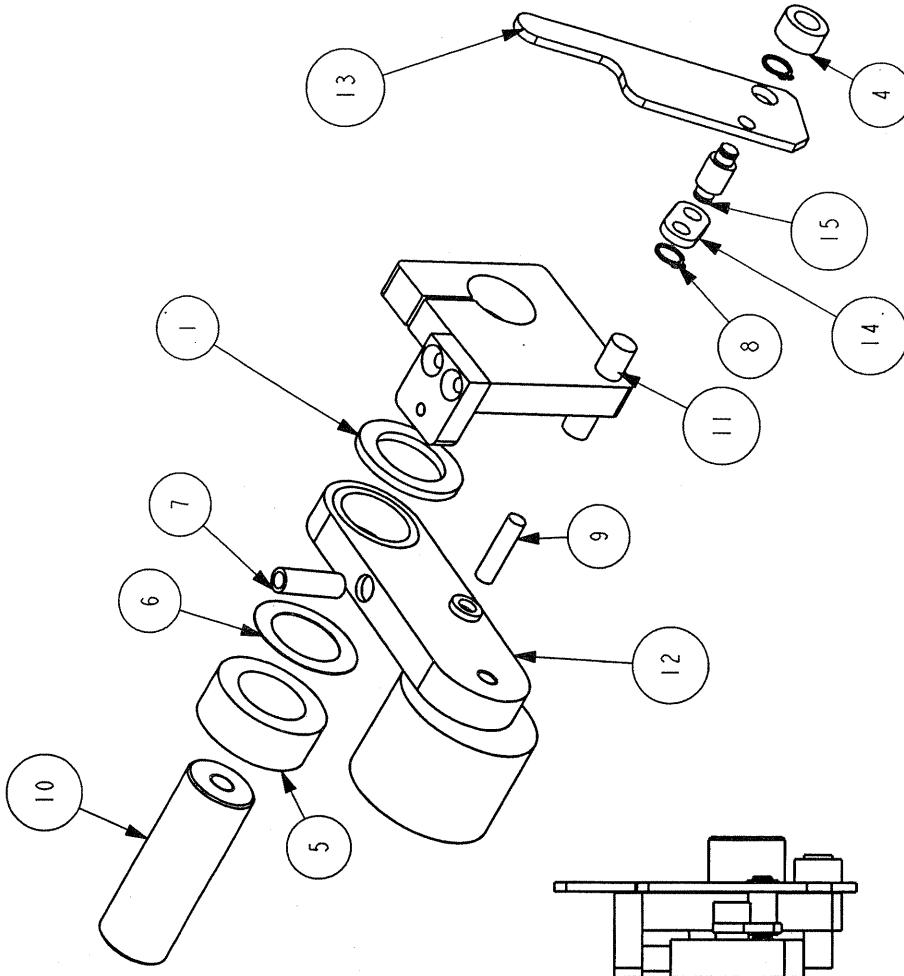
FINISH: N / A

REMOVED ALL BURRS AND
SHARP EDGES UNLESS
OTHERWISE NOTED

ALL DIMENSIONS ARE
FINISHED DIMENSIONS

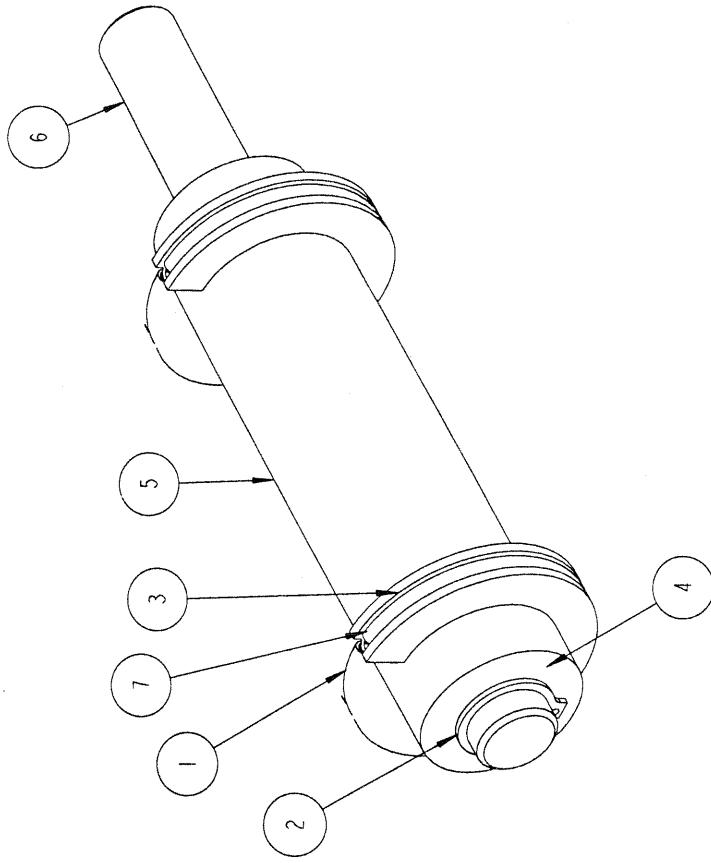
DO NOT SCALE - WORK
TO DIMENSIONS ONLY

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	100410	WASHER, BRASS TWO					
2	100608	WASHER, FLAT 1/4ID 3/32TK BRASS					
3	102206	COLLAR .250					
4	102211	COLLAR .375					
5	102212	COLLAR 1.000					
6	102659	SHIM, 1.000X1.500X.015					
7	102704	SPRING, COIL					
8	2 104100	SNAPRING, .375					
9	1 105401	DOWEL, PIN .250X1.000					
10	1 527650	STUD, PINCH ROLLER					
11	1 506292A	ASSY, SPRING CLAMP					
12	1 532094-01	ASSY, SWING ARM & ROLLER					
13	1 536752-01	BAR-LINKAGE					
14	1 536753-01	BAR-LINKAGE					
15	1 536754-01	STUD-PIVOT					
16	1 CURVE 7	LINKAGE					



DRAWN BY:	TVK	SCALE	0 . 430	MATERIAL:	N / A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA
CHECKED BY:		DATE	01 - JUL 1 - 99	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	N / A		
TRACED BY:	MASTER	AMG.	.01 .005 .5	HEAT TREAT:	N / A	MOD: SP76300	REO'D WHERE USED
				FINISH:	N / A	SHEET NO. 10F 1	DRAWING # 536360-01

ITEM	QTY	PART #	DESCRIPTION
1	2	102780	SPRING, EXTENSION
2	2	104106	SNAPRING, .500
3	2	525205	GUIDE, RING
4	2	102767-1	SPRING, EXTENSION
5	1	527615-0	ROLLER, WEB
6	1	527617-01	SHAFT WEB
7	2	532785-01	ASSY, SPRING CLIP

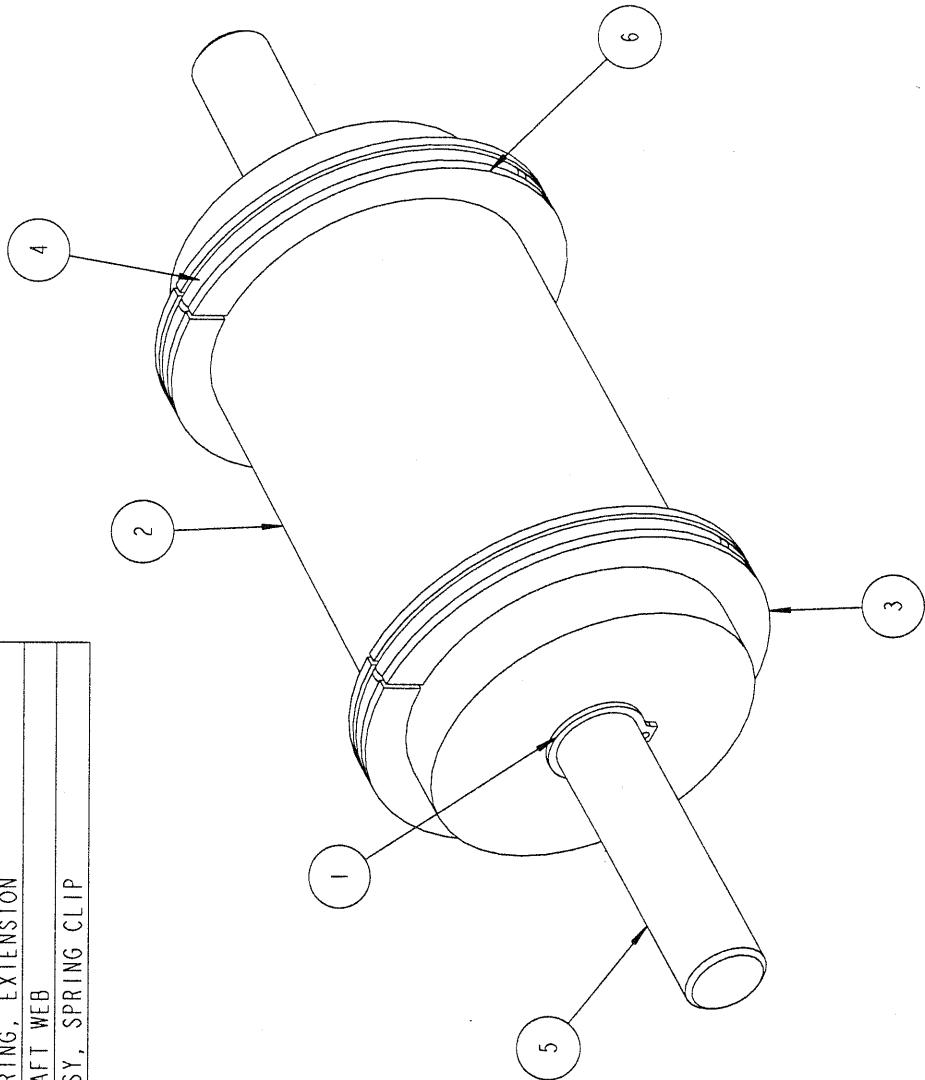


REV NO	DATE	DESCRIPTION	ECN NO	BY

2	527
REQ'D	WHERE USED

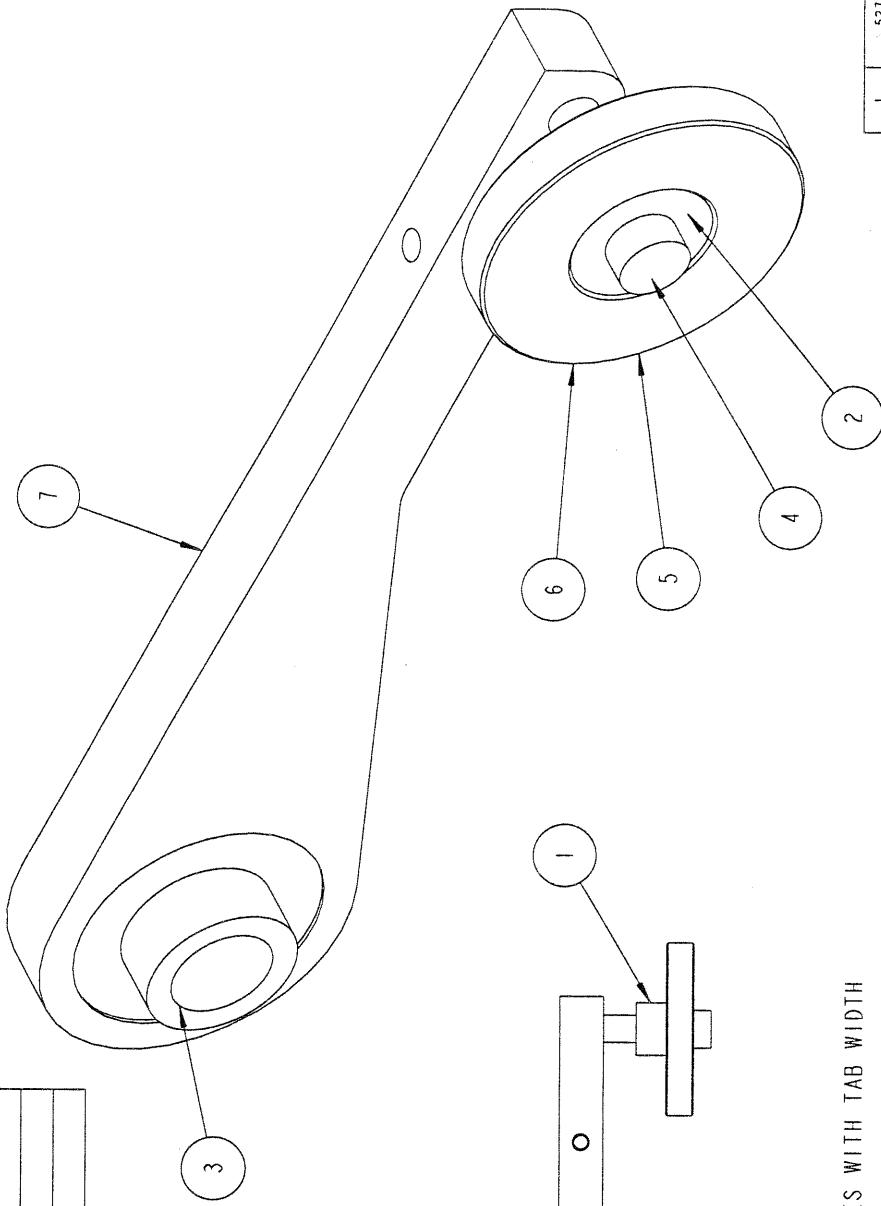
DRAWN BY: T JG	SCALE: 1 . 000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED EXCEPT IN FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA
CHECKED BY:	DATE: 15-Apr-98	.XX .XXX ANG. .01 .005 .5	HEAT TREAT: N/A	MODEL: 527	TITLE: ASSY, GUIDE ROLLER
TRACED BY:	MASTER	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	FINISH: N/A	SHEET NO: 10F1	DRAWING #: 532096-01

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	2	104106 SNAPRING, .500					
2	1	528233 ROLLER-WEB					
3	2	528234 GUIDE, RING					
4	6	102767-2 SPRING, EXTENSION					
5	1	527617-03 SHAFT WEB					
6	2	532785-02 ASSY, SPRING CLIP					

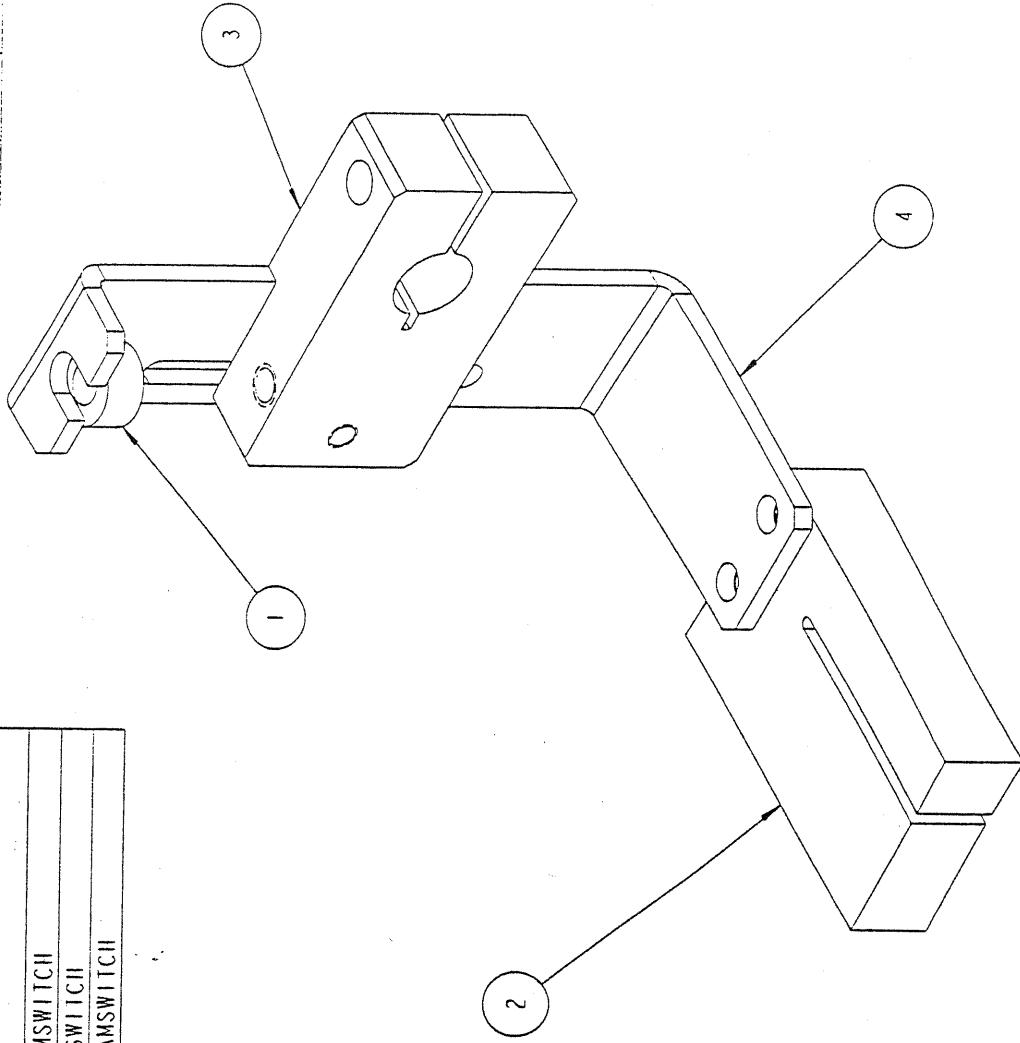


DRAWN BY:	T JG	SCALE	.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL: N/A	THIRD ANGLE PROJECTION	KIRK - RUDY, INC.
CHECKED BY:		DATE	15-Apr-98	.XX .XXX ANG. .01 .005 .5	HEAT TREAT: N/A	EX-PROJ	KIRK KENNE SAW, GEORGIA
TRACED BY:		MASTER	M	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	FINISH: N/A	MODE: 527	KENNE SAW, GA 30144 USA
				ALL DIMENSIONS ARE FINISHED DIMENSIONS		SHEET NO. 1 OF 1	TITLE: ASSY, GUIDE ROLLER
				DO NOT SCALE - WORK TO DIMENSIONS ONLY		DRAWING #	532097-01

ITEM QTY	PART #	DESCRIPTION
1	102204	COLLAR .313
2	103107	BEARING, FLAT .312
3	103804	BEARING, HUB .625
4	107105	BOLT, SHOULDER 5/16X1.00
5	500339	ROLLER, ARM
6	500339A	ASSY, ROLLER
7	527621-1	ARM, PINCH ROLLER



DRAWN BY:		SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		MATERIAL:	THIRD ANGLE PROJECTION		PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK RUDY, INC. KENNESAW, GA 30144 USA		REG'D WHERE USED
CHECKED BY:	T JG	.000	.XX	.XXX	ANG.			KIRK - RUDY, INC.	KENNESAW, GEORGIA	521
DATE	15 - Apr - 98		.01	.005	.5	HEAT TREAT:				
MASTER	M		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED		N/A	MODEL:	527	TITLE:		DRAWING #
TRACED BY:			ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY		N/A	SHEET NO:	10F 1	532098-01		

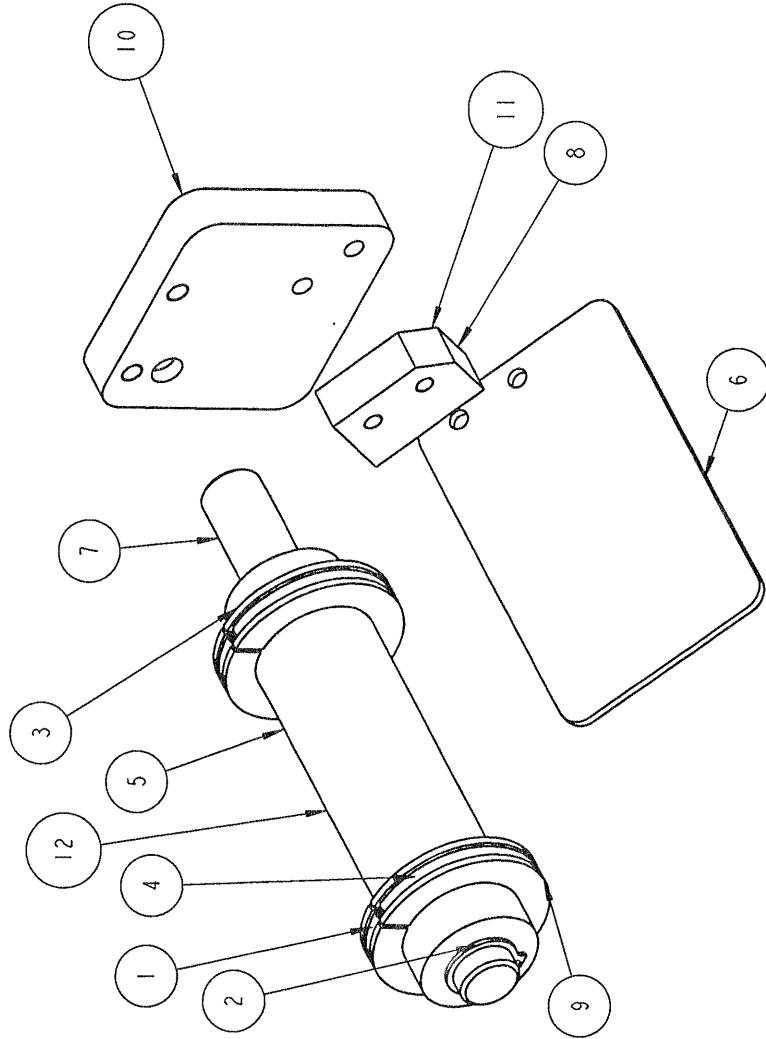


ITEM QTY	PART #	DESCRIPTION
1	102223	COLLAR .250
2	202249-3	SENSOR, BEAMSWITCH
3	532750-01	CLAMP, BEAMSWITCH
4	532751-02	BRACKET, BEAMSWITCH

DRAWN BY:	SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			NOTED	THIRD ANGLE PROJECTION		PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30044 USA	
CHIEFED BY:	DATE	.01	.005	.5	HEAT TREAT:			MODEL:	527
TRACED BY:	MASTER	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED			FINISH:	ASSY, SENSOR MOUNT		SHEET NO.	100F1
ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY					DRAWING:	KIRK-RUDY, INC. KENNESAW, GA		RECD'D	571
								WHERE USED	

532749-02

ITEM	QTY	PART #	DESCRIPTION
1	2	102780	SPRING, EXTENSION
2	2	104106	SNAPRING, .500
3	2	525205	GUIDE, RING
4	2	102767-1	SPRING, EXTENSION
5	1	527615-0	ROLLER, WEB
6	1	527616-5	PLATE, STRIPPER
7	1	527617-11	SHAFT WEB
8	1	527665-1	BLOCK, STRIPPER
9	2	532785-01	ASSY, SPRING CLIP
10	1	532967-01	PLATE, STRIPPER MOUNT
11	1	532970-02	ASSY, STRIPPER BLOCK
12	1	532980-01	ASSY, GUIDE ROLLER



ITEM	ECN NO	REV NO	DATE	DESCRIPTION	ECN BY
1	ECN6301				REO-D WHERE USED
					KIRK - RUDY, INC.
					KENNEBREW, GEORGIA
					
					KENNEBREW, GA 30144 USA
					PROPRIETARY AND CONFIDENTIAL
					NO PORTION OF THIS DRAWING
					MAY BE COPIED OR REPRODUCED
					IN ANY FORM WITHOUT THE
					EXPRESS WRITTEN PERMISSION
					OF KIRK-RUDY, INC.
					KENNEBREW, GA 30144 USA
DRAWN BY:	T JG	SCALE	0 . 750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL: N/A
CHECKED BY:		DATE	5 - Apr - 98	.xx .xxx ANG. .01 .005 .5	HEAT TREAT: N/A
TRACED BY:		MASTER		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	NOTE: 527 SHEET NO.: 10F1 DRAWING #: 532969-01

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	527624	ROLLER, CORE					
2	527625	HUB, ROLL					
3	527651-3	RING, RETAINING					
4	532794-02	ASSY, OUTSIDE RETAINING RING					
5	532795-02	ASSY, INSIDE RETAINING RING					
6	532974-02	ASSY, FEED ARM					
7	532976-02	PLATE, ARM SPLICE					
8	535795-01	WING, FEED ROLL RETAINING					

1 527
REQ'D WHERE USED

ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	100108	BUSHING, SLEEVE .625					
2	1	100131	BUSHING, SLEEVE .250					
3	3	102201	COLLAR .625					
4	2	102206	COLLAR .250					
5	1	102775	SPRING					
6	2	103110	BEARING, FLAT .625					
7	4	104104	SNAPRING, .625					
8	1	105407	DOWEL, PIN .250X1.500					
9	1	527643	BLOCK, BRAKE					
10	1	527678	SHAFT, ROLLER TAKE-UP					
11	1	527642-1	SHAFT, LET OFF SHAFT					
12	1	527689-SC	BELT, SPOOL BRAKE					
13	1	532973-02	ARM, CORE SUPPORT					
14	1	532979-01	WELDMENT, WEB ROD					
15	1	533126-01	ASSY, WEB ROD					
16	1	CSD271						
17	1	CSD296						
18	2	WA006						
19	2	WA010						

DRAWN BY: T J G SCALE: 0 . 312 DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

DATE	3 Apr - 98	X	.01	XXX	ANG.	HEAT TREAT:	N/A
CHECKED BY:			.005	.5		FINISH:	N/A
TRACED BY:	MASTER		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY				

THIRD ANGLE PROJECTION

MODEL: 527	TITLE: ASSY, FEED ARM
SHEET NO: 1 OF 1	DRAWING #: 532974-02

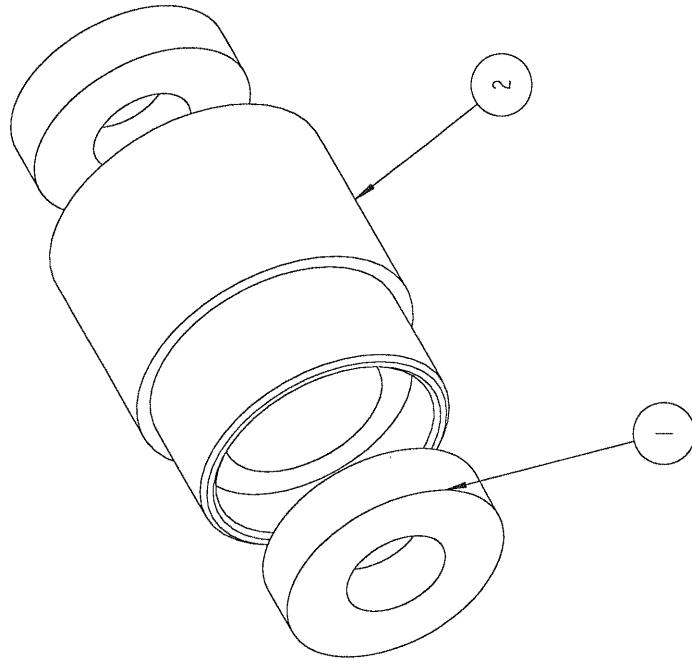
PROPRIETARY AND CONFIDENTIAL
NO PORTION OF THIS DRAWING
MAY BE COPIED OR REPRODUCED
IN ANY FORM WITHOUT THE
EXPRESS WRITTEN PERMISSION
OF KIRK-RUDY INC.
KENNESAW, GA 30144 USA

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECH NO	BY
1	109801	PULLEY, 16XL037 .312B .125K					
2	502388	STUD, COVER					
3	109001-1	BELT, TIMING 130XL037					
4	503531-A	ASSY, HUB					
5	527651-1A	ASSY, REWIND WHEEL					
6	532977-01	ARM, TAKE-UP					
7	532978-01	PLATE, ARM SPLICE					
8	533108-02	EG ASSY, WEB TAKUP ARM					
9	533109-01	EG ASSY, SLIP CLUTCH SHEFT					
10	533111-01	ASSY, REWIND RETAINER WING					
11	533127-01	ASSY, REWIND MOTOR					
12	533130-01	COVER, REWIND BELT					

1	527
REQ'D	WHERE USED
1	KIRK - RUDY, INC. KENNESAW, GEORGIA
<p>KR</p> <p>PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY INC. KENNESAW, GA 30144 USA</p>	
TITLE:	
MODEL: 527	
SHEET NO	1 OF 1
DRAWING #	
ASSY, REWIND	
533112-01	

DRAWN BY: T JG	SCALE: 0 .350	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		MATERIAL: N/A	THIRD ANGLE PROJECTION
CHECKED BY:	DATE: 4-Apr-98	.xx	.xxx	ANG.	
TRACED BY:	MASTER: M	.01	.005	.5	HEAT TREAT:
		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED		N/A	
		ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY		N/A	

ITEM QTY	PART #	DESCRIPTION
1	2	103110 BEARING, FLAT .625
2	1	503531 HUB, GEAR BEARING

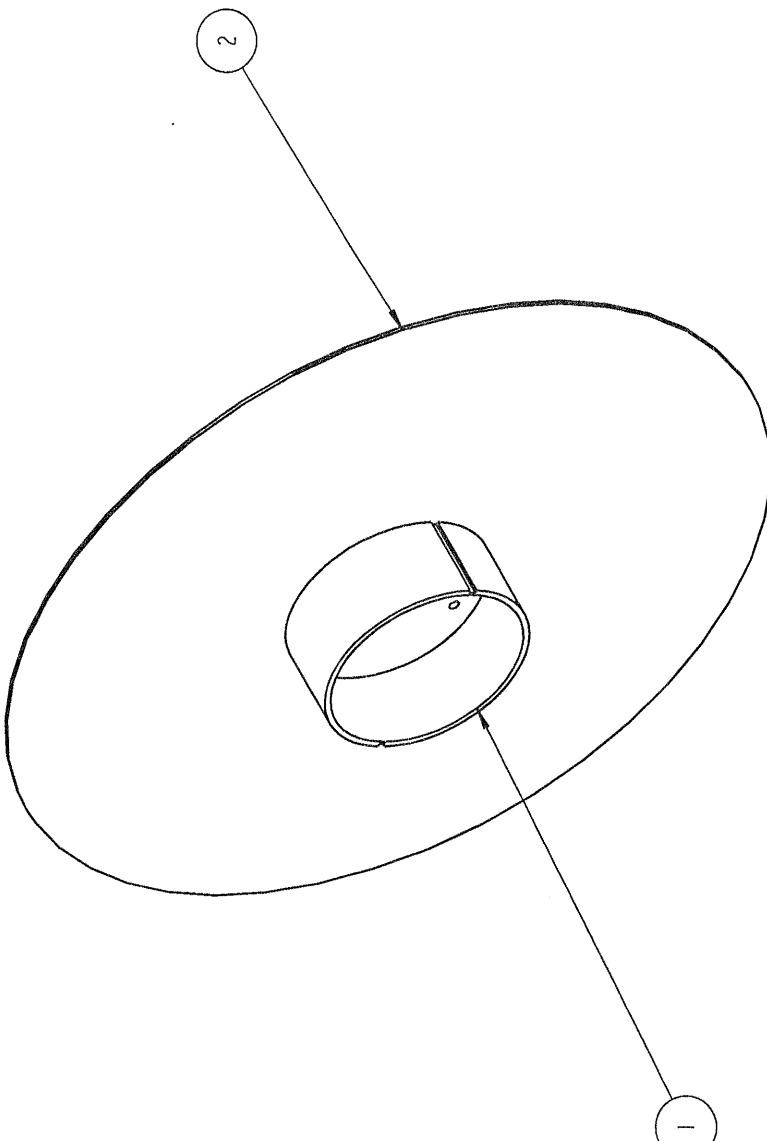


DRAWN BY:	SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL	NOTED	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	REQ'D WHERE USED
T JG	.000	.XX .XXX .01 .005 .5	AMG.	NONE			KIRK - RUDY, INC.
CHECKED BY:	DATE	22-Jan-98		HEAT TREAT:		KENNESAW, GEORGIA	
TRACED BY:	MASTER	REMOVE ALL BURS AND SHARP EDGES UNLESS OTHERWISE NOTED		FINISH:	MODEL: 324		
	M	ALL DIMENSIONS ARE FINISHED DIMENSIONS			SHEET NO. 1 OF 1	DRAWING 1	ASSY, HUB
		DO NOT SCALE - WORK TO DIMENSIONS ONLY					503531-A

DRAWING #

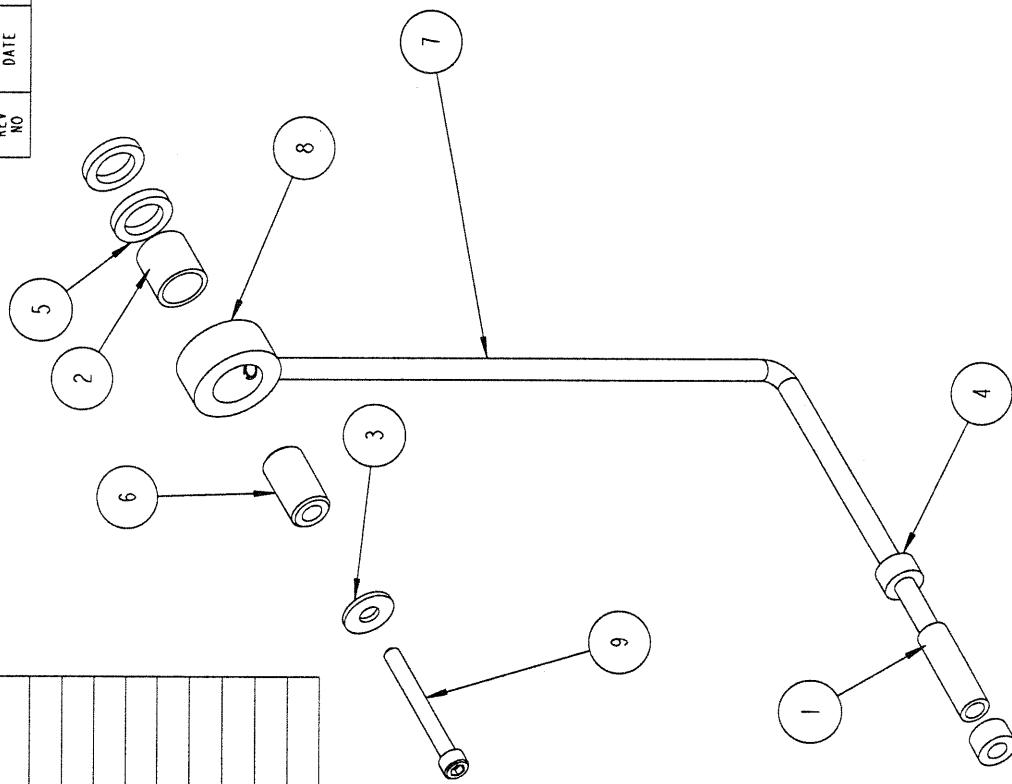
527651-1A

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	527610 ROLLER, TAKE UP					
2	1	527651-1 RING, RETAINING					



DRAWN BY:	T JG	SCALE	0 . 375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		MATERIAL:	N / A	THIRD ANGLE PROJECTION	KIRK - RUDY, INC.
CHECKED BY:		DATE	4 - Apr - 98	.01	.005	AMG.	.5	NO. 1	KENNESAW, GEORGIA
TRACED BY:		MASTER	<i>M</i>	REMOVE ALL BURS AND SHARP EDGES UNLESS OTHERWISE NOTED		HEAT TREAT:	N / A	NOTE:	
				ALL DIMENSIONS ARE FINISHED DIMENSIONS		FINISH:	N / A	SHEET NO.:	1 OF 1
				DO NOT SCALE - WORK TO DIMENSIONS ONLY				TITLE:	ASSY, REWIND WHEEL
								RECD WHERE USED	I 533112-01

ITEM QTY	PART #	DESCRIPTION
1	100131	BUSHING, SLEEVE .250
2	100162	BUSHING, SLEEVE .500
3	100401	WASHER, THRUST TB410
4	2 102206	COLLAR .250
5	2 102301	SHIM, .500X.750X.125
6	1 527688	SHAFT, CAM ARM BUSHING
7	1 532788-02	WLDMNT, TAKE-UP ROD
8	1 532789-02	ASSY, TAKE-UP ROD
9	1 CSDD272	

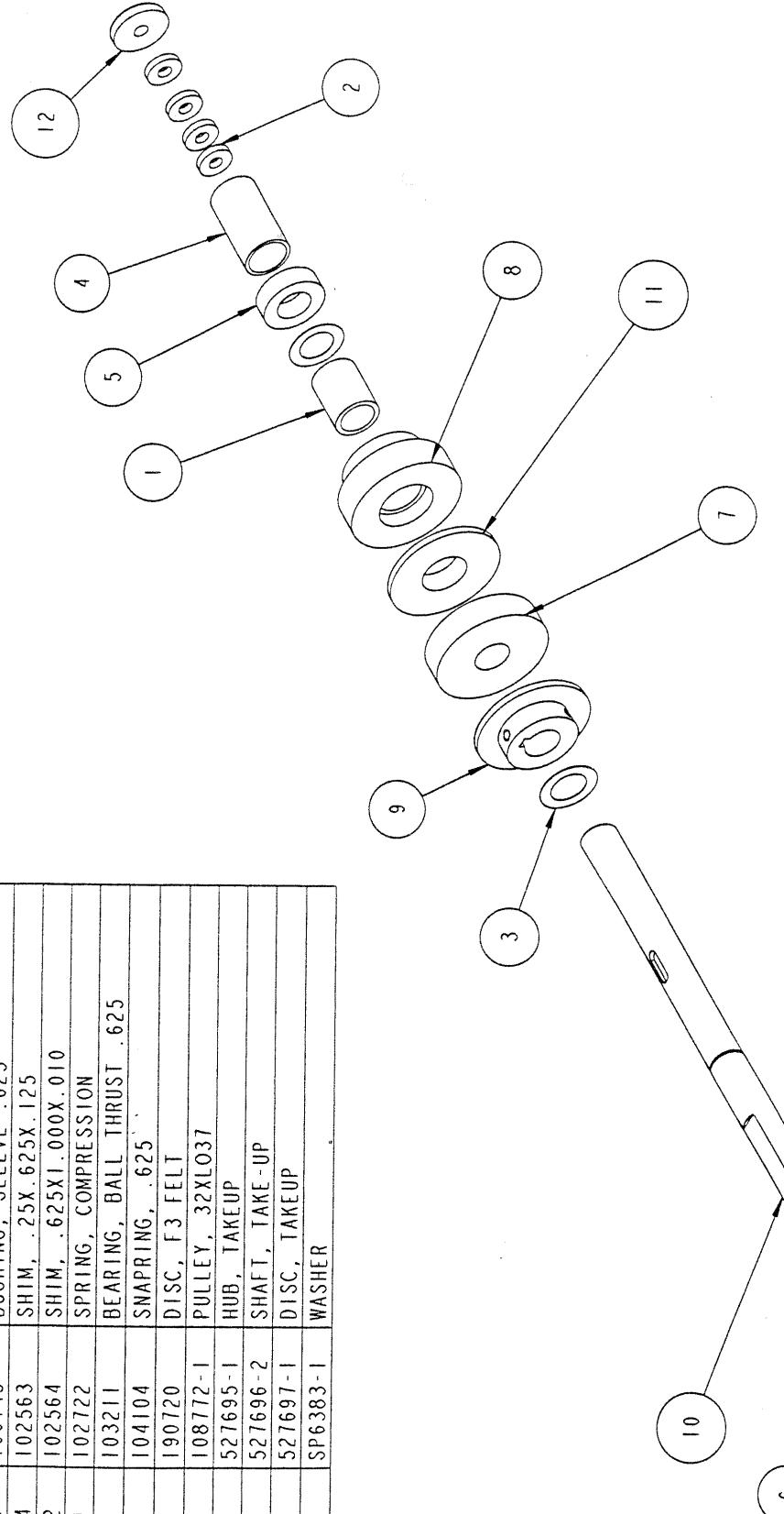


DRAWN BY:	SCALE	DATE	REV NO	DATE	DESCRIPTION	ECN NO	BY
T JG	0 . 500	4 - Apr - 98					
CHECKED BY:			.01	.005	ANG.		
TRACED BY:	M				HEAT TREAT:	N/A	
				DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			
				xx	.XXX		
				REMOVE ALL BURS AND SHARP EDGES UNLESS OTHERWISE NOTED			
				ALL DIMENSIONS ARE FINISHED DIMENSIONS			
				DO NOT SCALE - WORK TO DIMENSIONS ONLY			
				SHEET NO. 1 OF 1			
				TITLE: EG ASSY, WEB THUP ARM			
				RECD WHERE USED			
				1	533112-01		
				533108-02			

PROPRIETARY AND CONFIDENTIAL
NO PORTION OF THIS DRAWING
MAY BE QUOTED OR REPRODUCED
IN ANY FORM WITHOUT THE
EXPRESS WRITTEN PERMISSION
OF KIRK-RUDY INC.
KENNESAW, GA 30144 USA

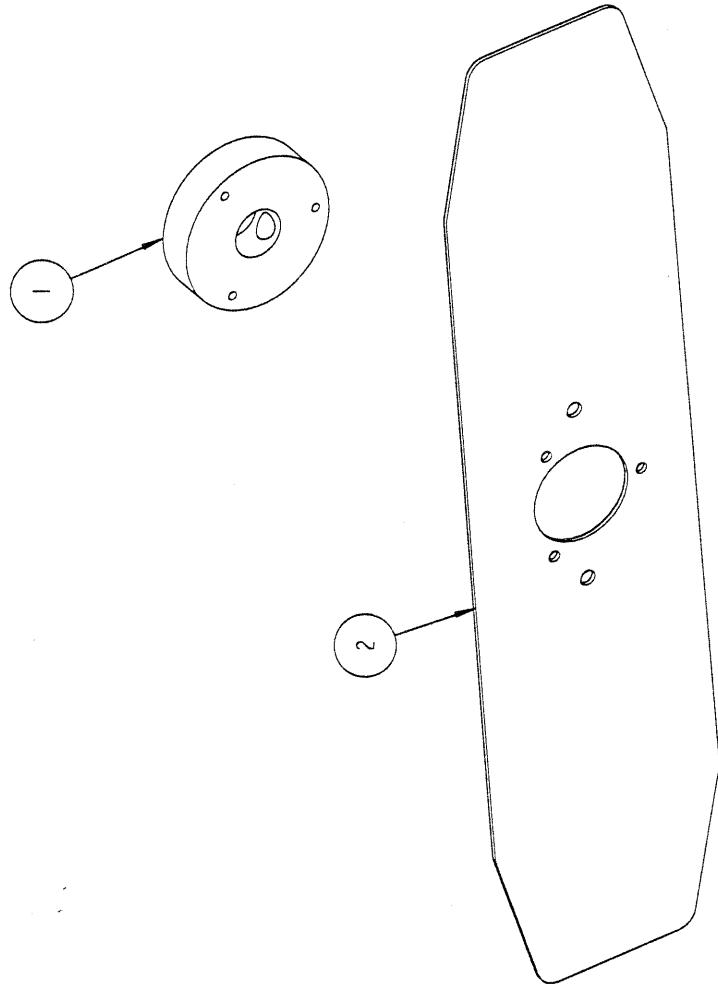
KIRK - RUDY, INC.
KENNESAW, GEORGIA

ITEM	QTY	PART #	DESCRIPTION
1	1	100145	BUSHING, SLEEVE .625
2	4	102563	SHIM, .25X.625X.125
3	2	102564	SHIM, .625X1.000X.010
4	1	102722	SPRING, COMPRESSION
5	1	103211	BEARING, BALL THRUST .625
6	1	104104	SNAPRING, .625
7	1	190720	DISC, F3 FELT
8	1	108772-1	PULLEY, 32XL037
9	1	527695-1	HUB, TAKEUP
10	1	527696-2	SHAFT, TAKE-UP
11	1	527697-1	DISC, TAKEUP
12	1	SP6383-1	WASHER



REV NO	DATE	DESCRIPTION	FCN NO	BY												
1				533112-01												
REO'D				WHERE USED												
DRAWN BY: T JG				THIRD ANGLE PROJECTION												
SCALE: 0 .375				PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN WHOLE OR IN PART, WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY INC. KENNESAW, GA 30144 USA												
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED				MODEL: 527												
<table border="1"> <tr> <td>.01</td> <td>.005</td> <td>.5</td> <td>HEAT TREAT:</td> </tr> <tr> <td>.005</td> <td>.005</td> <td>.5</td> <td>N/A</td> </tr> <tr> <td>.005</td> <td>.005</td> <td>.5</td> <td></td> </tr> </table>				.01	.005	.5	HEAT TREAT:	.005	.005	.5	N/A	.005	.005	.5		TITLE: EG ASSY, SLIP CLUTCH SHFT
.01	.005	.5	HEAT TREAT:													
.005	.005	.5	N/A													
.005	.005	.5														
CHECKED BY: DATE: 14 - Apr - 98				DRAWING #:												
TRACED BY: MASTER				SHEET NO. 10F												
REMOVED ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE WORK TO DIMENSIONS ONLY				533109-01												

ITEM	QTY	PART #	DESCRIPTION
1	1	527625	HUB, ROLL
2	1	527679	ARM, SALVAGE RETAINING

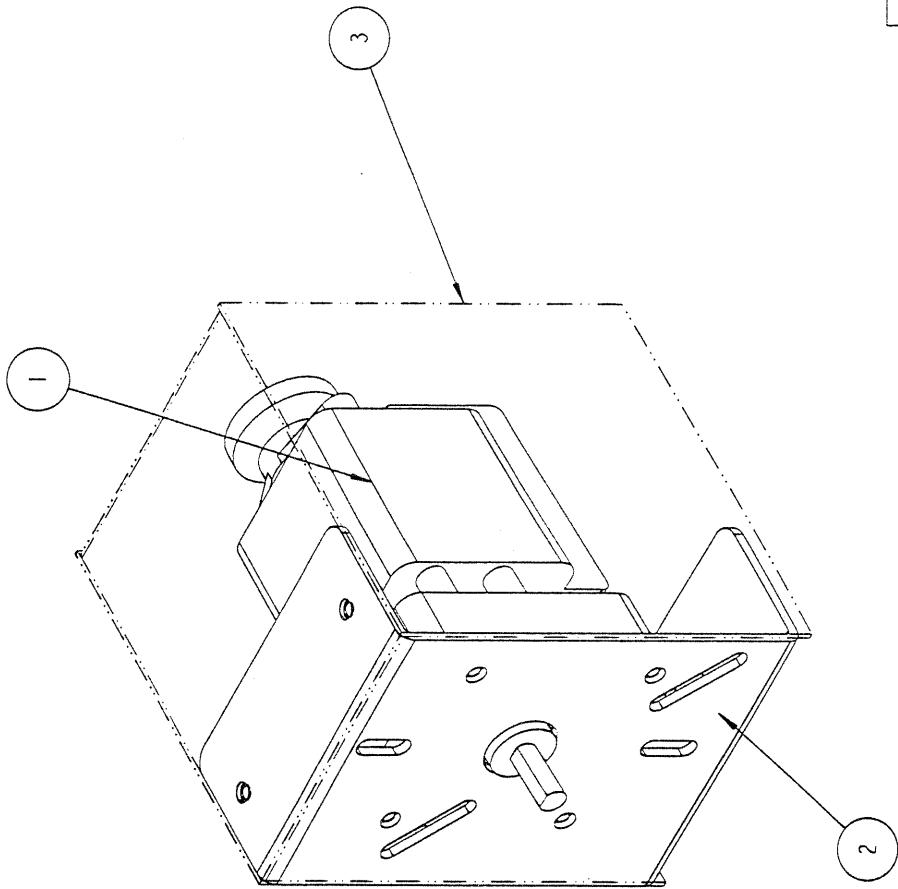


REV NO	DATE	DESCRIPTION	ITEM NO	BY

1	527600
REO D	WHERE USED

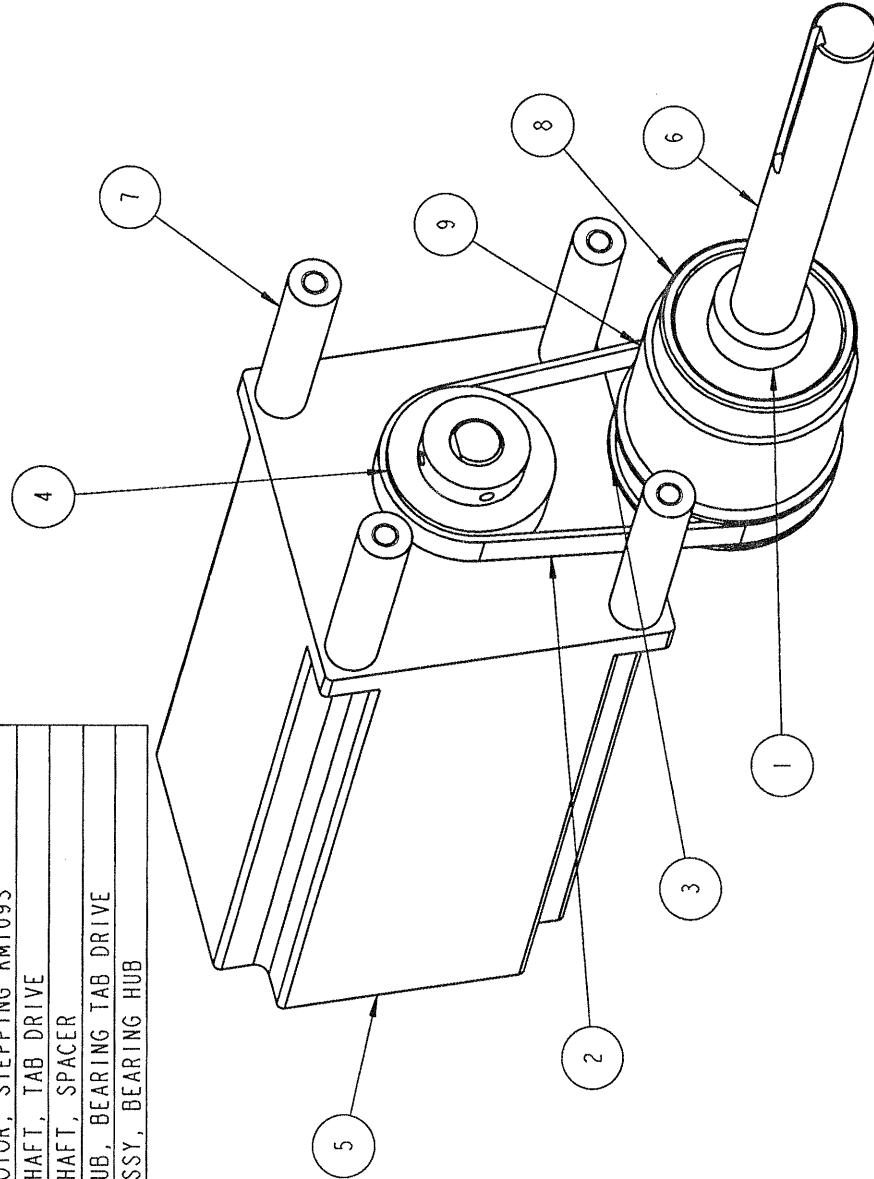
DRAWN BY:	SCALE	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL
A KEY	0 . 500	MATERIAL: N / A	NO PORTION OF THIS DRAWING MAY BE COPIED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY INC. KENNESAW, GA 30444 USA
CHECKED BY:	DATE	DIMENSIONAL TOLERANCES .01 .005 .5 .XX XXX ANG.	- - -
TRACED BY:	MASTER	HEAT TREAT: N / A	MODEL: 527
		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	NAME: ASSY, REWIND RETAINER WING
		ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE. WORK TO DIMENSIONS ONLY	SHEET NO: 1 OF 1
			DRAWING #:
			533111-01

ITEM QTY	PART #	DESCRIPTION
1	200178	MOTOR
2	532109-02	BRACKET, STEPPER MOTOR MOUNTING
3	532423-01	WLDMNT, 527 COVER



DRAWN BY:	T JG	SCALE:	0 . 500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		MATERIAL:	N / A	THIRD ANGLE PROJECTION			PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK RUDY, INC. KENNESAW, GA. 30144 USA
CHECKED BY:		DATE:	4 - Apr - 98	.01	.005	ANG.	.5	HEAT TREAT:	N / A	REMOVED ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	KIRK RUDY - RUDY, INC. KENNESAW, GEORGIA
TRACED BY:		MASTER:	M	ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY		FINISH:	N / A	MODEL:	527	ASSY, REWIND MOTOR	
						SHEET NO.:	101	FILE:		DRAWING #:	
										5331127-01	

ITEM	QTY	PART #	DESCRIPTION
1	2	103804	BEARING, HUB .625
2	1	109119	BELT, TIMING HTD 545M09
3	1	109717	PULLEY, TIMING 325M09 .625B .188K
4	1	109718	PULLEY, TIMING 255M09 .500B NK
5	1	200159-3	MOTOR, STEPPING KMT093
6	1	533114-01	SHAFT, TAB DRIVE
7	4	533116-01	SHAFT, SPACER
8	1	533120-01	HUB, BEARING TAB DRIVE
9	1	533121-01	ASSY, BEARING HUB



DRAWN BY:	SCALE	DATE	REVISION NO.	DATE	DESCRIPTION	ECN NO.	BY
TJG	0 .625			1 31-AUG-99	CHANGED DRIVE BELT AND MOTOR	6491	ATB
CHECKED BY:							
TRACED BY:							
PROPRIETARY AND CONFIDENTIAL							
NO PORTION OF THIS DRAWING							
MADE OR REPRODUCED							
IN ANY FORM WITHOUT THE							
EXPRESS WRITTEN PERMISSION							
OF KIRK-RUDY INC.							
KENNESAW, GA 30144 USA							
THIRD ANGLE PROJECTION							
NOTE D							
MATERIAL:							
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED							
-XX XXX ANG.							
.01 .005 .5							
HEAT TREAT:							
NONE							
REMOVE ALL RUGGS AND							
SHARP EDGES UNLESS							
OTHERWISE NOTED							
ALL DIMENSIONS ARE							
FINISHED DIMENSIONS							
DO NOT SCALE - WORK							
TO DIMENSIONS ONLY							
527							
REO'D							
WHERE USED							
KIRK - RUDY, INC.							
KENNESAW, GEORGIA							
KR							
ASSY, DRIVE MOTOR							
DRAWING 1							
533113-01							

ITEM QTY	PART #	DESCRIPTION
1	2	500794 PLATE-MOUNTING
2	1	501629 CLAMP, GUIDE STRIP
3	2	528248 SPACER
4	1	528258 SPACER, HEAD SUPPORT SHAFT
5	1	102131-5 KNOB
6	1	102131-5A KNOB ASSY
7	1	501629-A ASSY, CLAMP WITH KNOB
8	1	508996-4 BRACKET, PHOTOCELL
9	2	527608-R ARM, HEAD SUPPORT
10	1	528249-I BAR-SUPPORT
11	1	534813-01 ASSY, BEAM SWITH MOUNTING
12	1	536008-01 BAR-PHOTO EYE
13	1	CSD267
14	1	SP18329-2 SHAFT, UPPER BELT IDLER

REV NO	DATE	DESCRIPTION	ECN NO	BY
1	01-OCT-98	ADDED 508842 AND 534813-01	6390	NY
2	25-OCT-99	REPLACED 508842 WITH 534808-01	6501	AYB

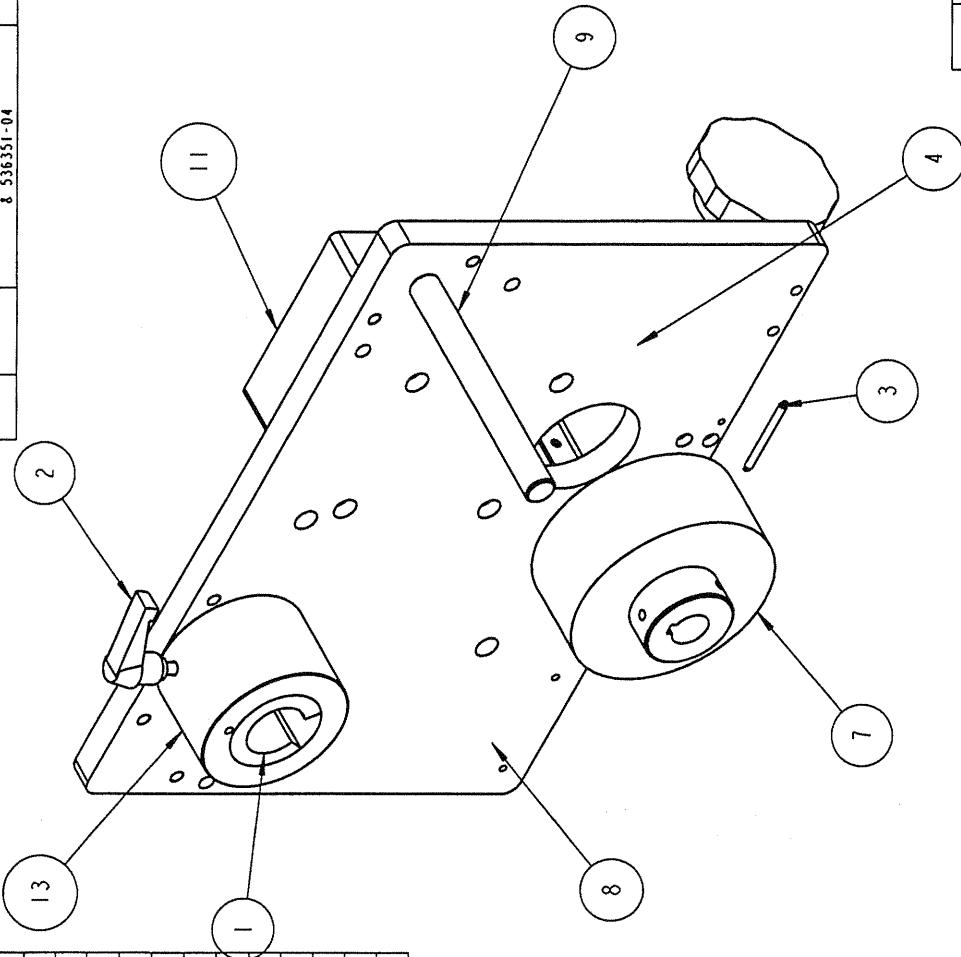
1	527
REQ'D	WHERE USED

DRAWN BY: T JG	SCALE 0 .250	MATERIAL: NOTED	THROAT ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC., KENNESAW, GA 30144 USA
CHECKED BY:	DATE 16 - Apr - 98	MATERIAL: NONE	HEAT TREAT:	MODEL: 527
		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED		TITLE:
TRACED BY:	MASTER	FINISH: NOTED		SHEET NO. 1 OF 1
		ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY		DRAWING #

KIRK - RUDY, INC.
KENNESAW, GEORGIA
KR

ASSY, MOUNTING FRAME
DRAWING # 533115-01

ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	100251	BEARING, LINEAR SLEEVE OPEN			REPLACED 100109 102130 100251 102140 500770 536351-04		
2	1	102140	HANDLE, RELEASE 1/4-20 X .75	1	17-NOV-99			
3	1	102767	SPRING, EXTENSION					
4	1	103955	BALL TRANSER					
5	1	190619	PLATE, NAME					
6	1	500772	KNOB					
7	1	527602	ROLLER, DRIVE					
8	1	527609	FRAME, HEAD					
9	1	508594-2	SHAFT, SPRING GUIDE MNT					
10	1	533117-02	BAR, HEIGHT ADJ					
11	1	533128-01	COVER, MOTOR TOP					
12	1	533129-01	COVER, MOTOR BOTTOM					
13	1	536351-04	HUB, LINEAR BEARING MOUNT					
14	1	536822-02	SHAFT, VERT. ADJ					



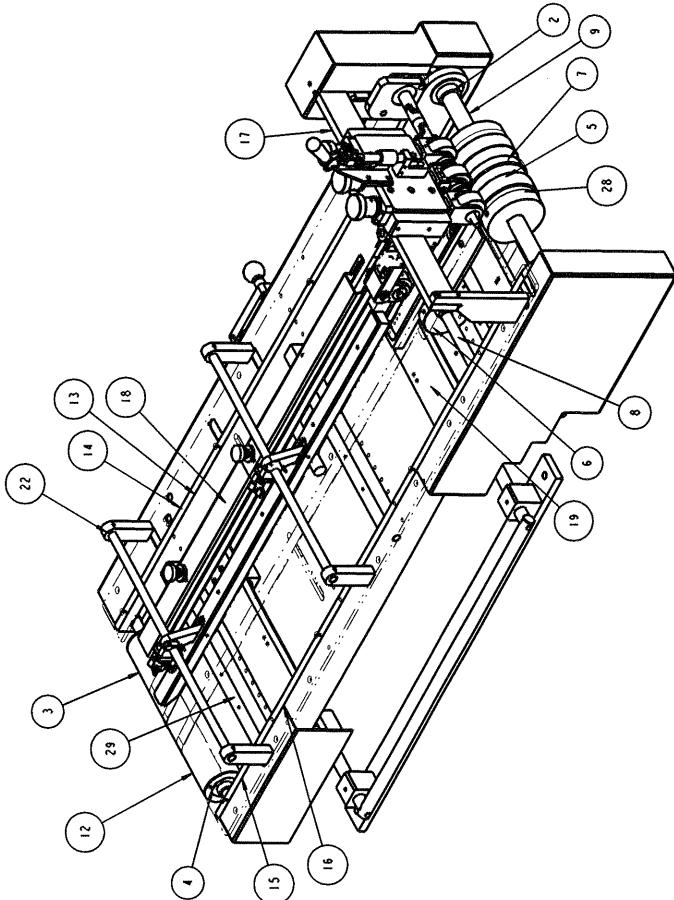
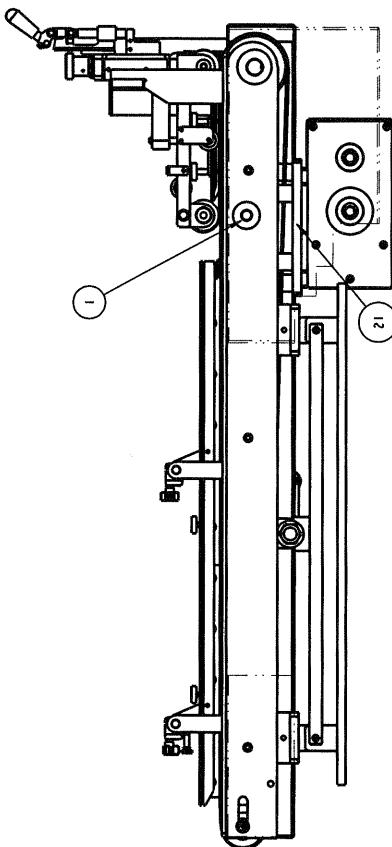
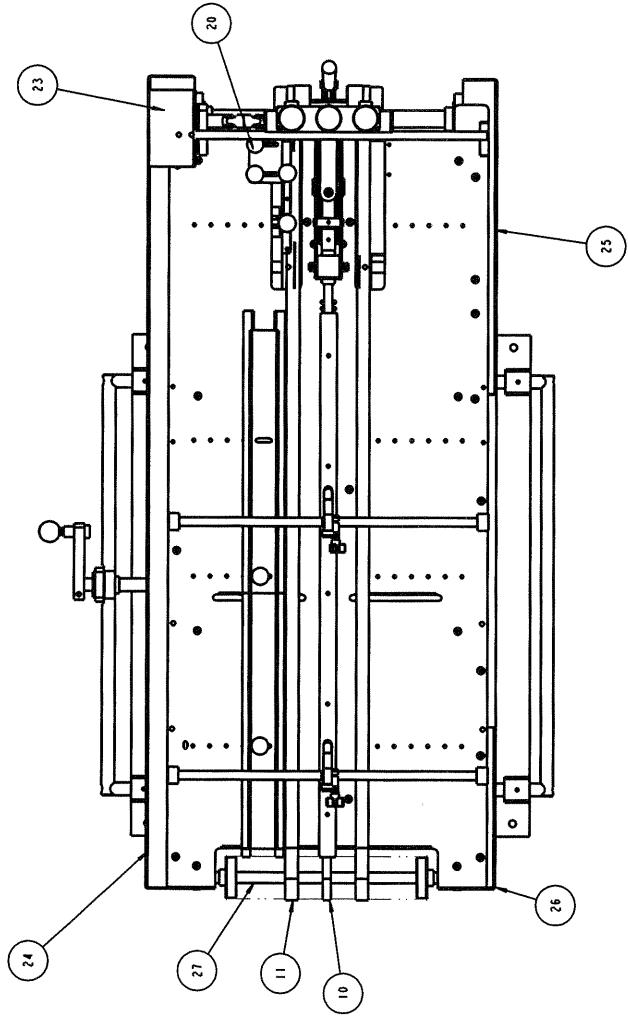
1	527
REQ'D	WHERE USED

PROPRIETARY AND CONFIDENTIAL	NO PORTION OF THIS DRAWING	PROPRIETARY AND CONFIDENTIAL
	MAY BE QUOTED OR REPRODUCED	
	IN ANY FORM WITHOUT THE	
	EXPRESS WRITTEN PERMISSION	
	OF KIRK-RUDY, INC.	
	KENNESAW, GA 30144 USA	

TITLE:	KIRK - RUDY, INC.
MODEL:	527
SHEET NO:	1 OF 1
DRAWING #:	533118-01

DRAWN BY:	T JG	SCALE	0 . 375	DIMENSIONAL TOLERANCES .01 .005 .005 .01 .005 ANG.	MATERIAL: N / A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL
CHECKED BY:		DATE	14 - Apr - 98	HEAT TREAT: N / A			
TRACED BY:		MASTER	M	FINISH: REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FIRM SHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	N / A		

ITEM NO.	PART #	DESCRIPTION	QTY	DATE	REVISION	CCN	BY
1	4	103804 BEARING, HUB .625	1	01-OCT-96	A	6394	WT
2	2	103808 BEARING, HUB 1.000	1				
3	1	500835 ROLLER	1				
4	2	500836 HUB	1				
5	2	527614 ROLLER	1				
6	2	527633 ROLLER TAB PRESS DOWN	1				
7	1	527634 ROLLER, CROWNED KR527	1				
8	1	527637 SHAFT, PRESS DOWN ROLLER	1				
9	1	528231 SHAFT, ROLLER DRIVE	1				
10	1	106231-1 BELT, FLAT HAT-B-P 1/2 X 97 IN	1				
11	2	106460-1 BELT, FLAT HAT-B-P 3/4 X 97 IN	1				
12	1	500835-A ASSY, TUBE ROLLER	1				
13	1	527632-L FRAME, LH SIDE	1				
14	1	527632-LA FRAME, ASY	1				
15	1	527632-R FRAME, RH SIDE	1				
16	1	527632-RA FRAME, ASY	1				
17	1	531577-01 BRIDGE ASY	1				
18	1	531578-01 ASSY, TABLETOP	1				
19	1	531579-01 SLIDE FRAME ASY	1				
20	1	531580-01 CHANNEL FOLDER ASY	1				
21	1	531581-01 ASSY, MOTOR MOUNT	1				
22	1	531924-01 SKID BAR ASY	1				
23	1	532420-01 WLDNT, 527 TOP CHAIN COVER	1				
24	1	532421-01 COVER, 527 SIDE	1				
25	1	532422-01 PNL, SIDE COVER	1				
26	1	532614-01 COVER, SHORT 527	1				
27	1	SP18318 SHAFT, INFED ROLLER	1				
28	2	SP18325 ROLLER, DRIVE (CROWNED)	2				
29	2	SP20308 BAR, SPACER	2				



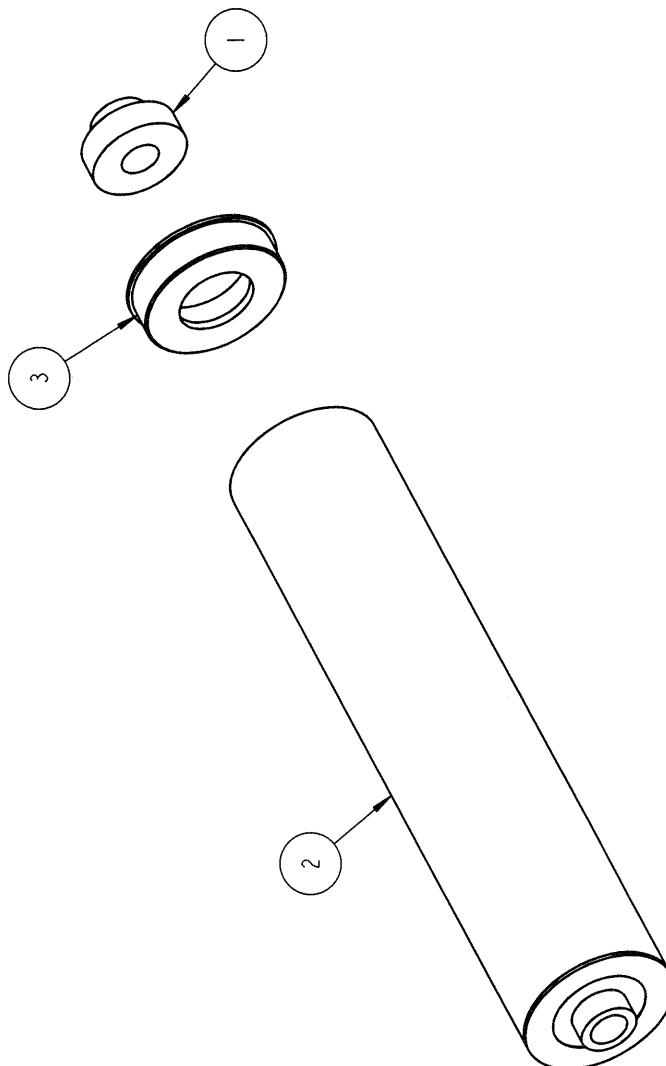
ITEM NO.		NAME	SIZE	QUANTITY	DESCRIPTION	ITEM NO.	NAME	SIZE	QUANTITY	DESCRIPTION
MY		SCREW	0.188	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
13		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
14		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
15		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
16		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
17		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
18		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
19		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
20		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
21		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
22		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
23		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
24		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
25		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
26		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
27		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
28		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				
29		SCREW	1/4-20	1	SCREWS, 1/4-20 X 1/2" L, PLATED	XXX				

ITEM NO.		NAME	SIZE	QUANTITY	DESCRIPTION
1		KIRK - RUDY, INC.			
2		WOODSTOCK, GEORGIA			

ASSY, TABLETOP 527

532316-01

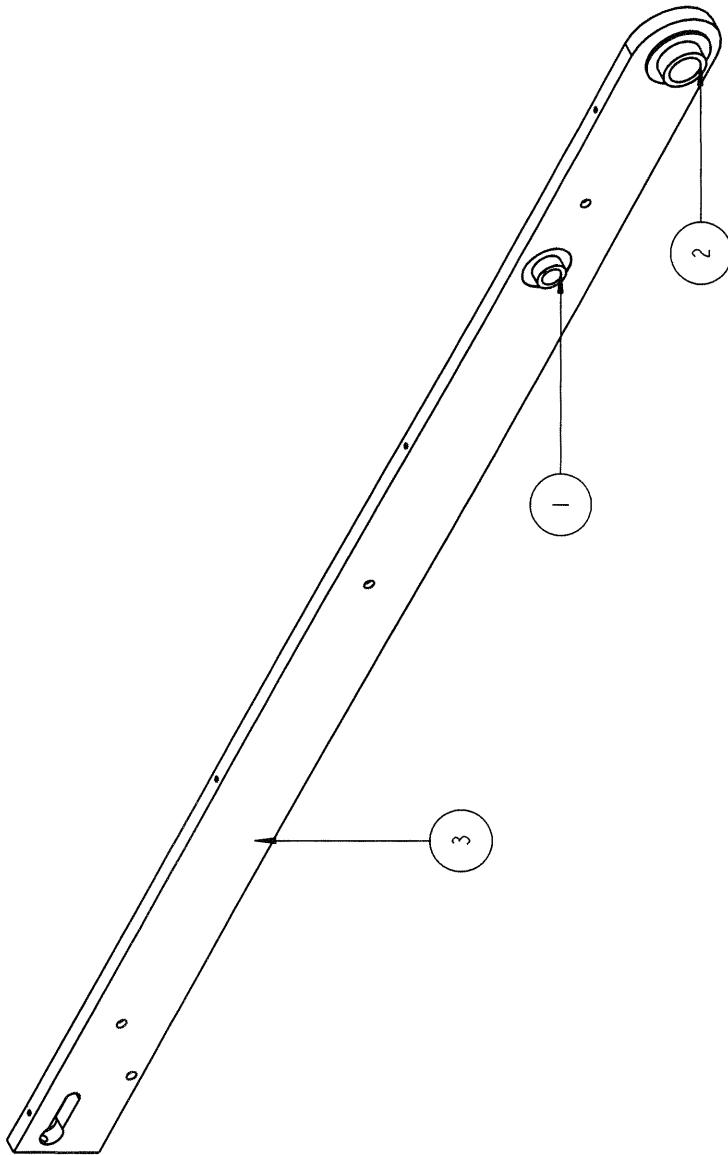
ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	2	103804 BEARING, HUB .625					
2	1	500835 ROLLER					
3	2	500836 HUB					



DRAWN BY: N JG	SCALE 0 .375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			MATERIAL: N / A	THIRD ANGLE PROJECTION 	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY INC. KENNESAW, GA 30444 USA
CHECKED BY:	DATE 28 - JUL - 97	.01	.005	.5	HEAT TREAT: N / A	MODEL: 215	KIRK - RUDY, INC. KENNE SAW, GEORGIA
TRACED BY:	MASTER	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DO NOT SCALE: WORK TO DIMENSIONS ONLY			FINISH: N / A	SHEET NO. OF 1	TITLE: ASSY, TUBE ROLLER DRAWING # 500835-A

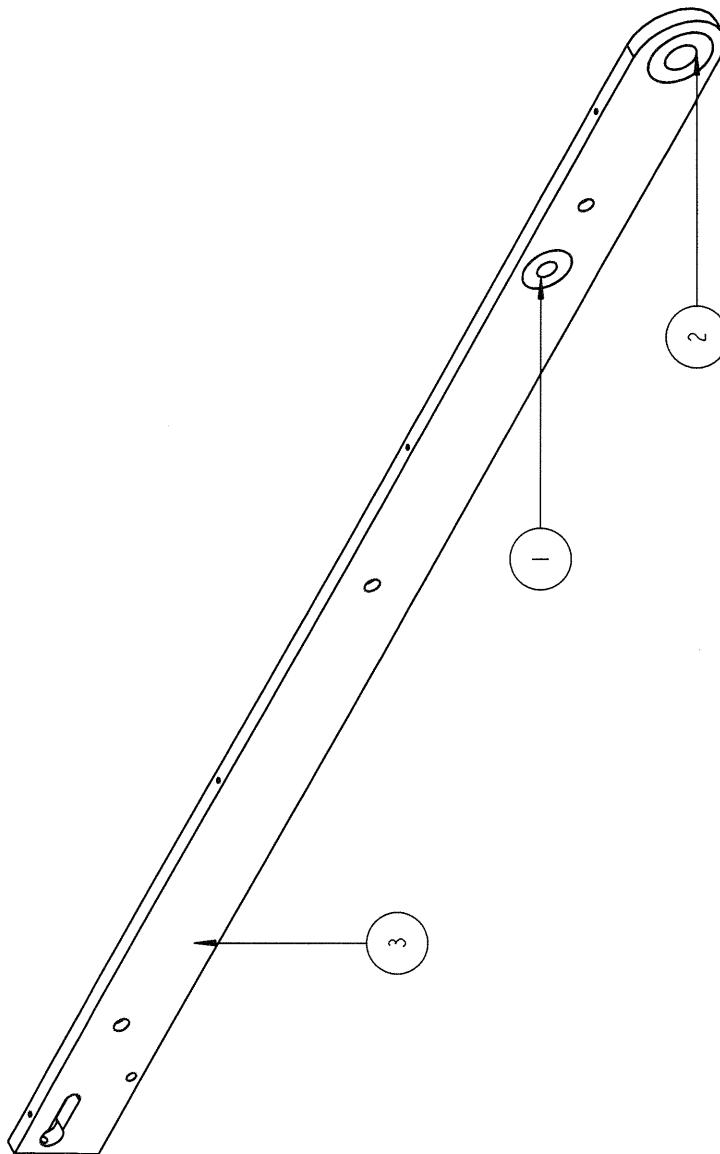
ITEM	QTY	PART #	DESCRIPTION
1	1	103804	BEARING, HUB .625
2	1	103808	BEARING, HUB 1.000
3	1	527622-L	FRAME, LH SIDE

ITEM	REV NO	DATE	DESCRIPTION	ECN NO	BY
1					



ITEM	REV D	WHERE USED
1	532316-01	
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ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	103804	BEARING, HUB .625					
2	1	103808	BEARING, HUB 1.000					
3	1	527622-R	FRAME, RH SIDE					



DRAWN BY:	SCALE	0 . 200	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED			MATERIAL:	XXX	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE COPIED OR REPRODUCED EXCEPT WITH WRITTEN PERMISSION OF KIRK-RUDY, INC., KENNESAW, GEORGIA		
CHECKED BY:	DATE	.xx	.xx	.01	.005	ANG.	.5	HEAT TREAT:	XXX	MODEL:	527
TRACED BY:	MASTER	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED					FINISH: ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY				
							SHEET NO. 1 OF 1				
							DRAWING #				
							527622-RA				
							I 532316-01 RECD WHERE USED				

DRAWING 1

531577-01

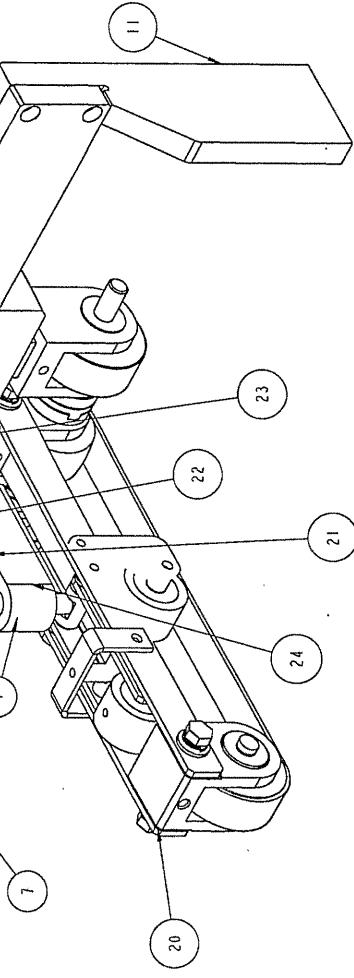
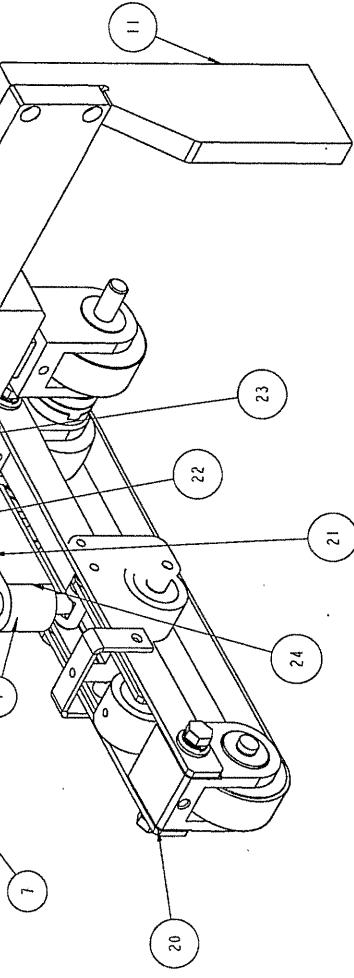
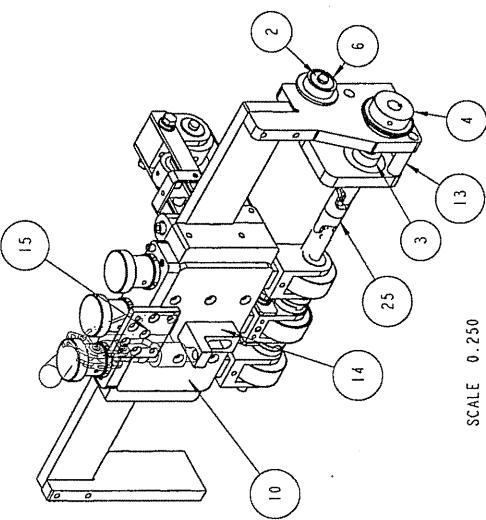
ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	ECN NO	BT
1	1	BUSHING, SL.375 ID.50000 .50016	1	07-OCT-98	ADDED 531578-0 AND 528226	N/A
2	1	BEARING, FLAT .375			CHANGED 528226 AND 528227 TO A	6390 N/A
3	2	BEARING, HUB .500	2	21-OCT-98	CHANGED 528226 AND 528227	6301 ATB
4	1	SPIKET, 258233 .5008 .125K				
5	1	LEVER - QUICK RELEASE				
6	1	503240				
7	1	SPROCKET, 25818				
8	1	PLATE-BRIDGE SUPPORT				
9	1	528227				
10	1	BAR-BRIDGE				
11	1	PLATE-BRIDGE SUPPORT				
12	1	PLATE-BRIDGE SUPPORT				
13	2	STUD-BRIDGE SUPPORT				
14	1	500799-2				
15	1	BLOCK - CONNECTOR				
16	1	CLAMP - MOUNTING PLATE				
17	4	STUD, BRIDGE (LONG)				
18	1	ASSY, SUPPORT PLATE				
19	1	ASSY, SUPPORT PLATE				
20	1	528227-A				
21	1	BAR-BRIDGE CROSS				
22	1	TOP BELT ASSY				
23	1	BAR				
24	1	531948-01				
25	1	BLOCK, BUSHING				
	1	531949-01				
	1	BAR				
	1	531950-01				
	1	GUIDE ASSY				
	1	DRIVE SHAFT & U-JOINT				
	1	538007-01				

REF C WHERE USED
1 523216-01**K** KARK - RUDY INC.,
KENNESAW, GEORGIA

ASY

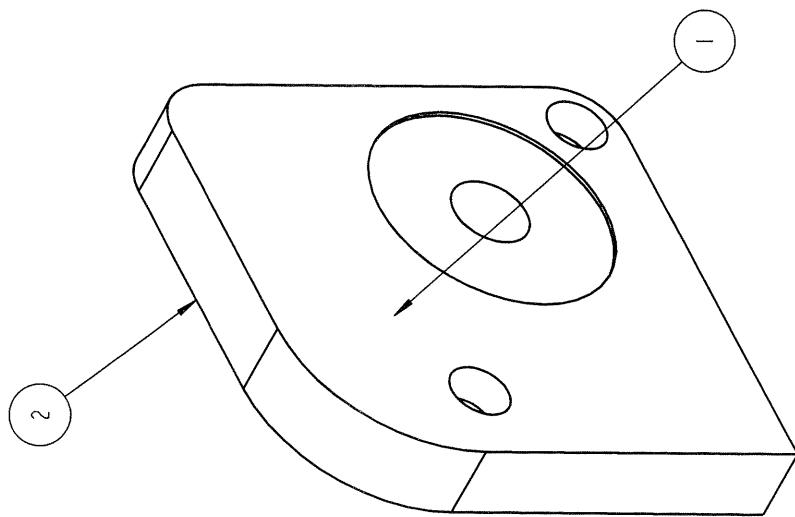
BRIDGE ASY
DRAWING 1
531577-01

PART NUMBER		MATERIAL		PART NUMBER		MATERIAL	
W	0.500	N/A	N/A	W	0.500	N/A	N/A
SCALE:	0	.11	.11	SCALE:	.11	.11	.11
DATE:	21-0C + .99	.44	.44	DATE:	N/A	N/A	N/A
CHECKED BY:				INITIALS:			
TRACED BY:				INITIALS:			
SCALE:	0.250			SCALE:			



PART NUMBER		MATERIAL		PART NUMBER		MATERIAL	
W	0.500	N/A	N/A	W	0.500	N/A	N/A
SCALE:	0	.11	.11	SCALE:	.11	.11	.11
DATE:	21-0C + .99	.44	.44	DATE:	N/A	N/A	N/A
CHECKED BY:				INITIALS:			
TRACED BY:				INITIALS:			
SCALE:	0.250			SCALE:			

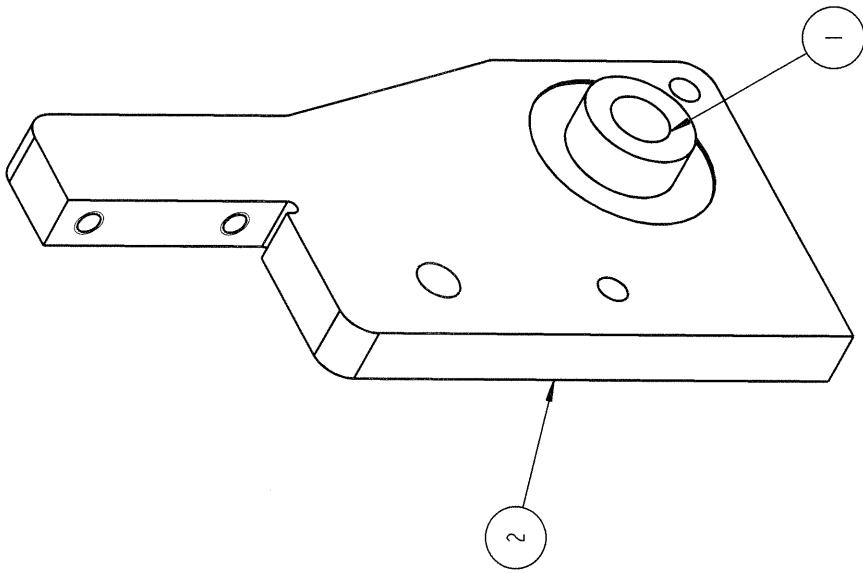
ITEM	QTY	PART #	DESCRIPTION	REV	DATE	DESCRIPTION	ECN	BY
				NO				
1	1	103803	BEARING, HUB .500					
2	1	528226	PLATE-BRIDGE SUPPORT					



DRAWN BY:	MY	SCALE	1 . 000	MATERIAL:	N / A	THIRD ANGLE PROJECTION	KIRK - RUDY - INC.	KIRK - RUDY - INC.
DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	.005	.005	.005	xx	xxx		NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	REO'D WHERE USED
CHECKED BY:		DATE	7-0c† - 98	HEAT TREAT:	N / A	MODEL:	527	TITLE:
TRACED BY:	MASTER	ALL DIMENSIONS ARE FINISHED UNLESS OTHERWISE NOTED	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	FINISH:	N / A	SHEET NO.	10F	DRAWING #

ITEM	QTY	PART #	DESCRIPTION
1	1	103803	BEARING, HUB .500
2	1	528227	PLATE-BRIDGE SUPPORT

REV NO	DATE	DESCRIPTION	ECN NO	BY



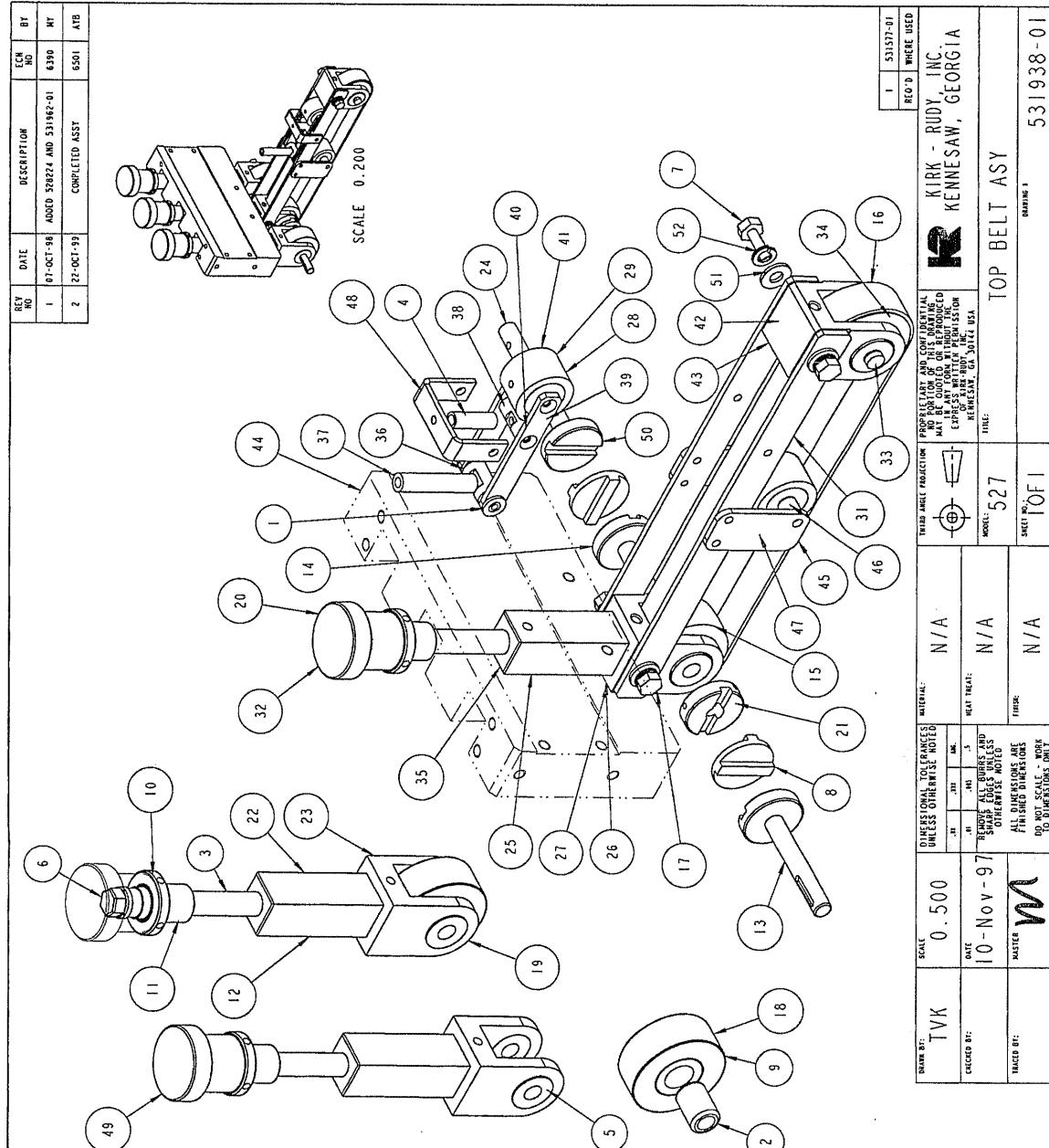
DRAWN BY:	SCALE	MATERIAL:	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PART OF THIS DRAWING MAY BE COPIED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA.
CHECKED BY:	DATE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	N / A	REMOVED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA.
TRACED BY:	MASTER	xx .xxx .005 .01 .5	HEAT TREAT:	MODEL: 527
				TITLE: ASSY, SUPPORT PLATE
				SHEET NO. 0F DRAWING # 528227-A

DRAWING 1

531938-01

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	ECN NO	BY
1	2	BUSHING, FL 25010, 37500, 250LG	1	67-OCT-68	ADDED 531938-01 AND 531938-01	6390 MY
2	2	BEARING, ONEWAY .375				
3	2	101100 SPRING	2	22-OCT-69	COMPLETED ASSY	6391 AY
4	1	102704 SPRING, COIL				
5	12	103106 BEARING, FLAT .375				
6	3	104400 BOLT - HEX HEAD				
7	4	1017306 HEX STUD				
8	2	190600 SPIDER - ROLLER DRIVE				
9	2	5001745 ROLLER, UPPER				
10	3	500807 NUT - LOCK				
11	3	500809 SLEEVE - THREADED				
12	2	500811 FORK ASY				
13	1	528223 ASSY, SHAFT, TOP ROLLER, DRIVE				
14	1	528224 SHAFT, TOP ROLLER CENTER				
15	1	528235 ROLLER-BELT DRIVE BELT				
16	1	103913-1 BELT				
17	4	101306A SCREW ASY				
18	2	500745A ASSY, UPPER FEED ROLLER				
19	2	500811A ASSY, FORK WITH BEARINGS				
20	3	500812-2 KNOB, ROLLER ADJUSTMENT				
21	1	528224-1 SHAFT-TOP ROLLER, CENTER				
22	2	531672-01 BAR, FORK				
23	2	531673-01 YOKE				
24	1	531859-01 STUD				
25	1	531864-01 FORK ASY				
26	1	531864-01 FORK ASY WITH BEARINGS				
27	1	531865-01 FORK				
28	2	531865-01 ROLLER-BELT DRIVE				
29	2	531866A-01 ROLLER ASY				
30	1	531938-01 TOP BELT ASY				
31	2	531939-01 BAR				
32	1	531941-01 EG FORK ASY				
33	1	531942-01 SHAFT				
34	1	531945-01 ROLLER-BELT DRIVE				
35	1	531947-01 BAR - FORK				
36	1	531951-02 STUD, PIVOT				
37	1	531952-01 STUD				
38	1	531953-01 BAR				
39	2	531954-01 BAR, BELT TAKEUP				
40	2	531955A-01 BAR ASY				
41	1	531955-01 TAKEUP ASY				
42	1	531960-01 BEARING BLOCK ASY				
43	1	531961-01 FORK				
44	1	531962-01 BAR, BRIDGE				
45	2	531967-01 BAR				
46	1	531968-01 STUD				
47	1	531969-01 ROLLER ASY				
48	1	531972-01 BRACKET, SPRING				
49	2	538006-01 ASSY, FORK				
50	1	SP 6215 SHAFT-TOP ROLLER, CENTER				
51	4	WA009 WASHER				
52	4	WHS009 LOCK WASHER				

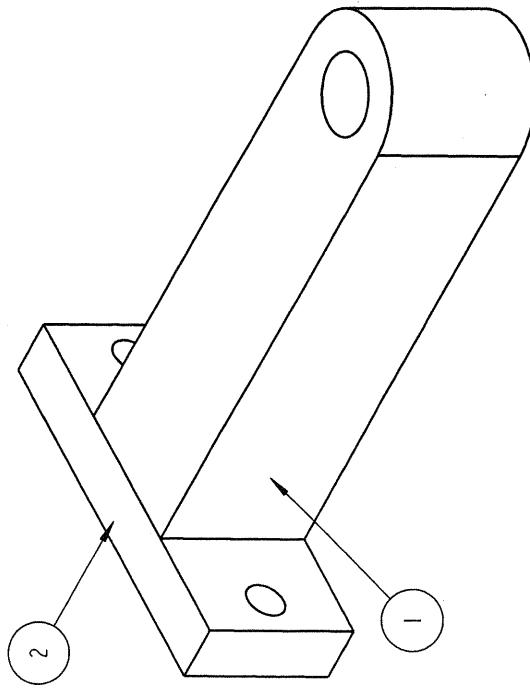
NAME #: TVK	SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED:	NAME: N/A	NAME: N/A	NAME: N/A	NAME: N/A	NAME: N/A	NAME: N/A	NAME: N/A
CHECKED BY: DATE: 10-Nov-97	STUD: N/A	ALL SURFACES AND OTHER PARTS ARE TO BE PLATED.	WEIGHT: N/A	ALL SURFACES AND OTHER PARTS ARE TO BE PLATED.	WEIGHT: N/A	ALL SURFACES AND OTHER PARTS ARE TO BE PLATED.	WEIGHT: N/A	ALL SURFACES AND OTHER PARTS ARE TO BE PLATED.	WEIGHT: N/A
TRACED BY: DATE: N/A	MASTER STUD: N/A	ALL DIMENSIONS ARE IN INCHES.	WEIGHT: N/A	ALL DIMENSIONS ARE IN INCHES.	WEIGHT: N/A	ALL DIMENSIONS ARE IN INCHES.	WEIGHT: N/A	ALL DIMENSIONS ARE IN INCHES.	WEIGHT: N/A
		DO NOT SCALE - WORK TO DIMENSIONS ONLY							



RECD WHERE USED	KIRK - RUDY INC. KENNESAW, GEORGIA
TIME:	531937-01

ITEM	QTY	PART #	DESCRIPTION
1	1	531948A-01	BLOCK, BUSHING
2	1	531949-01	BAR

REV NO	DATE	DESCRIPTION	ECN NO	BY
-	-	-	-	-

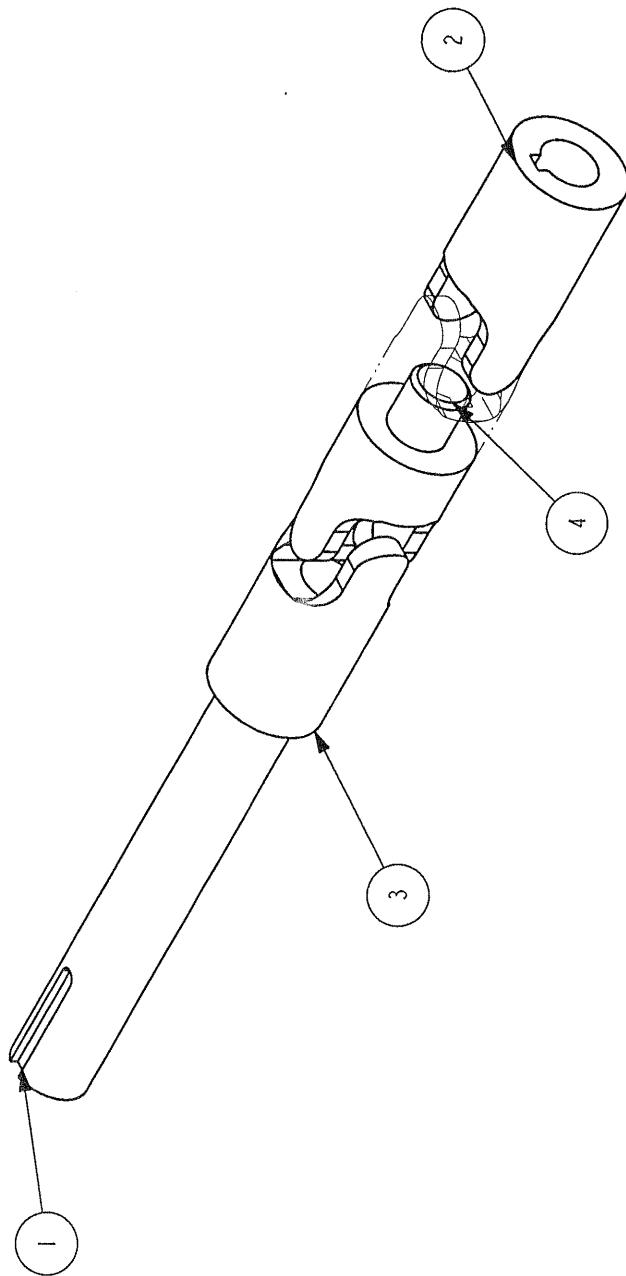


1	532316-01	
REQ'D	WHERE USED	
		KRK KIRK - RUDY, INC. KENNEBUNK, GEORGIA
PROPRIETARY AND CONFIDENTIAL	THIRD ANGLE PROJECTION	NO COPIES OF THIS DRAWING MAY BE MADE OR CIRCLED WITHOUT WRITTEN PERMISSION EXPRESS WRITTEN PERMISSION OF KIRK - RUDY INC. KENNEBUNK, GA 30144 USA
DRAWN BY: MY	SCALE: .000	MATERIAL: N/A
CHECKED BY:	DATE: 18-May-98	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED
TRACED BY:	MASTER	.01 .005 .5 ANG.
		REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED
		ALL DIMENSIONS ARE FINISHED DIMENSIONS
		DO NOT SCALE - WORK TO DIMENSIONS ONLY
		FINISH: N/A
		SHEET NO. 1 OF 1
		DRAWING # 531950-01

DRAWING #

538007-01

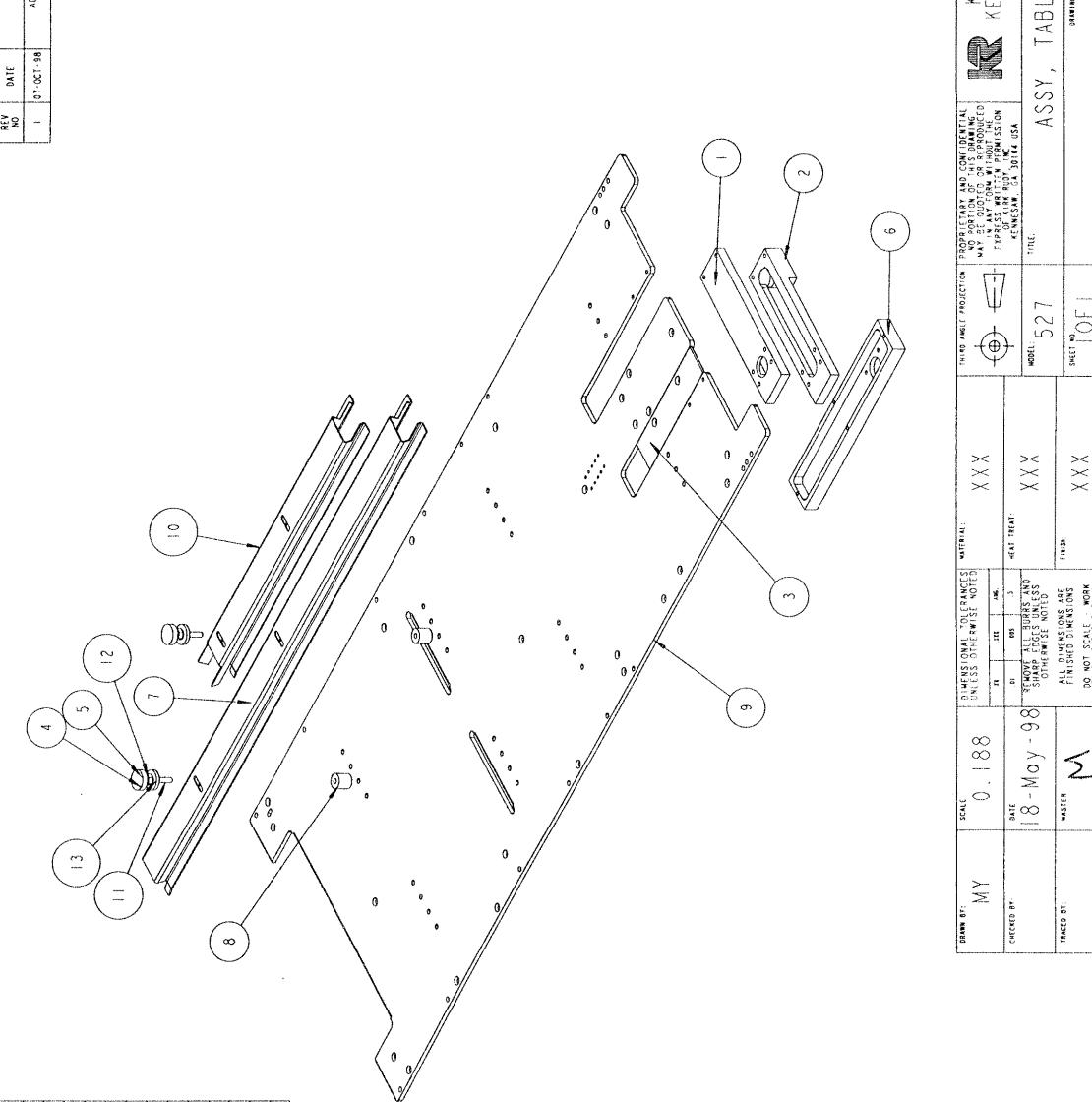
ITEM QTY	PART #	DESCRIPTION
1	528225	SHAFT-UPPER FEED ROLLER
2	SP16268	JOINT, UNIVERSAL
3	SP16269	JOINT, UNIVERSAL
4	SP16270-1	SHAFT, UNIVERSAL



DRAWN BY:	SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL:	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA
CHECKED BY:	DATE	.xx .xx ANG.	N / A	-	
TRACED BY:	MASTER	.01 .005 .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N / A	MODEL: 527	TITLE: ASSY, DRIVE SHAFT & U-JOINT
		ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE WORK TO DIMENSIONS ONLY	FINISH: N / A	SHEET NO: 1 OF 1	DRAWING #: 538007-01

531578-01

ITEM #	PART #	DESCRIPTION
1	527662	BLOCK, UPPER VACUUM
2	527663	BLOCK, LOWER VACUUM
3	527681	PLATE, FILLER
4	102131-2	KNOB
5	102131-2A	KNOB ASY
6	527638-1	BLOCK, VACUUM
7	531871-01	SIDE GUIDE
8	531872-01	STUD
9	531923-01	TABLETOP, TABER
10	531970-01	SIDE GUIDE, BUMP TURN
11	CSD0299	
12	LOCNUUT, 250-20 HEX STUD	
13	SP6383-1	WASHER

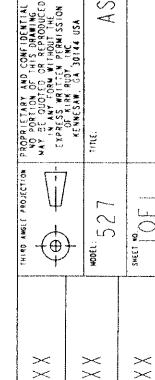


REV NO	DATE	DESCRIPTION	ECN NO	B/T
1	27 OCT 98	ADDED 102131-2A AND 527681	6390	WT

6	532316-01
step 2	WHERE USED

KIRK - RUDY INC
KIRK - RUDY INC
KENNESAW, GEORGIA

ASSY, TABLETOP
DRAWING # 531578-01



PRINTED AND PRODUCED
BY KIRK - RUDY INC
FOR THE USE OF THIS DRAWING
IS RESTRICTED TO THE
PERSONNEL OF KIRK - RUDY INC
KENNESAW, GA 30040 USA

527
ASSY, TABLETOP
DRAWING # 531578-01

ITEM #	SCALE	DIMENSIONAL TOLERANCES	NOTES	ITEM #	SCALE	DIMENSIONAL TOLERANCES	NOTES
M1	0.188	UNLESS OTHERWISE	X X X				
checked by:	18-May-98	STOCK ALL STUDS AND Screws, WASHERS, SPLIT LOCK WASHERS, SPLIT LOCK WASHERS	X X X	3	1/16"	STOCK ALL STUDS AND Screws, WASHERS, SPLIT LOCK WASHERS, SPLIT LOCK WASHERS	X X X
TRAILED BY:	MASTER	ALL DIMENSIONS ARE FINISHED DIMENSIONS TO SCALE. WORK DIMENSIONS ONLY	X X X				

ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	1	100116	BUSHING, SLEEVE 1.000					
2	8	100149	BUSHING, SLEEVE .750					
3	1	100162	BUSHING, SLEEVE .500					
4	1	102133	KNOB, PLASTIC 1-1/4 DIA					
5	1	10212	COLLAR 1.000					
6	1	107251	BOLT, SHOULDER 1/2X1-1/4					
7	1	503732	HUB, MOUNT					
8	1	503734	SHAFT					
9	1	503736	HUB					
10	4	527601	BLOCK, SLIDE					
11	2	527603	SHAFT, SLIDE					
12	1	527605	SHAFT, SLIDE					
13	4	527612	BLOCK, SUPPORT					
14	2	527613	BAR					
15	2	527620	PLATE					
16	4	527639	SPACER, FRAME					
17	1	503732A	BUSHING BLOCK ASY					
18	1	508684-2	ARM, TAKE UP					
19	1	508684-2A	HANDLE ASY					
20	4	527601A	BUSHING BLOCK ASY					
21	1	527605-1	SHAFT, SLIDE					
22	1	RHN017						

REO'D WHERE USED

1	532316-01
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PROPRIETARY AND CONFIDENTIAL
NO PORTION OF THIS DRAWING
MAY BE COPIED OR REPRODUCED
IN ANY FORM WITHOUT THE
EXPRESS WRITTEN PERMISSION
OF KIRK-RUDY, INC.
KENNESAW, GA 30144 USA

THIRD ANGLE PROJECTION

MATERIAL: XXX

HEAT TREAT: XXX

MODEL: 527

TITLE: SLIDE FRAME ASY

DRAWING #: 531579-01

SCALE: 0.125

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED:

XX	XXX	ANG.
.01	.005	.5

CHECKED BY: DATE: 18-May-98

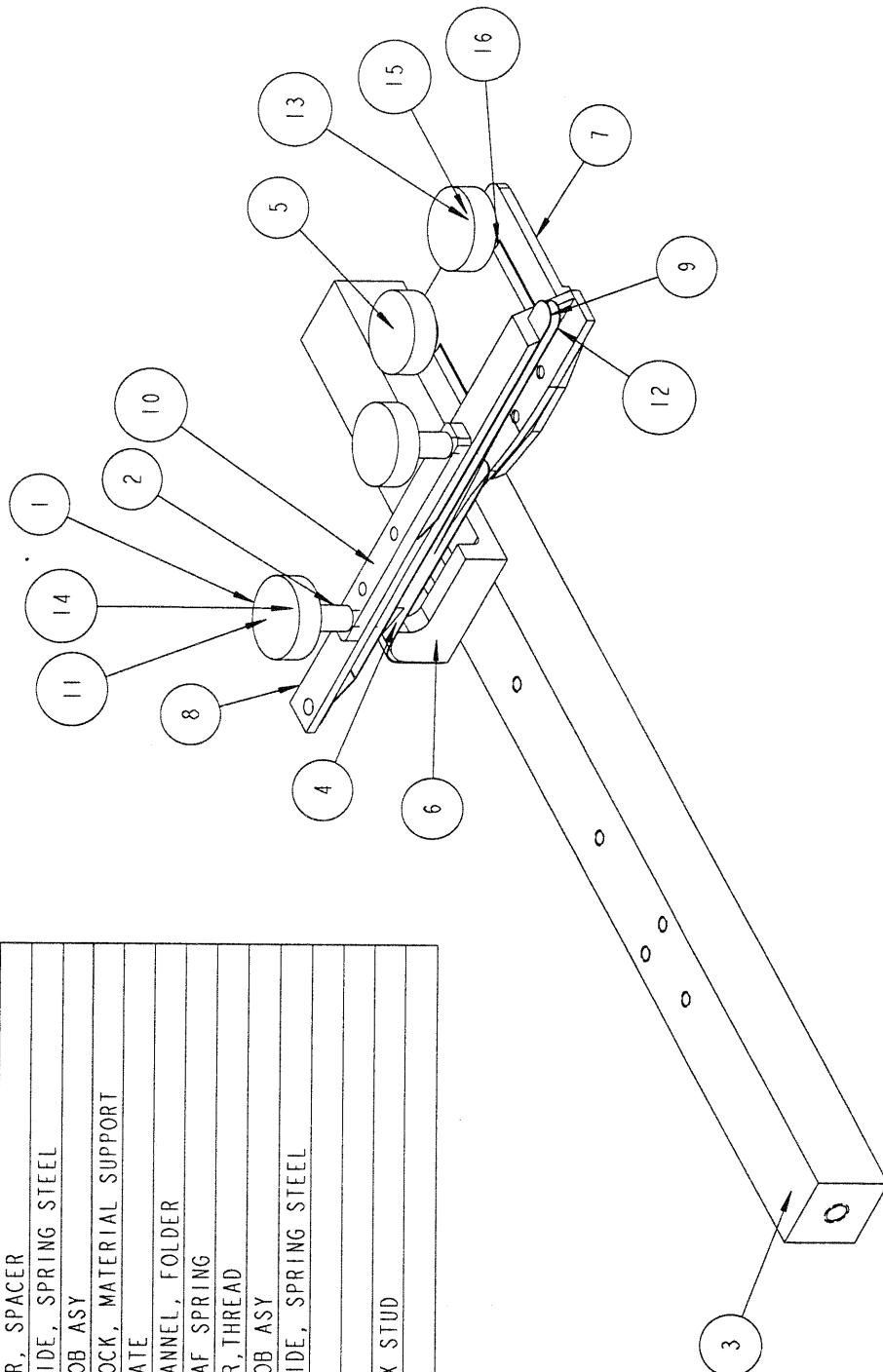
REMOVED ALL BURRS AND
SHARP EDGES UNLESS
OTHERWISE NOTED

ALL DIMENSIONS ARE
FINISHED DIMENSIONS
DO NOT SCALE - WORK
TO DIMENSIONS ONLY

TRACED BY: MASTER

SHEET NO. OF 1

ITEM	QTY	PART #	DESCRIPTION
1	4	102131	KNOB
2	2	102768	SPRING
3	1	527675	BAR, SPACER
4	1	528245	GUIDE, SPRING STEEL
5	2	102131A	KNOB ASY
6	1	527669-1	BLOCK, MATERIAL SUPPORT
7	1	528204-2	PLATE
8	1	528205-4	CHANNEL, FOLDER
9	1	531850-01	LEAF SPRING
10	1	531851-01	BAR, THREAD
11	2	531852-01	KNOB ASY
12	1	531869-01	GUIDE, SPRING STEEL
13	2	CSDD267	
14	2	CSDD270	
15	2	LOCKNUT	HEX STUD
16	2	WA006	



DRAWN BY:	SCALE	DATE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL:	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA
MY	0 . 500	19 - May - 98	.XX .XXX .005 .5	XXX		
CHECKED BY:				HEAT TREAT:		KIRK - RUDY, INC.
TRACED BY:	MASTER			FINISH:		KENNESAW, GEORGIA
					SHEET NO. 0F1	TITLE: CHANNEL FOLDER ASY
						DRAWING # 531580-01
						REMOVED ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED
						ALL DIMENSIONS ARE IN INCHES DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY

ITEM/OIDY		PART #	DESCRIPTION	REV NO	DATE	ECN NO	BY
1	4	10304	BEARING - HUB				
2	1	104104	SNAPRING - 625				
3	1	108309	PULLEY, TIMING 12L015 .625B .188K				
4	1	108321	PULLEY, TIMING 12L050 .500B NK				
5	1	109320	PULLEY, TIMING 32L015 .625B .188K				
6	1	509005	PLATE, FRONT SIDE				
7	1	509015	HUB-BEARING				
8	1	509032	SHAFT-OUTPUT				
9	1	509035	SHAFT-IDLER				
10	1	509037	COVER, REDUCER				
11	1	108911-1	BELT, TIMING 150L075				
12	1	108912-1	BELT, TIMING 187L050				
13	1	109319-1	PULLEY, TIMING 32L050 .625B .188K				
14	1	200165-4	MOTOR, LEESON DC				
15	1	509006-1	PLATE, REAR SIDE				
16	2	530138-01	BAR, MOUNTING				
17	5	SFT16208	SHAFT, SPACER				

Drawing # 509000-1A

REV 0 NOV 98

REPLACED SPACE AND PULLETS
CHANGED ASSY DESCRIPTION

6401 MT

1 531581-01
REC'D WHERE USED

DRAWN BY:		SCALE	0 .5000	DIMENSIONAL TOLERANCES		MATERIAL:		THIRD ANGLE PROJECTION		PROPRIETARY AND CONFIDENTIAL	
				IN .000 .000		N/A				DO NOT SCALE DRAWINGS	
CHECKED BY:		DATE	18-Macy-98	IN .000 .000		MEASUREMENT:		EQUIPMENT FORM NO. 100-10000-10000		EXCEPT AS NOTED	
TRACED BY:		MASTER	M	REMOVED ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED		NONE		EQUIPMENT FORM NO. 100-10000-10000		PRINTED ON 10/10/98	
				ALL DIMENSIONS ARE		N/A		REMAINS IN HANSON, GA 30141 USA		PRINTED ON 10/10/98	
				FINISHED DIMENSIONS		N/A				PRINTED ON 10/10/98	
				DO NOT SCALE DRAWINGS		N/A				PRINTED ON 10/10/98	
				DO NOT SCALE DRAWINGS		N/A				PRINTED ON 10/10/98	

KIRK-RUDY INC.

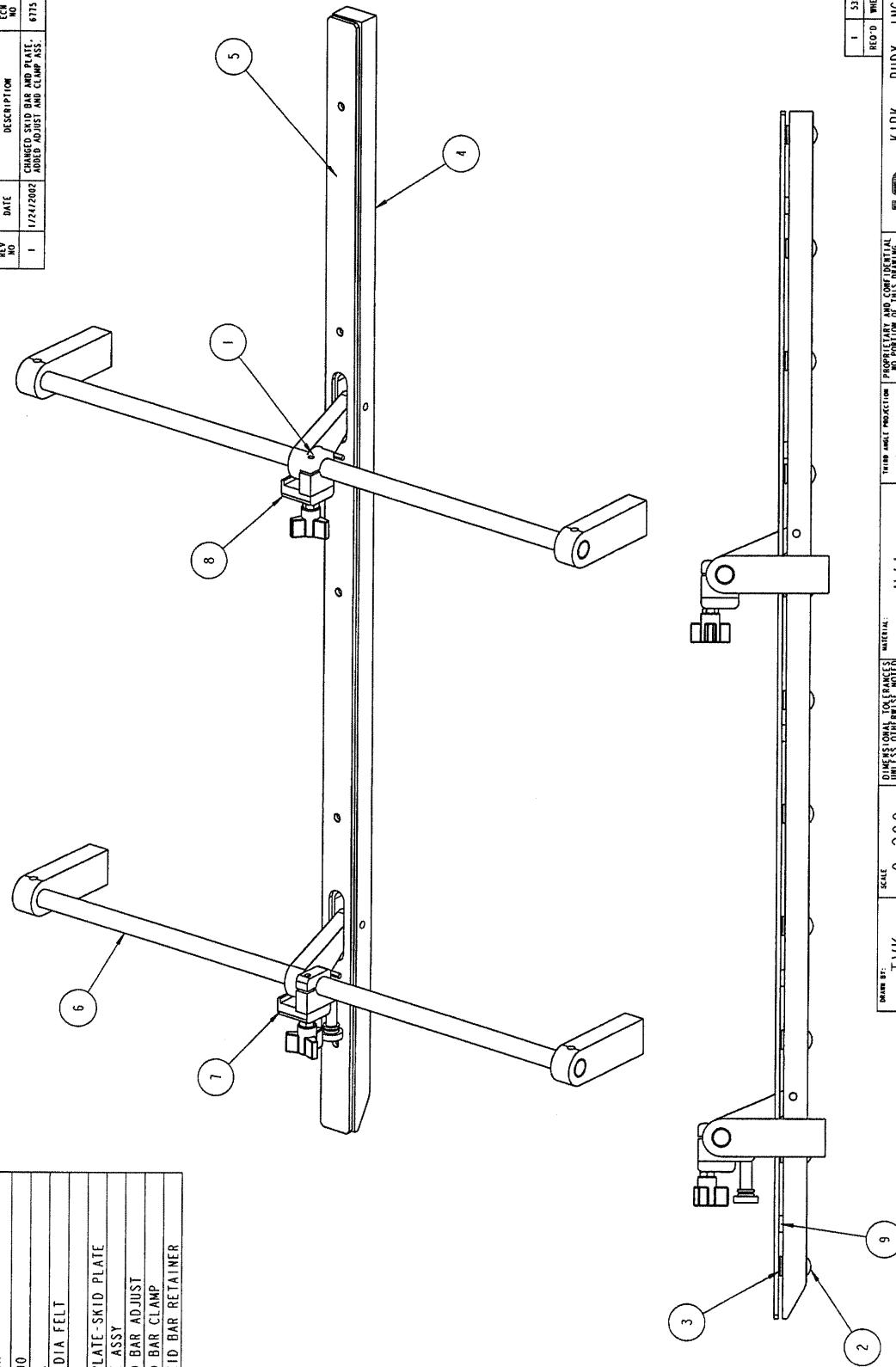
KENNESAW, GEORGIA

TIME: ASSY, MOTOR/REDUCER DR 1/4 HP

SHEET NO. 1 OF 1

509000-1A

ITEM	QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	ECN NO	BY
1	2	102205	COLAR 500					RSH
2	11	190770	STEEL BALL					
3	11	190869	DISC. 1/2 DIA FELT					
4	1	529107-5	SKID BAR					
5	1	529148-5	RETAINER PLATE-SKID PLATE					
6	2	531925-01	SKID PLATE ASSY					
7	1	538816-01	ASSY, SKID BAR ADJUST					
8	1	538817-01	ASSY, SKID BAR CLAMP					
9	5	541756-01	SPACER, SKID BAR RETAINER					



1	532316-01	RED 0 WHERE USED
2	KRK	KIRK - RUDY, INC.
3	KR	KENNESAW, GEORGIA
4	TEL	PRODUCTION AND CONTRACTUAL MAY BE ORDERED OR REPRODUCED EXCLUSIVELY FROM THE COMPANY OF KIRK - RUDY, INC., KENNESAW, GA 30044 USA
5	527	SKID BAR ASY
6	10F 1	531924-01

DRAWING 1

531924-01

RED 0

WHERE USED

532316-01

TEL

PRODUCTION AND CONTRACTUAL

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INC., KENNESAW,

GA 30044 USA

TIRE

527

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531924-01

RED 0

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TIRE

527

SKID BAR ASY

531924-01

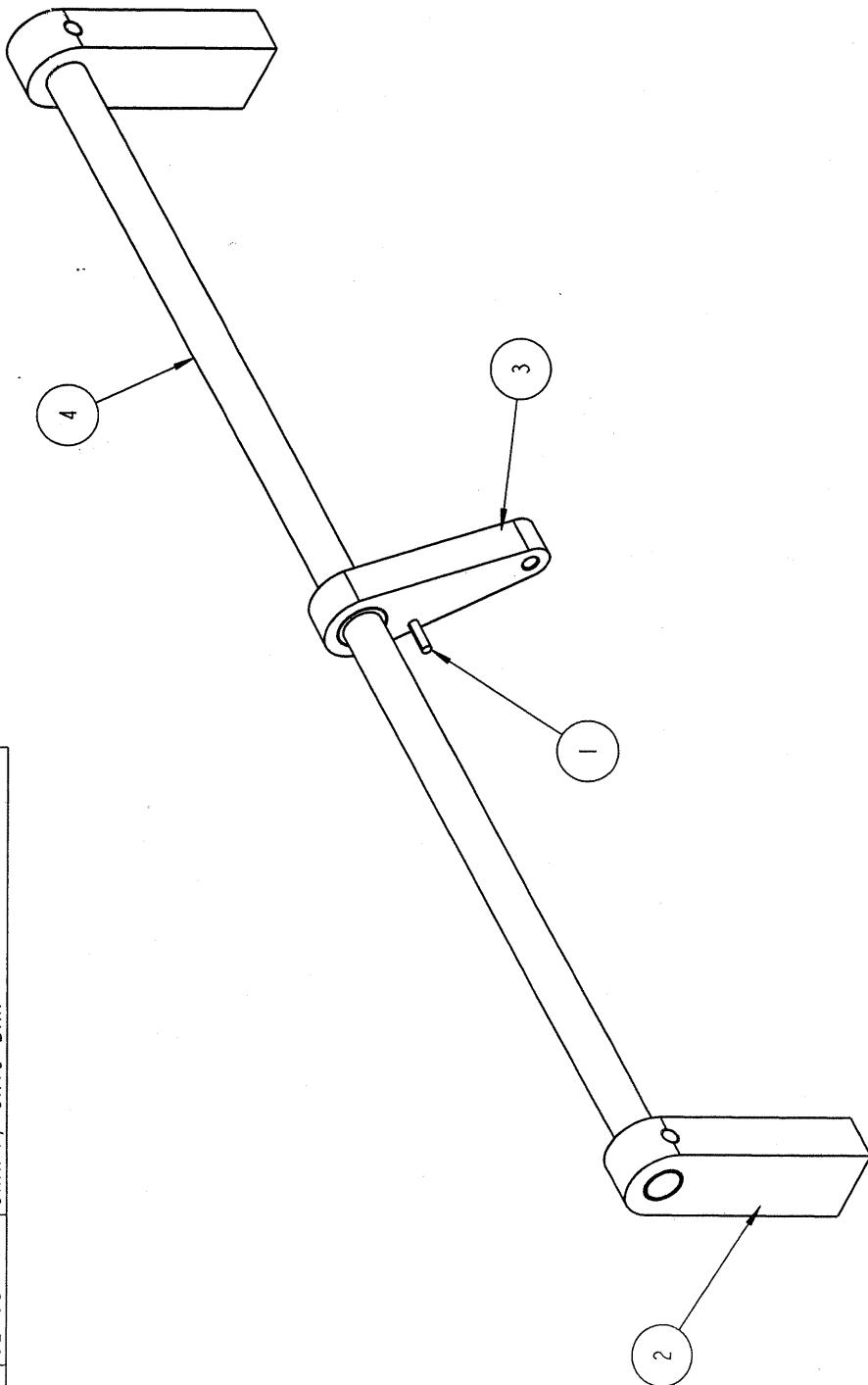
RED 0

WHERE USED

532316-01

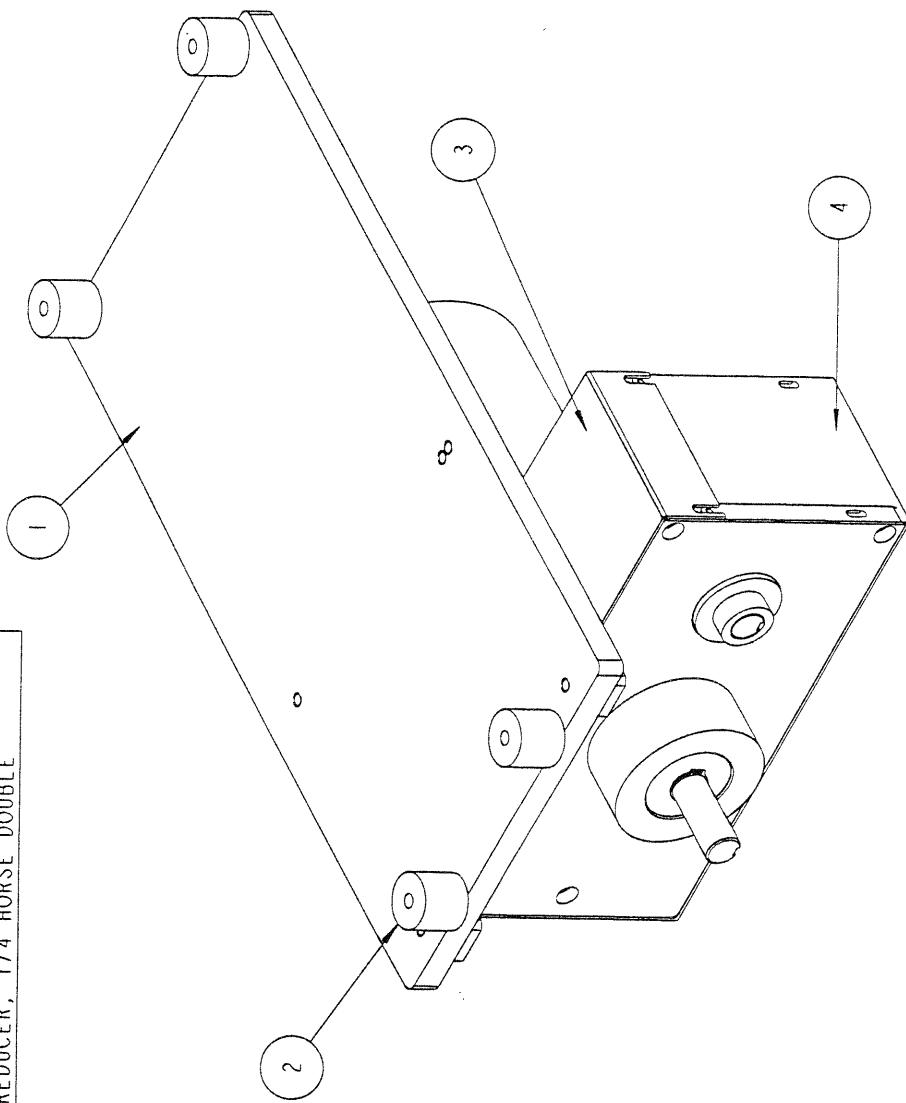
TEL

ITEM	QTY	PART #	DESCRIPTION
1	1	105210	PIN, ROLL .125X.750
2	2	500791	POST, SIDEGUIDE
3	1	500801A	ASSY, LINK
4	1	527687-1	SHAFT, SKID BAR



DRAWN BY:	SCALE	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL:	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL
MY	0 .500	N/A	N/A		KIRK - RUDY, INC. KENNESEEW, GEORGIA
CHECKED BY:	DATE	.XX .XXX .01 .005 .5	HEAT TREAT:		NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESEEW, GA 30044 USA
TRACED BY:	MASTER	18-May-98 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	N/A	MODEL: 527	TITLE: SKID PLATE ASSY
			SHEET NO. 0F1	DRAWING #	531925-01
					2 531924-01 REF'D WHERE USED

ITEM QTY	PART #	DESCRIPTION	REV NO	DATE	DESCRIPTION	FCN NO	BY
1	1	527604			PLATE, MOTOR MOUNT		
2	4	527671			SPACER, MOTOR SUPPORT		
3	1	528257			COVER, TABBER DRIVE MOTOR		
4	1	509000-1A			REDUCER, 1/4 HORSE DOUBLE		



DRAWN BY:	SCALE	0 . 333	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED		MATERIAL:	X X X	THIRD ANGLE PROJECTION	KIRK - RUDY, INC.
CHECKED BY:	DATE	X X X	.01	.005	ANG.	X X X	X X X	KIRK - RUDY, INC.
TRACED BY:	MASTER	18 - May - 98			HEAT TREAT:	X X X	527	KENNESAW, GA 30144 USA
					FINISH:	X X X		
					DO NOT SCALE - WORK TO DIMENSIONS ONLY	X X X		

1	532316-01
RECD	WHERE USED

PROPRIETARY AND CONFIDENTIAL
NO PORTION OF THIS DRAWING
MAY BE QUOTED OR REPRODUCED
IN ANY FORM WITHOUT THE
EXPRESS WRITTEN PERMISSION
OF KIRK - RUDY, INC.

KIRK - RUDY, INC.
KENNESAW, GA 30144 USA
TITLE: 527
SHEET NO: 101
DRAWING #

531581-01

7 ELECTRICAL SCHEMATICS AND PARTS



WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

7.1 SCHEMATIC NUMBER LIST

The following wiring diagrams are supplied in a separate package and enlarged with your manual for your reference. A reference of drawing symbols is also provided.

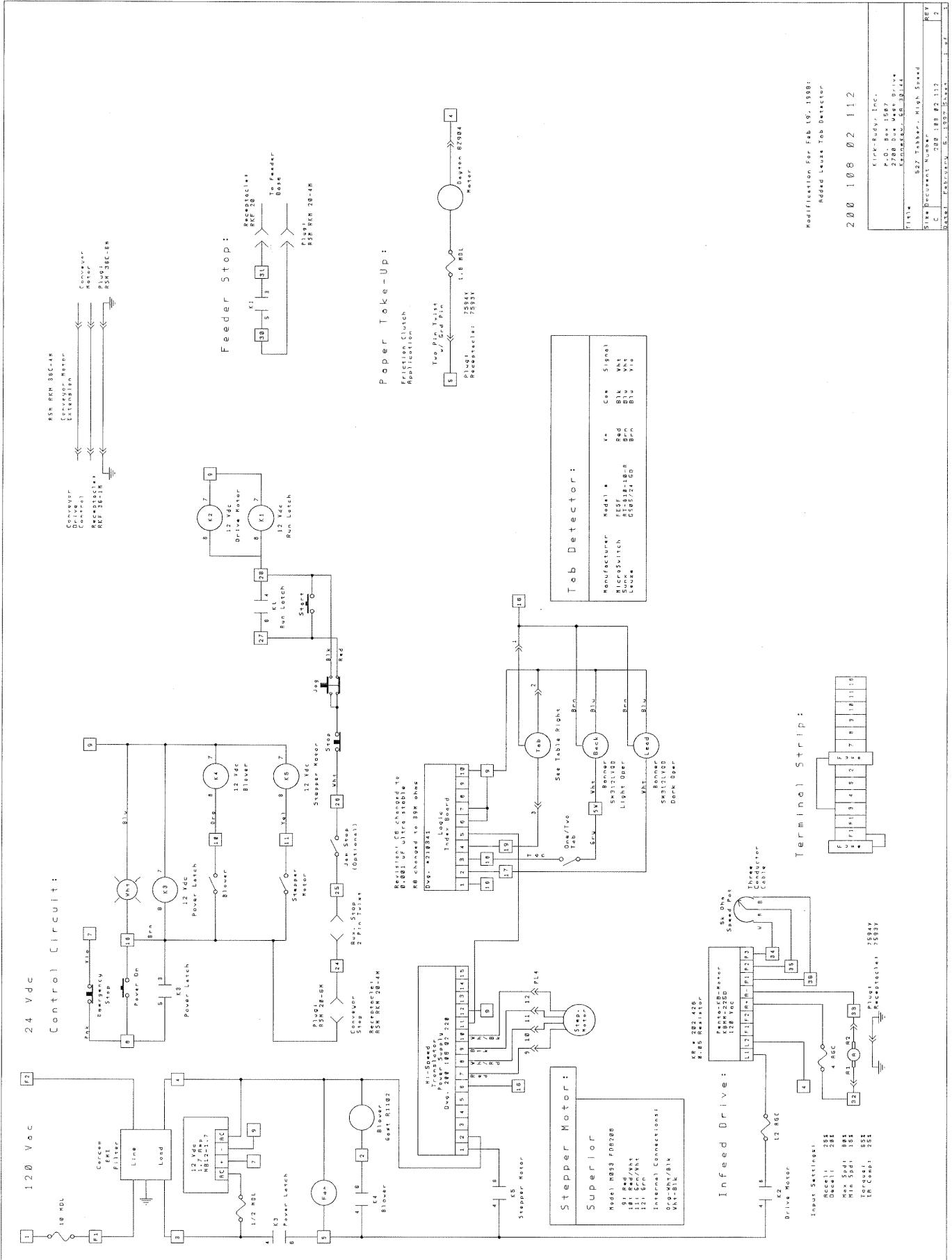
200-108-02-112 527 Tabber, High Speed (Feb. 5, 1997)
SYMBOLS.ORG Schematic Symbols Reference

7.2 PARTS LIST

KR Part #	Qty	Manufacturer	Manufacture Part #	Description
200 338	1	Thomas & Betts	LT38P	Strain Relief - 3/8"
200 339	1	Thomas & Betts	LT938P	Strain Relief - 90 Degree
201 514	2	Hubbell	7594-VBLK	Plug - Twist, 3 Pin, Male
201 511	2	Hubbell	7464-VBLK	Connector - Twist, 2 Pin, Female
201 541	1	Turck	RKF36-1M	Receptacle - 3 Pin, 1 Meter
201 540	1	Turck	RKF20	Receptacle - 2 Pin
201 125-2	1	Cutler Hammer	E22MLL2, W/0'	Pushbutton - Red Mushroom, Off
201 124-1	1	Cutler Hammer	E22P3, W/1	Pushbutton - Green, Power On
201 125	1	Cutler Hammer	E22E2	Pushbutton - Red
201 126	1	Cutler Hammer	E22P1	Pushbutton - Black
208 503	1	Sunon	SP100A	Fan - 120 Vac
200 323-1	6	Mencom	PCG-1/2R	Connector - Strain Relief
200 327-1	2	Mencom	PCG-3/4R	Connector - Strain Relief
208 043	1			Fuse - 10 MDL
202 424	1		Translator	Superior
200 159-1	1	Superior	M093 FD8208	Motor - 200 Steps/Rev
208 023	1			Fuse - 12 AGC
208 044	1			Fuse - 4 AGC
202 249-3	1	Leuze	GS05/24 GD	Sensor, Assembly
200 178	1	Maxtor	6Z904	Motor - 1/45 HP
208 030	1			Fuse - 1.6 MDL
201 542	1	Turck	RSM 20-6M	Plug - 2 Pin w/ Cable

7.2 PARTS LIST (continued)

KR Part #	Qty	Manufacturer	Manufacture Part #	Description
201 544	2	Turck	RSM RKM 20-4M	Cable - 2 Pin Extension
201 545	1	Turck	RSM RKM 36C-4M	Cable - 3 Pin Extension
202 315	1	Kirk-Rudy		Board, Logic - Indexer
201 124	1	Cutler Hammer	E22P3	Pushbutton - Green
202 426	1	Penta Power	KBMM-225D	Board, Motor, DC, 120 Vac - For 90 Vdc Motor
209 163	1	Phoenix	NS35/7.5	DIN Rail Strip - Length is application specific
201 510	1	Hubbell	7465-VBLK	Plug - Twist, 2 Pin, Male
202 277	5	Idec	SH2B05	Socket, Relay - For 202 275, 202 276
202 275	5	Idec	RH2B-ULCD12	Relay - 12 Vdc, Small
201 130	6	Cutler Hammer	E22B2	Contact - Normally Open
201 131	3	Cutler Hammer	E22BR1	Contact - Normally Closed
204 318	1	Clarostat	RV4NAYSD502A	Potentiometer - 5k Ohm
209 016	1	Alcoswitch	PKS-90B-10	Knob, Potentiometer - For 204 318
209 237	3	Phoenix	USLKG16	Terminal, Ground
209 238	2	Phoenix	E-UK	Terminal, End Stop
209 203-1	1	International Dev	30153	Socket, Lamp
209 204-6	1	International Dev	3114	Lens, White
209 205-2	1	Sylvania	28ESB	Lamp - 28 Vdc
201 145	3	Cutler Hammer	E22X51	Selector - E22X51
202 261-05	2	Banner	SM312LVQD	Beamswitch, Retro - 10-30 Vdc
208 017	1	Buss	BK/MDL-1/2	Fuse - 0.5 MDL, 250 V
209 045	1	Corcom	5VR3	Filter, EMI - 120/220 Vac, 5 Amp
202 318	1	International P.	IHB12-1.7	DC Supply - 12 Vdc, 1.7 Amp
200 120	1	Gast	R1102	Blower



8 APPENDIX



WARNING

Read and follow all Safety Instructions in Section 1, Page 3 before proceeding.

The following component's brochures are supplied in a separate package with your manual for your reference.

<u>COMPONENT</u>	<u>MANUFACTURER</u>
DC Supply	International Power
Blower	Gast
Translator	Warner Electric
DC Motor Board	Penta-KB
Beamswitch	Banner
Tab Detector	Leuze



SPECIFICATIONS AND APPLICATIONS OPEN FRAME SERIES

SERIES DESCRIPTION

The International Power open frame series are a high reliability line of power supplies designed to operate over the wide range of A.C. power sources found worldwide. This feature simplifies your inventory and service consideration by allowing the use of one standard power supply regardless of destination.

These models are designed to meet many domestic and European regulatory agency requirements. If you plan to distribute your products worldwide, obtaining necessary agency approvals can be greatly simplified by specifying the International Power open frame series.

FEATURES

- | | |
|------------------------------|----------------------------------------------------------|
| VDE transformer construction | - Two hour burn-in |
| 100/120/220/230-240VAC input | - Two-year warranty |
| OVP on 5 volt outputs | - U.L. recognized - File #E84242 |
| ± .05% regulation | - CSA Certified - File #LR52143 |
| Remote sense on most outputs | - TUV licenses |
| Industry standard case size | - Chassis notched for A.C. input |
| Full rated to 50°C | - Input accepts .110 x .032 fast-on or solder connection |
| Foldback/current limit | |

SPECIFICATIONS

A.C. INPUT:

100/120/220/230-240 VAC +10% - 13%
47-63 Hz frequency range. See chassis
A.C. connection table for jumper and line
fusing requirements. Derate output
current 10% for 50 Hz operation.
Tolerance for 230-240 volt operation is
+15% - 10%

D.C. OUTPUT:

Adjustment range ± 5% minimum.

LINE REGULATION:

± .05% for a 10% line change.

LOAD REGULATION:

± .05% for a 50% load change.

TRANSIENT RESPONSE:

Less than 50 microseconds for 50% load
change.

OUTPUT RIPPLE:

5 volt to 15 volt units: 5.0mV PK-PK
maximum.

24 Volt to 250 volt units: .02% PK-PK
maximum.

SHORT CIRCUIT AND

OVERLOAD PROTECTION:

Automatic current limit/foldback.

OVERVOLTAGE PROTECTION:

Built-in on all 5 volt outputs. Set at 6.2± .4
volts.

Other outputs use overvoltage protection
modules.

REMOTE SENSING:

Provided on most models. Open sense
lead protection built in on most models.

EFFICIENCY (TYPICAL):

5 volt unit: 45%. 12 and 15 volt units:
55%.

24 through 250 volt units: 60%.

STABILITY:

± .3% for 24-hour period after 1 hour
warm up.

TEMPERATURE RATING:

0°C to 50°C full rated, derated linearly to
40% at 70°C.

TEMPERATURE COEFFICIENT:

.01%/°C typical, .03%/°C maximum

VIBRATION:

Per MIL-STD-810D, Method 514.3,
Category 1, Procedure 1.

SHOCK:

Per MIL-STD-810D, Method 516.3,
Procedure III.

EMI/RFI:

These linear power supplies have
inherently low conducted and radiated
noise levels. For most system applications
they will meet the requirements of FCC
Docket 20780 for Class B equipment and
VDE 0871 for Class B equipment without
additional noise filtering.

SAFETY SPECIFICATIONS

The INTERNATIONAL POWER supplies are designed to meet or exceed requirements for the following specifications: IEC 380, IEC 435, VDE 0730 Part 2, VDE 0804, ECMA-57, CEE 10 Part 2P, UL 1012, CSA 22.2 No. 143, CSA 22.2 No. 154. Specifically, field terminal to terminal spacing is 5.25 mm with 9.0 mm creepage to other metal, leakage current is less than 5.0 µA and dielectric withstand voltages are 3750 VAC input to chassis, 3750 VAC input to output and 300 VDC output to chassis.

OVER VOLTAGE PROTECTION (OVP)

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115% - 135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not foldback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. International Power has provided OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

COMMON-MODE LATCH UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. International Power has incorporated a unique anti-latch circuit into every dual power supply which will minimize this problem.

WARRANTY

International Power warrants each power supply of its manufacture that does not perform to published specifications, as a result of defective materials or workmanship, for a period of two full years from the date of original delivery.

International Power assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

CUSTOMER SERVICE REPAIR

Please follow this procedure when returning product for repair:

Contact International Power for a returned material authorization (RMA) number. The RMA number must appear on all shipping documents and containers. Returns must be freight prepaid. Returns shipped freight collect or without an RMA will not be accepted.

International Power
360 Bernoulli Circle
Oxnard, CA 93030-5167

Phone: (805) 981-1188
FAX: (805) 981-1184

Applications

Remote Sense

Remote sense terminals may be used to compensate for output line losses and provide for a remote point of regulation. *Figure 1* shows the proper termination for a power supply with remote sensing.

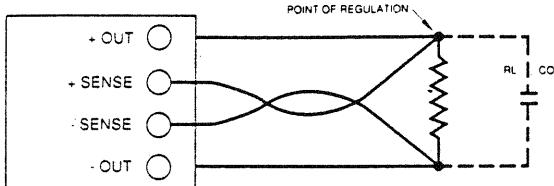


FIGURE 1

Load lines must be sized to prevent an excessive voltage drop from the output to the load. Since the point of regulation is at the load, the power supply must compensate for line losses. Excessive load line losses may affect current limiting, AC line dropout point and OVP margin (if applicable).

Leads should be sized to drop no more than 0.5V — the less the better. Use of a twisted pair or shielded pair for the sense lines is recommended for noise immunity. In problem applications, the use of a small AC decoupling capacitor (.1 to $10\mu F$) across the sense terminals is highly recommended. In some applications there may be a tendency for the power supply to oscillate due to the additional phase shift caused by the series resistance and inductance in the load leads. The addition of capacitor Co will reduce output impedance and provide stability. The recommended value of Co is $100\mu F$ per ampere or $50\mu F$ per foot and can be the sum of the distributed decoupling capacitors found in most systems. International Power supplies have open sense lead protection on most outputs to protect the load from an overvoltage condition if the sense leads are removed. There is no need to strap the sense terminals to the output terminals in the local sense mode.

Overvoltage Protection (OVP)

An overvoltage protection circuit, commonly referred to as a crowbar, is used to prevent damage to voltage sensitive loads such as TTL logic. Trip point of the OVP is usually set at 115% - 135% of the output voltage. The OVP will short the output terminals upon sensing a fault condition. The primary fuse of the supply will blow if the supply is not feedback current limited. Nuisance tripping of the OVP is a common problem. Noise from input line spikes or load noise can cause an OVP to fire. International Power has provided OVP noise filtering to prevent nuisance tripping and reduced transformer interwinding capacitance to minimize input line susceptibility.

Common-Mode Latch UP

In certain instances dual power supplies can exhibit a problem known as common-mode latch up. This occurs when the positive supply comes up first and forces a reverse bias condition on the negative supply. The negative supply latches up in a current limit condition. International Power has incorporated a unique antilatch circuit into every dual power supply which will minimize this problem.

Grounding

Grounding consideration in designing a power distribution system are often overlooked but can have a significant impact on overall system performance. A single point system ground should be employed where possible to eliminate ground loops and improve regulation.

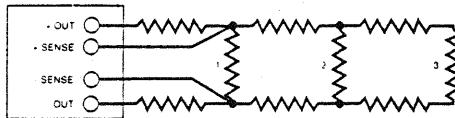


FIGURE 2

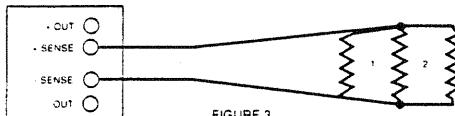


FIGURE 3

Figure 2 shows a simple but *undesirable* connection scheme. Regulation at loads 2 and 3 becomes progressively worse due to voltage drops in the finite wire resistance between loads. *Figure 3* shows an improved connection system in which regulation is maintained at all three loads because wire losses are not cumulative.

AC Connection and Fusing

The five wire input provides four voltage ranges: 100/120/220/230-240** $\pm 10\%$, -13% . See chassis AC connection table for the jumpering requirements. Extended low line tolerance provides additional drop out margin in areas where line voltages are marginal. Inputs must be fused.

For Use at	AC Input 47-63-Hz			
	100 VAC	120 VAC	220 VAC	230/1240 VAC
JUMPER	1 & 3 2 & 4	1 & 3 2 & 4	2 & 3	2 & 3
Apply A.C.	1 & 5	4 & 1	1 & 5	4 & 1

FIGURE 4

**Tolerance for 230VAC operation is $+15\%$, -10% .

Jumpering Example

Figure 5 is an example of proper jumpering of the primary for 100/120 VAC operation.

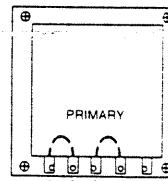


FIGURE 5

Warranty

International Power warrants each power supply of its manufacture that does not perform to published specifications, as a result of defective materials or workmanship, for a period of two full years from the date of original delivery.

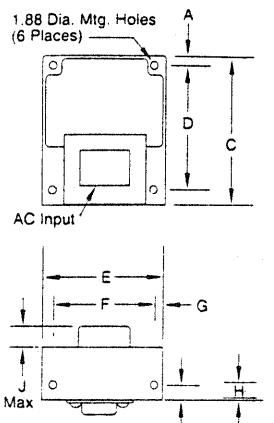
International Power assumes no liabilities for consequential damages of any kind through the use or misuse of its products by the purchaser or others. No other obligations or liabilities are expressed or implied.

Customer Service/Warranty Repair

Please follow this procedure when returning product for customer service: Contact International Power DC Power Supplies, Inc. for a returned material authorization (RMA) number. The RMA number must appear on all shipping containers. Returns must be returned freight prepaid. Returns shipped freight collect or without an RMA number will not be accepted.

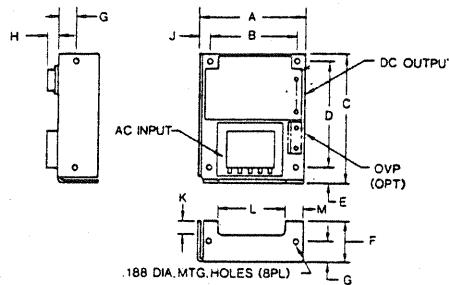
Ship to: International Power,

Outline and Mounting Drawings



A Case
Overall Size: 3.75" x 3.00" x 2.20"
Overall Size: 3.75" x 3.00" x 2.20" WT. 1LB.

	INCH	mm
A	.250	6.35
B	.450	11.43
C	3.75	95.25
D	3.100	78.74
E	3.00	76.20
F	2.500	63.50
G	.250	6.35
H	1.25	31.75
I	.350	8.89
J	.500	12.70

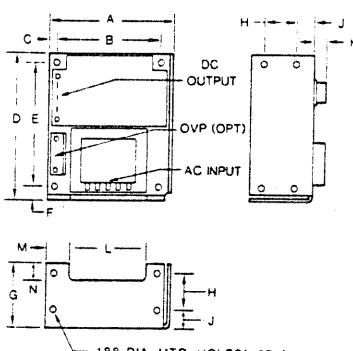


B Case
Overall Size: 4.87" x 4.00" x 2.10"
123.70mm x 101.60mm x 53.34mm
Weight 2 lbs.

	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.62	41.15
G	0.75	19.05
H	0.450	11.43
J	0.38	9.65
K	0.57	14.48
L	2.60	66.04
M	0.794	20.17

24 Vdc/1.2 AMP

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC

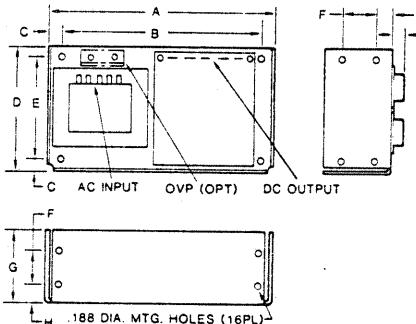


C Case
Overall Size: 5.62" x 4.87" x 2.95"
142.75mm x 123.70mm x 74.93mm
Weight 4 lbs.

	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.62	142.75
E	4.875	123.83
F	0.50	12.70
G	2.50	63.50
H	1.250	31.75
J	0.75	19.05
K	0.450	11.43
L	2.85	72.39
M	1.025	26.04
N	0.665	16.89

24Vdc/2.4AMP

FUSE AT: 0.0/0.5 AMPS FOR 100-120/220-240 VAC

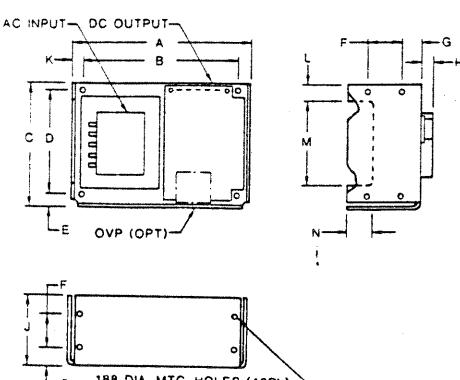


D Case
Overall Size: 9.00" x 4.87" x 3.28"
228.60mm x 123.70mm x 83.83mm
Weight 7.5 lbs.

	INCH	mm
A	9.00	228.60
B	8.000	203.20
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

24Vdc/4.8 AMP

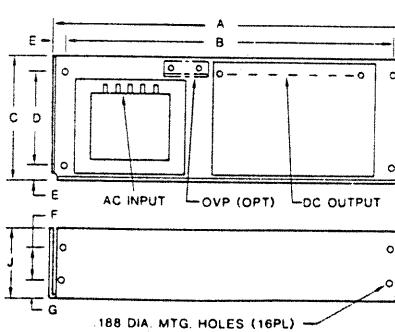
FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC



N Case
Overall Size: 7.00" x 4.87" x 3.20"
177.80mm x 123.70mm x 81.28mm
Weight 6 lbs.

	INCH	mm
A	7.00	177.80
B	6.250	158.75
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.450	11.43
J	2.75	69.85
K	0.38	6.35
L	0.640	16.26
M	3.345	84.96
N	1.00	25.40

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC



E Case
Overall Size: 14.00" x 4.87" x 3.53"
355.60mm x 123.70mm x 89.66mm
Weight 10 lbs.

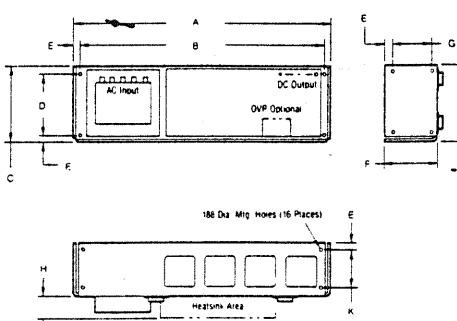
	INCH	mm
A	14.00	355.60
B	13.000	330.20
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.650	16.51
J	2.75	69.85

FUSE AT: 3.0/1.5 AMPS FOR 100-120/220-240 VAC

Outline and Mounting Drawings

F Case

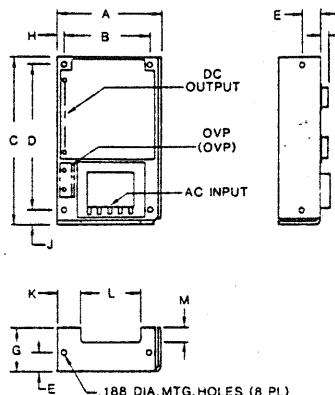
Overall Size: 16.75" x 5.50" x 4.88"
Weight 19 lbs.



	INCH	mm
A	16.75	425.45
B	16.00	406.40
C	4.88	123.95
D	4.125	104.80
E	0.375	9.53
F	5.00	127.00
G	2.50	63.50
H	1.50	36.10
J	3.50	88.90
K	2.50	63.50

AA Case

Overall Size: 6.50" x 4.00" x 2.10"
165.10mm x 101.60mm x 53.34mm
Weight 2 lbs.

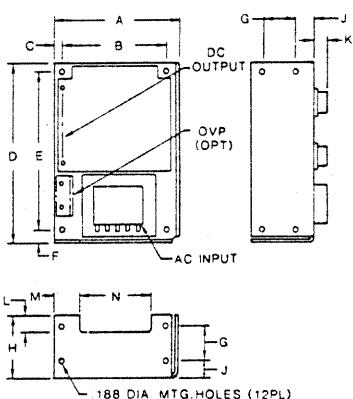


	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	6.50	165.10
D	5.750	146.05
E	0.75	19.05
F	0.450	11.43
G	1.62	41.15
H	0.25	6.35
J	0.50	12.70
K	0.955	24.26
L	2.37	60.20
M	0.57	14.48

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC

BB Case

Overall Size: 7.00" x 4.88" x 2.95"
177.80mm x 123.95mm x 74.93mm
Weight 4 lbs.

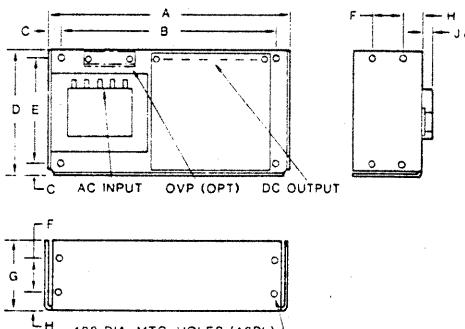


	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	7.00	177.80
E	6.250	158.75
F	0.50	12.70
G	1.250	31.75
H	2.50	63.50
J	0.75	19.05
K	0.450	11.43
L	0.665	16.89
M	1.025	26.03
N	2.05	51.58

FUSE AT: 0.5/0.25 AMPS FOR 100-120/220-240 VAC

CC Case

Overall Size: 9.38" x 4.87" x 3.28"
238.25mm x 123.70mm x 83.31mm
Weight 7 lbs.



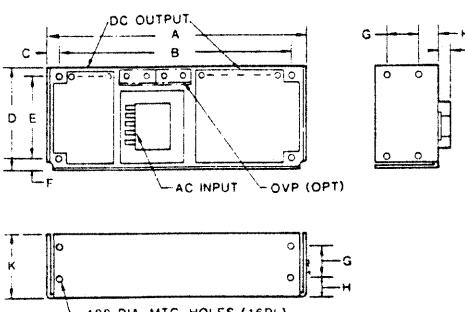
	INCH	mm
A	9.38	238.25
B	8.375	212.73
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC

ICCCR121 0.3/1.5 AMPS FOR 100-120/220-240 VAC

BAA Case

Overall Size: 10.25" x 4.00" x 2.95"
260.35mm x 101.60mm x 74.93mm
Weight 5 lbs.

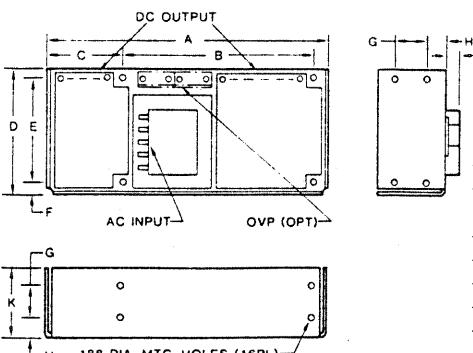


	INCH	mm
A	10.25	260.35
B	9.250	234.95
C	0.50	12.70
D	4.00	101.60
E	3.375	85.73
F	0.37	9.40
G	1.250	31.75
H	0.75	19.05
J	0.450	11.43
K	2.50	63.50

FUSE AT: 1.0/0.5 AMPS FOR 100-120/220-240 VAC

CBB Case

Overall Size: 11.00" x 4.87" x 3.28"
279.40mm x 123.70mm x 83.31mm
Weight 8 lbs.



	INCH	mm
A	11.00	279.40
B	7.50	190.50
C	3.00	76.20
D	4.87	123.70
E	4.125	104.78
F	0.50	12.70
G	1.250	31.75
H	0.75	19.05
J	4.50	11.43
K	2.75	69.85

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC



Post Office Box 97
Benton Harbor, Michigan
Ph: 616/926-6171
Fax: 616/925-8288

Product Specifications

PART NUMBER: LTD138
ECN# 24340 REVISION: B

MODEL NUMBER	MOTOR SPECIFICATIONS	RPM	MAX VAC		MAX PRESS		HP	kW	NET WT.	
			'H ₂ O	mbor	'H ₂ O	mbor			lbs.	kg
R1102	110/220-240-50-1	2890	20	50	21	52	1/10	0.07	15.75	7.2
	115/208-230-60-1	3450	26.5	66	28.5	71	1/8	0.09		

SOUND LEVEL 57/54 dB(A) MAX. @ 60/50 Hz

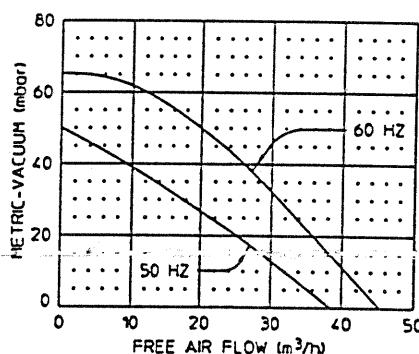
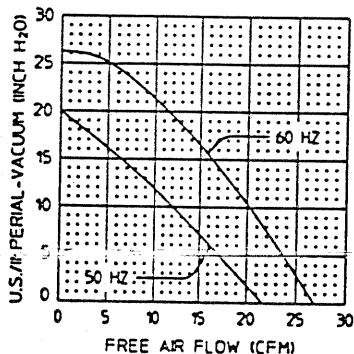
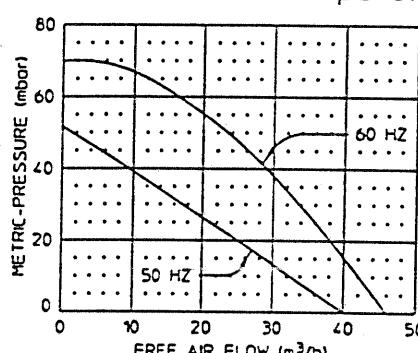
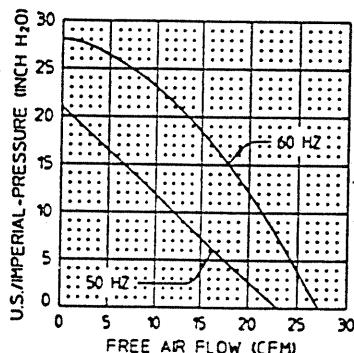
NORMAL AMBIENT -29°C TO 40°C

RELATIVE HUMIDITY 0% - 100% NON CONDENSING

ENVIRONMENT CLEAN DUST FREE

TECHNICAL DATA SUBJECT TO CHANGE WITHOUT NOTICE.

Product Performance (Metric U.S. Imperial)



PERFORMANCE DATA

THE PERFORMANCE DATA SHOWN WAS DETERMINED UNDER THE FOLLOWING CONDITIONS:

LINE VOLTAGE @ 60 Hz. 230V OR 460V FOR 3 PHASE UNITS. 115V OR 230V FOR 1 PHASE UNITS.

LINE VOLTAGE @ 50 Hz. 220V FOR 3 PHASE OR 1 PHASE UNITS.

UNITS IN A TEMPERATURE STABLE CONDITION.

DELIVERY MEASUREMENTS MADE WITH OUTPUT PORT THROTTLED.

SUCTION MEASUREMENTS MADE WITH INPUT PORT THROTTLED.

TEST CONDITIONS: INLET AIR DENSITY @ 0.075 lbs. per cu. ft. [20°C (68°F), 29.92" Hg (14.7 PSIA)].

NORMAL PERFORMANCE VARIATIONS ON THE RESISTANCE CURVE WITHIN ±10% OF SUPPLIED DATA CAN BE EXPECTED.

Product Dimensions

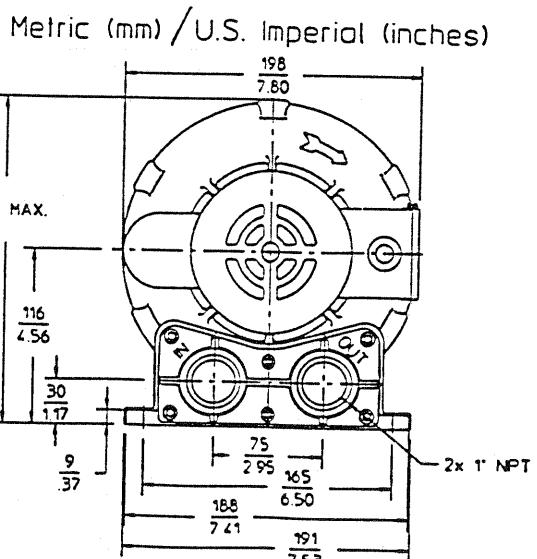
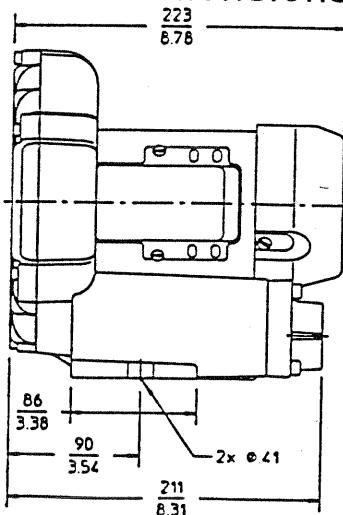
Low Voltage, Single Phase

- Blue P1 Line
- Brown P2
- Black 5 Tie Together
- Orange 3 Insulate
- White 2 Tie Together
- Yellow 4 Line

High Voltage, Single Phase

- Blue P1 Line
- Brown P2 Insulate
- Black 5
- Orange 3 Tie Together
- White 2 Insulate
- Yellow 4 Line

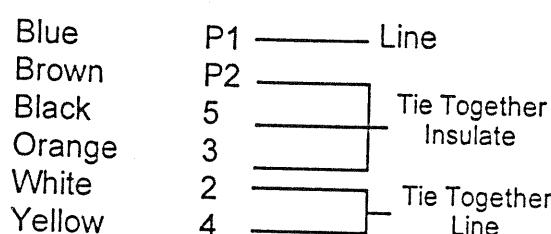
Wiring Diagram



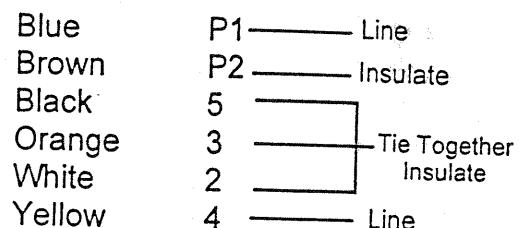
Wiring Diagrams for Regenerative Blower Models
R1102, R2103, R2105, R3105-1,
R3105-12, R4110-2, R4P115, R5125-2, R6125-2

70-6000A

Low Voltage - Single Phase



High Voltage - Single Phase

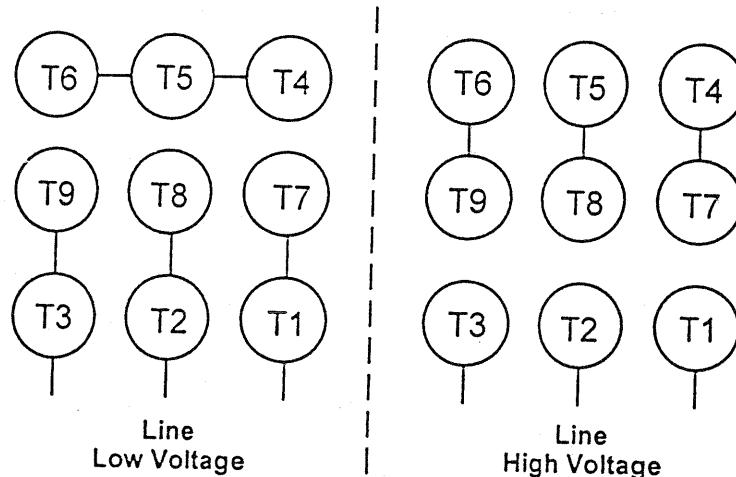


Models

R2303A, R3305A-1, R3305A-13, R4310A-2,
 R4P315A, R6350A-2, R6P350A, R6PP3110M,
 R6PS3110M, R7100A-2, R7P3160M, R7S3160M

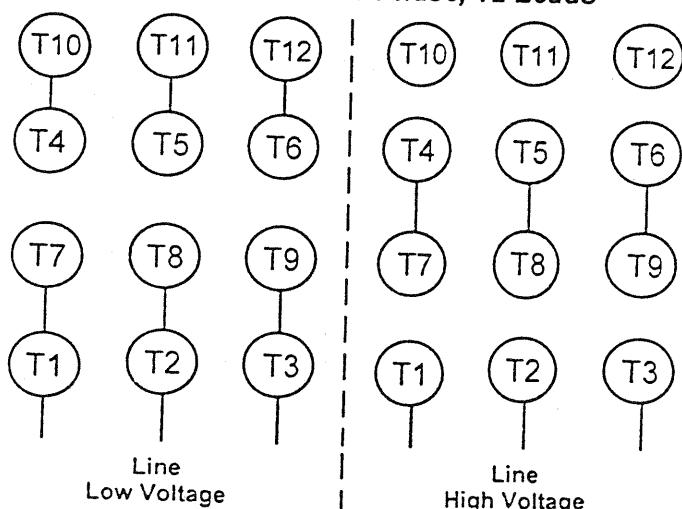
NOTE: Model R6P355A has two additional leads labeled "J" for an external thermal motor protection circuit.

Connections for 3 Phase, 9 Leads



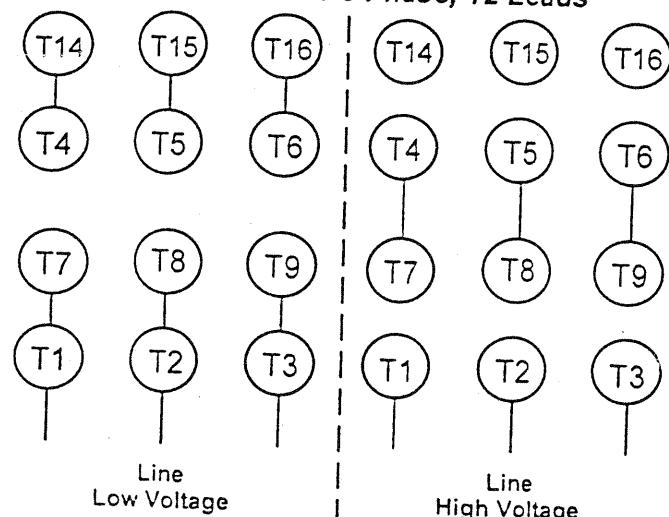
Models R6335A-2, R6P335A

Connections for 3 Phase, 12 Leads



Models R5325A-2, R6325A-2

Connections for 3 Phase, 12 Leads



To reverse rotation on any three phase motor, interchange any two external motor line connections to any two line leads.

WARRANTY AND LIMITATION OF LIABILITY

Warner Electric (the "Company"), Bristol, Connecticut, warrants to the first end user purchaser (the "purchaser") of equipment manufactured by the Company that such equipment, if new, unused and in original unopened cartons at the time of purchase, will be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from the Company's factor, or a warehouse of the Company in the event that the equipment is purchased from the Company or for a period of one year from the date of shipment from the business establishment of an authorized distributor of the Company in the event that the equipment is purchased from an authorized distributor.

THE COMPANY'S OBLIGATION UNDER THIS WARRANTY SHALL BE STRICTLY AND EXCLUSIVELY LIMITED TO REPAIRING OR REPLACING, AT THE FACTORY OR A SERVICE CENTER OF THE COMPANY, ANY SUCH EQUIPMENT OR PARTS THEREOF WHICH AN AUTHORIZED REPRESENTATIVE OF THE COMPANY FINDS TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP UNDER NORMAL USE AND SERVICE WITHIN SUCH PERIOD OF ONE YEAR. THE COMPANY RESERVES THE RIGHT TO SATISFY SUCH OBLIGATION IN FULL BY REFUNDING THE FULL PURCHASE PRICE OF ANY SUCH DEFECTIVE EQUIPMENT. This warranty does not apply to any equipment which has been tampered with or altered in any way, which has been improperly installed or which has been subject to misuse, neglect, or accident.

THE FOREGOING WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, and of any other obligations or liabilities on the part of the Company, and no person is authorized to assume for the Company any other liability with respect to equipment not manufactured by the Company. The Company shall have no liability with respect to equipment of its manu acture. THE COMPANY SHALL HAVE NO LIABILITY WHATSOEVER IN ANY EVENT FOR PAYMENT OF ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR INJURY TO ANY PERSON OR PROPERTY.

Written authorization to return any equipment or parts thereof must be obtained from the Company. The Company shall not be responsible for any transportation charges.

IF FOR ANY REASON ANY OF THE FOREGOING PROVISIONS SHALL BE INEFFECTIVE, THE COMPANY'S LIABILITY FOR DAMAGES ARISING OUT OF ITS MANUFACTURE OR SALE OF EQUIPMENT, OR USE THEREOF, WHETHER SUCH LIABILITY IS BASED ON WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE, SHALL NOT IN ANY EVENT EXCEED THE FULL PURCHASE PRICE OF SUCH EQUIPMENT.

Any action against the Company based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment, or the use thereof, must be commenced within one year after the cause of such action arises.

The right to make engineering refinements on all products is reserved.
Dimensions and other details are subject to change.



WARNER ELECTRIC
LINEAR AND ELECTRONICS DIVISION
BRISTOL PLANT
383 Middle Street • Bristol, CT 06010
(860)585-4500•Fax:(860)589-2136



Manufactured under an ISO 9002
compliant manufacturing system



Manufactured under an ISO 9002
compliant manufacturing system

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THINGS TO KNOW BEFORE USING THIS EQUIPMENT

- Only qualified personnel should install or perform servicing procedures on this equipment. Do not operate the unit without the enclosures in place as voltage present in this unit can cause serious or fatal injury.
- Before performing any work on the unit, allow at least five minutes for the capacitors to discharge fully.
- Voltage is present on unprotected pins when unit is operational.
- The "PWR ON" LED must be off for approximately 30 seconds before making or breaking the motor connections.

- Motors powered by this drive may develop extremely high torque. Be sure to disconnect power to this drive before doing any mechanical work.

CAUTION:

This unit is designed for 24 to 75 Vdc input only (see Section 4.2, Electrical Specifications, Page 11).

WARRANTY RESTRICTIONS

- Reconfiguration of the circuit in any fashion not shown in this manual will void the Warranty.
- Failure to follow the installation guidelines as described in Section 3 will void the Warranty.

SECTION 1: INTRODUCTION

1.1 USING THIS MANUAL

It is important that you understand how this SLO-SYN SS2000MD7 Translator/Drive is installed and operated before you attempt to use it. We strongly recommend that you read this manual completely before proceeding with the installation of this unit.

This manual is an installation and operating guide to the SLO-SYN SS2000MD7 Translator/Drive. Section 1 gives an overview of the Drive and its features. Section 2 describes the steps necessary to place the drive into operation. General wiring guidelines as well as the physical mounting of the unit and connections to the drive portion are covered in Section 3.

Complete specifications, listed in Section 4, provide easily referenced information concerning electrical, mechanical and environmental specifications. The procedure for setting the motor current level is also covered in this section.

Torque versus speed characteristics with all appropriate SLO-SYN Stepper Motors are given in Section 5. Section 6, Troubleshooting, gives procedures to follow if the Translator/Drive fails to operate properly.

Appendix A provides procedures for troubleshooting electrical interference problems.

1.2 PRODUCT FEATURES

The SLO-SYN SS2000MD7 Translator/Drive is a bipolar, speed adjustable, two-phase PWM drive which uses power MOSFET devices. It can be set to operate a stepper motor in 1/2, 1/10, 1/25 or 1/100 micro-steps. The maximum running speed is 3,000 rpm. To reduce the chances of electrical noise problems, the control signals are optically isolated from the drive circuit.

- UL recognized under Component Program, File #E146240
- Switch selectable current levels of 1 through 7 amperes
- Full short circuit protection (phase-to-phase and phase-to-ground)
- Undervoltage and transient overvoltage protection
- Thermal protection
- Efficient thermal design
- Optically isolated inputs
- Reduce Current and Winding Off capability
- Switch selectable step resolution
- Compact size
- Sturdy all-aluminum case

SECTION 2: EXPRESS START UP PROCEDURE

The following instructions define the minimum steps necessary to make your Drive operational.

CAUTION:

Always disconnect the power to the unit and be certain that the "PWR ON" LED is OFF before connecting or disconnecting the motor leads. FAILURE TO DO THIS WILL RESULT IN A SHOCK HAZARD AND MAY DAMAGE THE DRIVE.

Always operate the unit with the Motor and the Drive enclosure GROUNDED. Be sure to twist together the wires for each motor phase as well as those for the dc input. Six twists per foot is a good guideline.

1. Check to see that the motor used is compatible with the drive. Refer to Section 4.4 for a list of compatible motors.
2. Set the correct current level for the motor being used per the instructions in Section 4.5. Heatsinking is required if a current of 4 amperes or higher is used.
3. Select the appropriate step resolution and set the switches as described in Section 4.6.
4. Wire the motor per the "Motor Connections" description in Section 3.2.
5. Connect the power source to the DC input terminal strip. Be sure to follow the instructions for connecting the filter capacitor as described in Section 3.2, under Power Input.

NOTES:

If the motor operates erratically, refer to Section 5, "Torque Versus Speed Characteristics".

Clockwise and counterclockwise directions are properly oriented when viewing the motor from the end opposite the mounting flange.

SECTION 3: INSTALLATION GUIDELINES

3.1 MOUNTING

The SLO-SYN Drive is mounted by fastening its mounting brackets to a flat surface as shown in Figure 3.1. If the Heat Sink Assembly, part number 221576-001, is mounted against a bulkhead, be sure to apply a thin coating of thermal compound between the heat sink and the mounting surface before fastening the unit in place. Do not use too much thermal compound. It is better to use too little than too much.

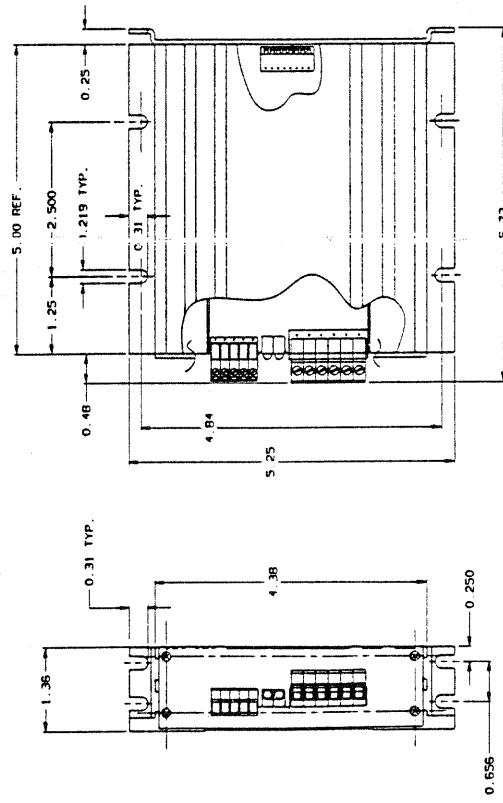


Figure 3.1, Mounting Diagram

NOTE: Case temperature should not exceed +70° C (+158° F). A heat sink, such as Superior Electric Heat Sink Assembly 221576-001, must be used when the drive is operated at a current setting of 4 amperes or more. In this case the unit should be mounted upright (with the cooling fins vertical), or proper cooling will not occur. Air flow should not be obstructed. Forced air cooling may be required to maintain temperature within the stated limits.

When selecting a mounting location, it is important to leave at least two inches (51 mm) of space around the top, bottom and sides of the unit to allow proper airflow for cooling.

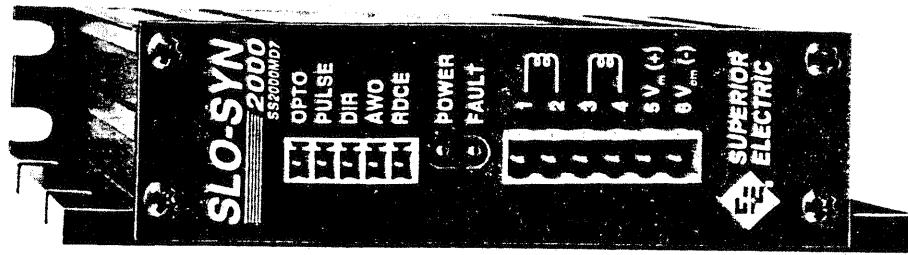


Figure 3.2, Connector Locations

It is also important to keep the drive away from obvious noise sources. If possible, locate the drive in its own metal enclosure to shield it and its wiring from electrical noise sources. If this cannot be done, keep the drive at least three feet from any noise sources.

3.2 CONNECTOR LOCATIONS AND PIN ASSIGNMENTS

Figure 3.2 shows the connector locations for the SLO-SYN SS2000MD7 Translator/Drive.

MOTOR CONNECTIONS

All motor connections are made via the 6-pin connector, part number 218397-006. Pin assignments for this connector are given below. Motor connections are shown in Figure 3.3.

Pin	Assignment
1	M1 (Phase A)
2	M3 (Phase A)
3	M4 (Phase B)
4	M5 (Phase B)

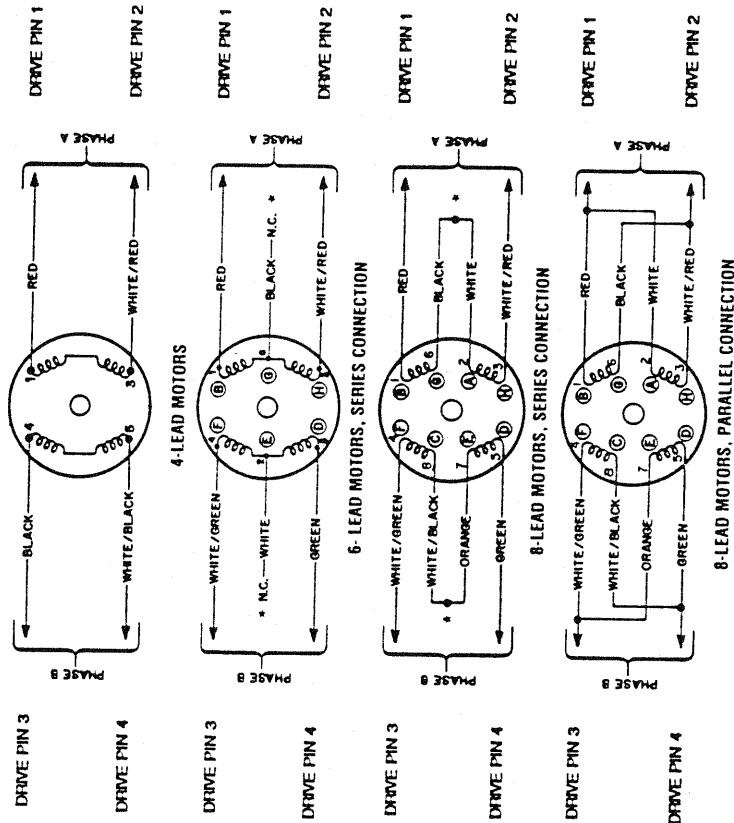
NOTE: Motor phase A is M1 and motor phase B is M4 and M5. The motor frame must be grounded.

Cabling from the drive to the motor should be done with a shielded, twisted-pair cable. As a guideline, the wires for each motor phase should be twisted about six times per foot.

Superior Electric offers the following motor cable configurations. These cables have unterminated leads on both ends.

Length	Part Number
10 ft (3 m)	216022-031
25 ft (7.6 m)	216022-032
50 ft (15.2 m)	216022-033
75 ft (22.8 m)	216022-034

Figure 3.3 shows the possible motor wiring configurations.



- * These leads must be insulated and isolated from other leads or ground.

Circled letters identify terminals for connector motors, numbers identify those for terminal box motors.

Figure 3.3, Motor Wiring Configurations

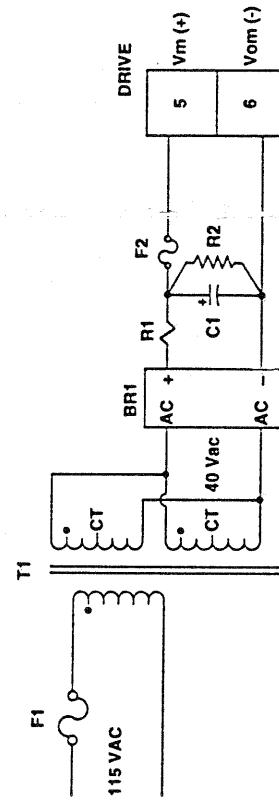
POWER INPUT

The dc input power is connected to pins 5 and 6 of the power connector. Pin 5 [Vm(+)] is the power supply plus (+) connection and pin 6 [Vm(-)] is the power supply minus (-) connection.

An unregulated supply similar to that shown in Figure 3.4 is preferable. If a regulated supply is used, it must be a linear regulated supply and must be capable of operating with the added filter capacitor. A switching regulated supply is not recommended for use with this drive. It is important that capacitor (C1) be connected within three feet (0.9 meter) of the input terminals. The capacitor must be of the correct value and have the proper current and voltage parameters (see list of components on page 11).

It is recommended that the power supply leads be twisted together (6 twists per foot).

NOTE: If the power supply is grounded, it must only be grounded on the negative side or the short circuit protection will not operate properly.



Components for circuit shown in Figure 3.4:

5 ampere or lower setting
F1 3 amp., time delay, Bussman MDA-3 or equivalent
F2 15 amp. very fast acting, Bussman GBB-15 or equivalent
R1 5 ohm surge limiter, Dale 7SS35 or equivalent
R2 4.7k ohm, 2 watts, ±5%
T1 160 VA, Bicron Electronics BU216AS040D, Signal Transformer 80-2 or equivalent
BR1 General Instrument GBPC3502 or equivalent
C1 4700 µf, 6.9 amp. ripple current, 100 Vdc, United Chemi-Con 36DA472F100AL2A or equivalent

6 and 7 ampere settings

F1 6 amp., time delay, Bussman MDA-6 or equivalent
F2 15 amp. very fast acting, Bussman GBB-15 or equivalent
R1 4 ohm surge limiter, Dale 14SS56 or equivalent
R2 4.7k ohm, 2 watts, ±5%
T1 320 VA, Bicron Electronics BU233AS040D, Signal Transformer 80-4 or equivalent
BR1 General Instrument GBPC3502 or equivalent
C1 6800µf, 9.4 amp. ripple current, 100 Vdc, United Chemi-Con 36DA682F100AD2A or equivalent

SECTION 4: SPECIFICATIONS

4.1 MECHANICAL SPECIFICATIONS

Size	4.375 H x 1.36 W x 5.73 D
	(Inches)	(mm)
Weight	111 H x 35 W x 146 D 1.5 pounds (680 grams)

4.2 ELECTRICAL SPECIFICATIONS

DC Input Range	24 Vdc min., 75 Vdc max.
DC Current	see Motor Table
Drive Power Dissipation (Worst Case)	40 watts

NOTES: The cable between the filter capacitor (C1) and the drive should be twisted (six twists per foot). Maximum wire length is three feet.

Use #16 AWG or larger wire.

Figure 3.4
Typical Power Supply For A Single Drive Application

4.3 ENVIRONMENTAL SPECIFICATIONS

Temperature	Operating	+32° F to +122° F (0° C to +50° C)	free air ambient, Natural Convection. Maximum heat sink temperature of 158° F (70° C) must be maintained. Forced-air cooling may be required.
Storage	-40° F to +167° F (-40° C to +75° C)	95% max. noncondensing
Humidity	95% max. noncondensing	10,000 feet (3048 m) max.
Altitude	95% max. noncondensing	10,000 feet (3048 m) max.

4.4 MOTOR COMPATIBILITY

Motor Types	Superior Electric M Series		
Frame Sizes	M061 (NEMA 23D) (NEMA 34)	through	M093
Number of Connections	4, 6, 8		
Inductance	1 millihenry		
Maximum Resistance	= 0.25 × Vdc Supply/I Setting		

Example:

$$\begin{aligned}V_{dc} &= 60 \quad I \text{ Setting} = 7 \\R_{max.} &= 0.25 \times 60/7 = 2.1 \text{ ohms}\end{aligned}$$

NOTE: Maximum resistance is total of motor plus cable.

CAUTION: Do not use larger frame size motor than those listed, or the drive may be damaged. If a larger frame size motor must be used, consult the factory for recommendations.

Power supply currents shown are measured at the output of the rectifier bridge in Figure 3.4.

M061, M062 and M063 motors listed include LS, LE, CS, FC and FD versions. M091, M092 and M093 motors include FC and FD versions with 6 or 8 leads. Motors with windings other than those listed can be used as long as the current ratings listed on the motors are not exceeded. Consult the factory for recommendations concerning the use of M111 and M112 frame size motors.

MOTORS FOR USE WITH THE SS2000MD7 TRANSLATOR/DRIVE

Motor	Winding	Connection	Current Setting (Amperes)	Power Supply Current Standstill (Amps. DC)	Maximum (Amps. DC)
M061	08	Series	3	1.0	2.0
M062	09	Series	3	1.0	2.0
M062	09	Parallel	6	1.5	4.0
M063	09	Series	3	1.0	2.0
M063	09	Parallel	6	1.5	4.0
M091	09	Series	4	1.5	2.0
M091	09	Parallel	6	1.5	4.0
M092	09	Series	4	2.0	2.0
M092	09	Parallel	7	2.0	4.0
M093	14	Series	5	2.0	2.0
M093	14	Parallel	7	2.0	4.0

4.5 CURRENT SETTINGS

The proper current setting for each motor is shown on the individual torque vs. speed curves. Use this current level to obtain the torque shown. The access hole for the switches which set the motor current level is located on the back of the unit (see Figure 4.1). Switches 1 through 6 are used to select the current level. Select the desired operating current by setting the appropriate switch to position 1 (ON). The OFF position is labeled "0". Only one switch should be ON. If two or more switches are ON, the one which selects the highest current level will be the active switch. The switch settings are as follows:

Position	Current (amperes)
None	1.0
1	2.0
2	3.0
3	4.0*
4	5.0*
5	6.0*
6	7.0*

- * Heat sinking is mandatory at current settings of 4 amperes or higher.

4.6 STEP RESOLUTION

The number of pulses per revolution is selected using positions 7 and 8 of the switch described in Section 4.5. The following chart shows the correct switch settings for each available step resolution.

Switch Position	Step Resolution	Pulses Per Revolution
7	8	
0	0	1/2
1	0	1/10
0	1	1/25
1	1	1/100
		400
		2,000
		5,000
		20,000

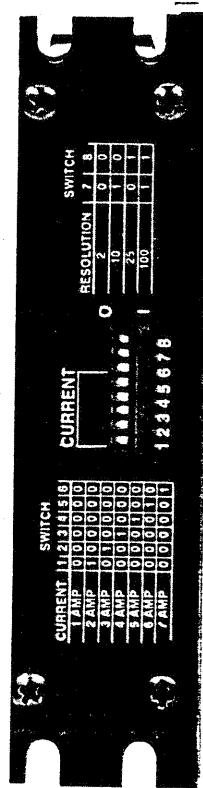


Figure 4.1
Switches For Setting Current Level
And Step Resolution

4.7 SIGNAL SPECIFICATIONS

4.7.1 Connector Pin Assignments

All connections are made via the 5-pin connector, part number 221536-005.

Pin	Assignment
1	OPTO
2	PULSE
3	DIR
4	AWO
5	RDCE

4.7.2 Signal Descriptions

OPTO	Opto-Isolator Supply User supplied power for the opto-isolators.
PULSE	Pulse Input A low to high transition on this pin advances the motor one step. The step size is determined by the Step Resolution switch setting.

- DIR** Direction Input
When this signal is high, motor rotation will be clockwise.
Rotation will be counterclockwise when this signal is low.
- Clockwise and counterclockwise directions are properly oriented when viewing the motor from the end opposite the mounting flange.

- AWO** All Windings Off Input
When this signal is low, AC and DC current to the motor will be zero. **Caution:** There will be no holding torque when the AWO signal is low.

- RDCE** Reduce Current Input
The motor current will be 50% of the selected value when this signal is low. **Caution:** Holding torque will also be reduced when this signal is low.
- NOTE:** If you are using the drive with an SS20001 or SS20001V control, the READY input and the OPTO input on the control must be jumpered together.

4.7.3 Level Requirements

OPTO

Voltage	4.5 to 6.0 volts dc
Current	16 mA per signal used

Other Signals

Voltage	Low	≤0.8 Vdc
	High	≥OPTO
		≥OPTO - 1 volt	

Current	Low	≤16 mA
	High	≤0.2 mA

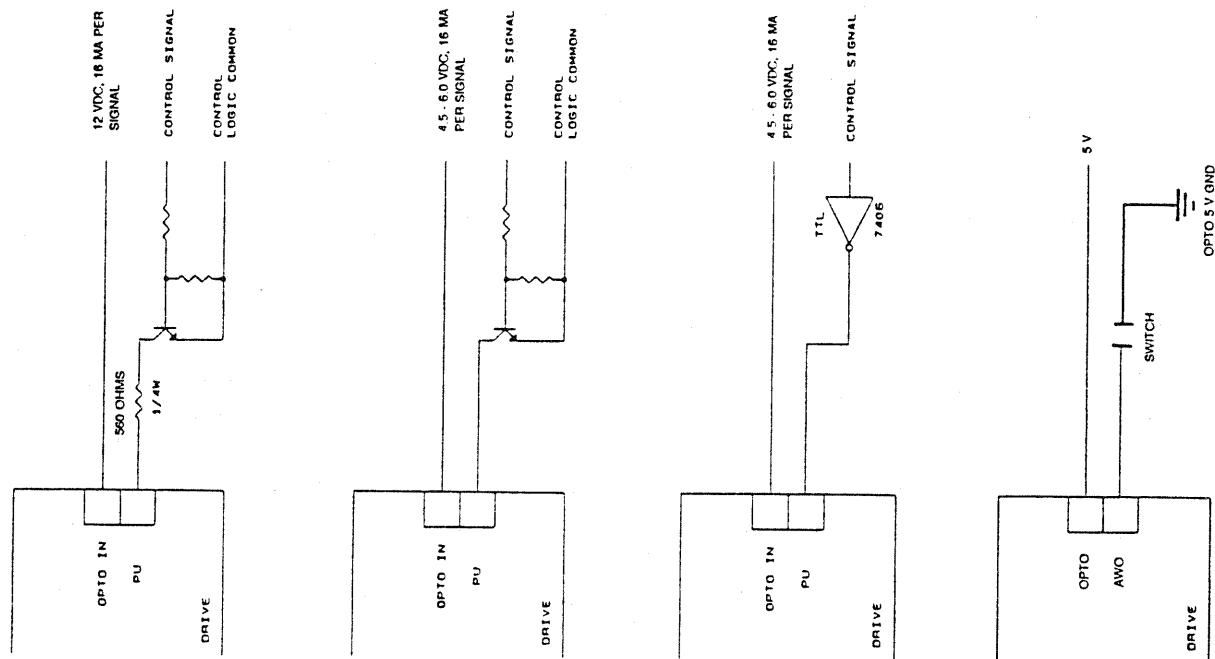
4.7.4 Timing Requirements

PULSE

Max. Frequency	500 kHz
Max. Rise And		
Fall Times	1 microsecond
Min. Pulse Width	1 microsecond

Other Signals

Response Time	≤50 microseconds
---------------	-------	------------------



Suggested Methods For Control Interface
Figure 4.2

4.8 INDICATOR LIGHTS

"POWER" LED, Red Lights when the drive logic power supply is present, indicating that the drive is energized.

"FAULT" LED, Red Lights to indicate over current condition. This condition is a result of motor wiring errors or a ground fault.

Also lights to indicate the heat sink temperature has exceeded a safe level for reliable operation.

Recovery from over current or over temperature condition requires removing and then reapplying the power.

SECTION 5: TORQUE VERSUS SPEED CHARACTERISTICS

- 1) Avoid constant speed operation at the motor's unstable frequencies. Select a base speed that is above the motor's resonant frequencies and adjust acceleration and deceleration to move the motor through unstable regions quickly.
- 2) The motor winding current can be reduced as described in Section 4.5. Lowering the current will reduce torque proportionally. The reduced energy delivered to the motor can decrease velocity modulation.
- 3) Use microstepping to provide smoother operation and reduce the effects of mid range instability. Note that microstepping reduces the shaft speed for a given pulse input rate.

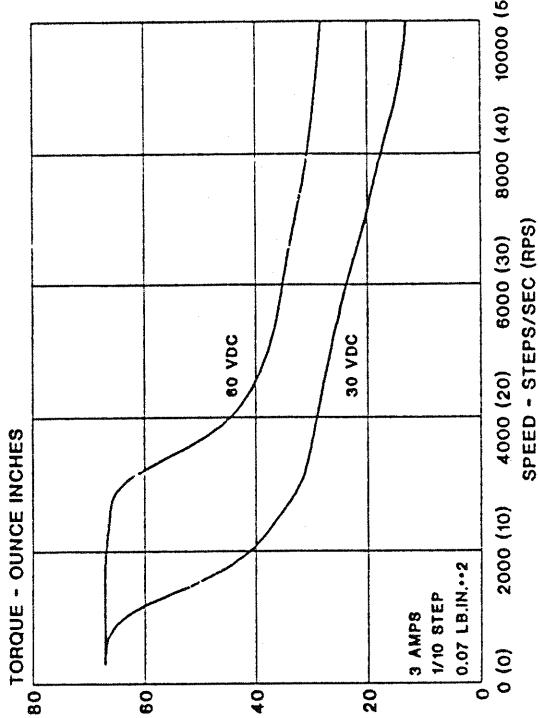
5.2 TYPICAL TORQUE VERSUS SPEED CURVES

NOTE: The test conditions used when obtaining the torque versus speed data are listed in the lower left-hand corner of each curve.

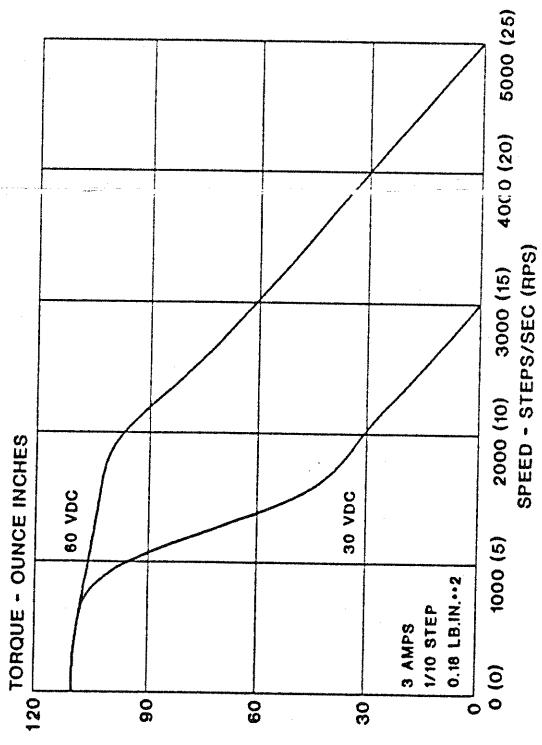
5.1 MOTOR PERFORMANCE

All stepper motors exhibit instability at their natural frequency and harmonics of that frequency. Typically, this instability will occur at speeds between 50 and 1000 full steps per second and, depending on the dynamic motor load parameters, can cause excessive velocity modulation or improper positioning. This type of instability is represented by the open area at the low end of each Torque vs. Speed curve.

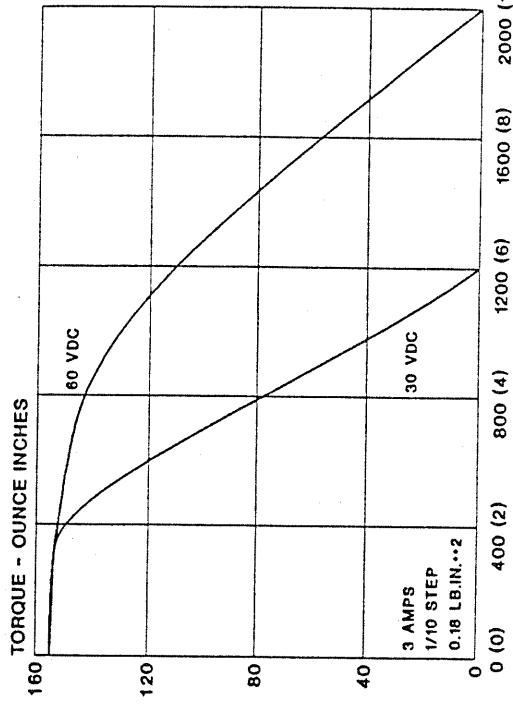
There are also other instabilities which may cause a loss of torque at stepping rates outside the range of natural resonance frequencies. One such instability is broadly defined as mid-range instability. Usually, the damping of the system and acceleration/deceleration through the resonance areas aid in reducing instability to a level that provides smooth shaft velocity and accurate positioning. If instability does cause unacceptable performance under actual operating conditions, the following techniques can be used to reduce velocity modulation.



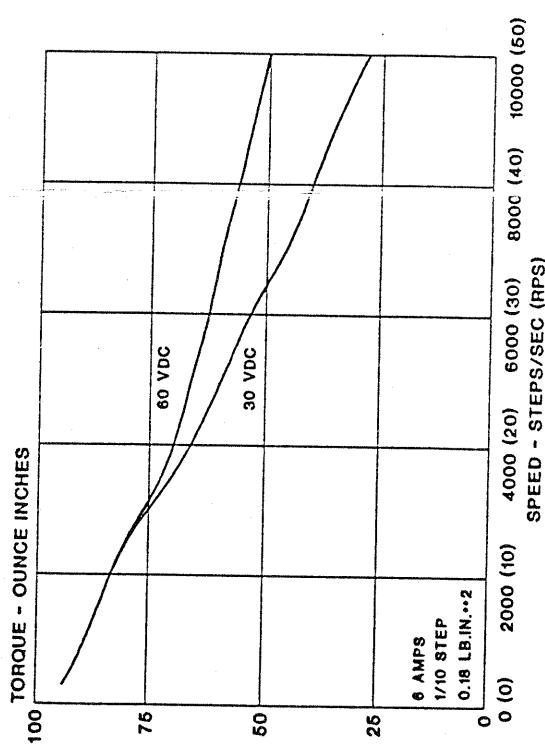
M061-L608 MOTOR, 3 AMPERES
SERIES CONNECTION



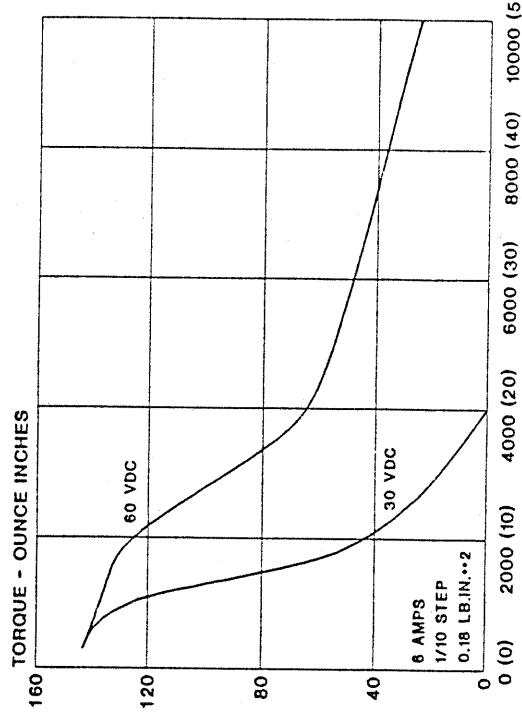
M062-LE09 MOTOR, 3 AMPERES
SERIES CONNECTION



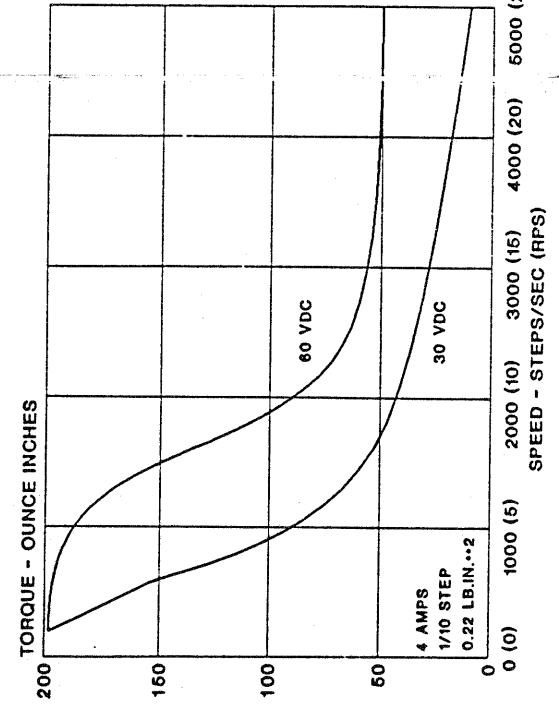
M063-LE09 MOTOR, 3 AMPERES
SERIES CONNECTION



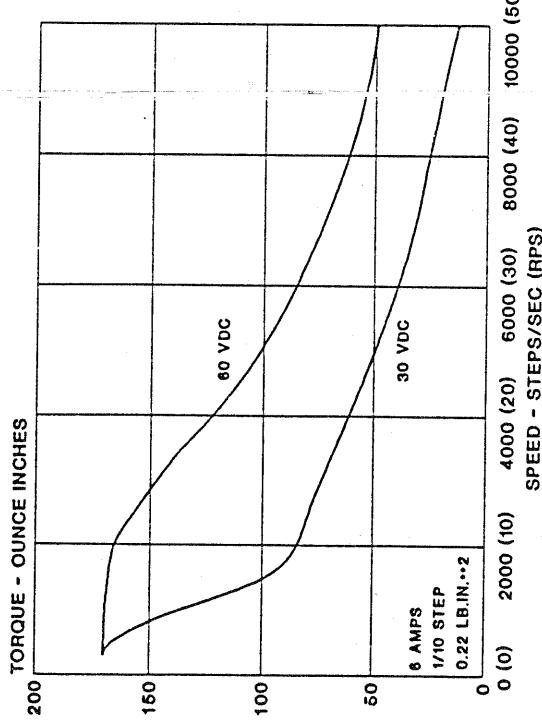
M062-LE09 MOTOR, 6 AMPERES
PARALLEL CONNECTION



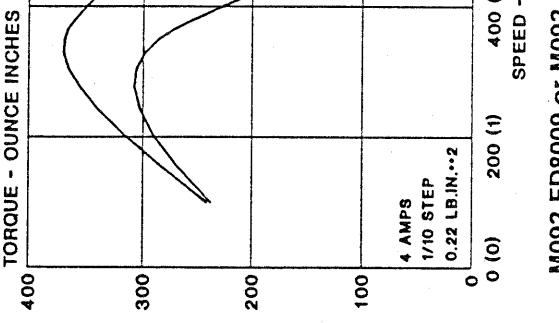
M063-LE09 MOTOR, 6 AMPERES
PARALLEL CONNECTION



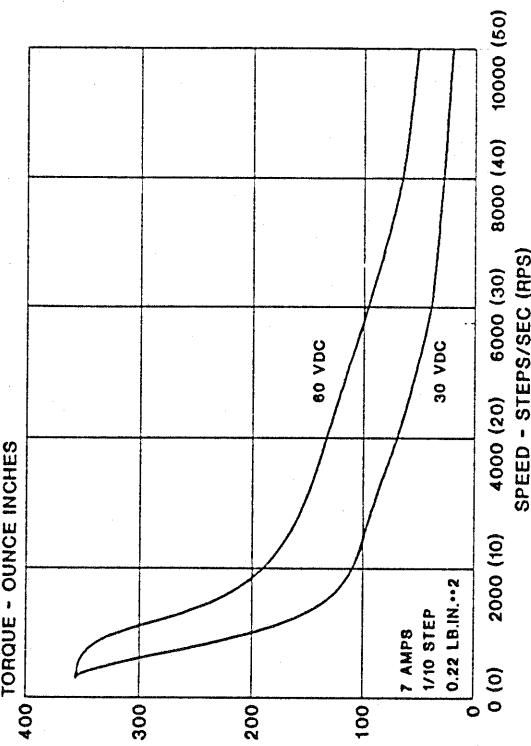
M091-FD8009 or M091-FD8109 MOTOR, 4 AMPERES
SERIES CONNECTION



M091-FD8009 or M091-FD8109 MOTOR, 6 AMPERES
PARALLEL CONNECTION



M092-FD8009 or M092-FD8109 MOTOR, 4 AMPERES
SERIES CONNECTION



M092 FD8009 or M092-FD8109 MOTOR, 7 AMPERES
PARALLEL CONNECTION

SECTION 6: TROUBLESHOOTING

WARNING:

Motors connected to this drive can develop high torque and large amounts of mechanical energy.

Keep clear of the motor shaft and all parts mechanically linked to the motor shaft.

Turn off all power to the drive before performing work on parts mechanically coupled to the motor.

If installation and operating instructions have been followed carefully, this unit should perform correctly. If the motor fails to step properly, the following checklist will be help locate and correct the problem.

In General:

- Check all installation wiring carefully for wiring errors or poor connections.

- Check to see that the proper voltage levels are being supplied to the unit. Be sure that the "POWER" LED lights when power is applied.

- Be sure that the motor is a correct model for use with this unit.

Specifically:

IF MOTOR DIRECTION (CW, CCW) IS REVERSED, Check For:

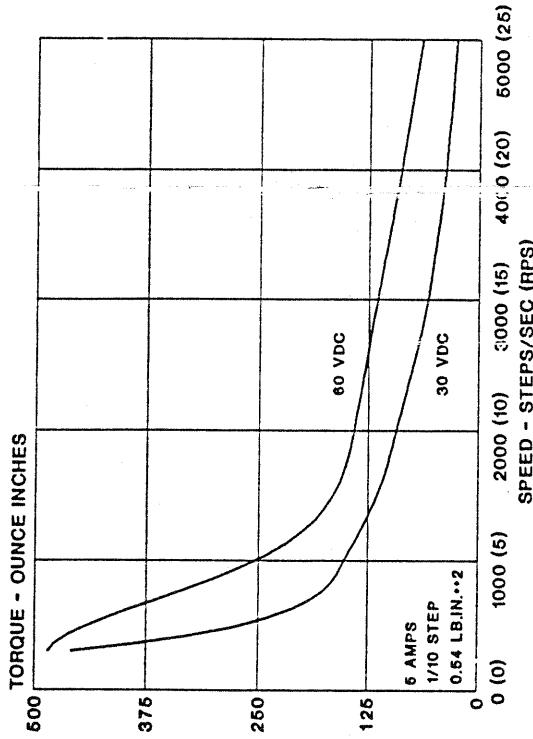
Reversed connections to the Motor Connector. Reversing the phase A or the phase B connections will reverse the direction of motor rotation.

IF THE MOTOR MOTION IS ERRATIC, Check For:

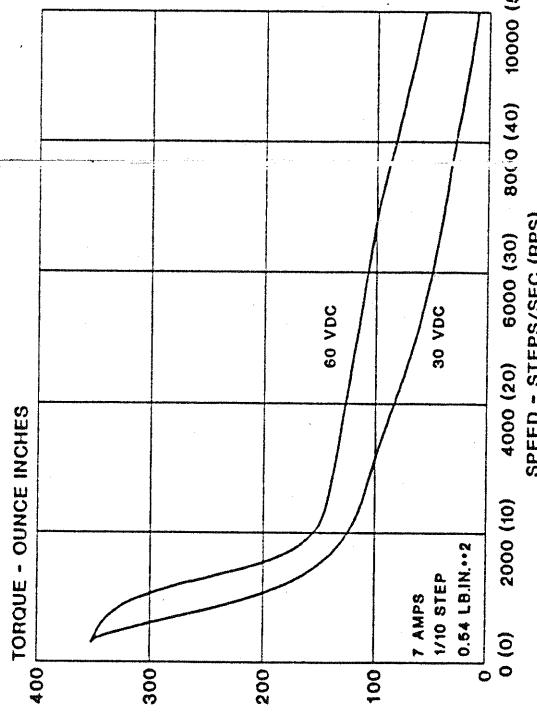
Supply voltage out of tolerance.

Improper motion parameters (low speed, acceleration/deceleration, jog speed, home speed and feed rate). Set parameters on controller supplying pulse input to drive.

Filter capacitor missing or too low in value.



**M093-FD8114 or M093-FD8014 MOTOR, 5 AMPERES
SERIES CONNECTION**



**M093-FD8114 or M093-FD8014 MOTOR, 7 AMPERES
PARALLEL CONNECTION**

IF TORQUE IS LOW, Check For:

All Windings Off active or Reduced Current active.

Improper supply voltage.

IF "POWER" INDICATOR IS NOT LIT, Check For:

Improper input wiring and voltage levels

Blown supply circuit fuse or tripped input circuit breaker

IF "FAULT" INDICATOR IS LIT, Check For:

Improper motor wiring

Grounded or shorted wiring to the motor or shorted motor

Improper motor type or incorrect Current Select switch setting

Ambient temperature around drive above 50°C (122°F)

Heat sink temperature above 70° C (158° F)

Restricted airflow around drive

If a malfunction occurs that cannot be corrected by making the preceding checks, contact Superior Electric.

APPENDIX A: TROUBLESHOOTING ELECTRICAL INTERFERENCE PROBLEMS

Electrical interference problems are common with today's computer-based controls, and such problems are often difficult to diagnose and cure. If such a problem occurs with your system, it is recommended that the following checks be made to locate the cause of the problem.

1. Check the quality of the ac line voltage using an oscilloscope and a line monitor, such as the Superior Electric VMS series. If line voltage problems exist, use appropriate line conditioning, such as line filters or isolation transformers.
2. Be certain proper wiring practices are followed for location, grounding, wiring and relay suppression.
3. Double check the grounding connections to be sure they are good electrical connections and are as short and direct as possible.
4. Try operating the drive with all suspected noise sources switched off. If the drive functions properly, switch the noise sources on again, one at a time, and try to isolate which ones are causing the interference problems. When a noise source is located, try rerouting wiring, suppressing relays or other measures to eliminate the problem.

KBMM™ *

Solid State DC Motor Speed Control

Installation and Operating Instructions* * Patented

* See Safety Warning on Page 2

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PENTA KB POWER

A COMPLETE LINE OF SCR DRIVES

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PENTA KB POWER

A COMPLETE LINE OF SCR DRIVES

* See Safety Warning on Page 2

**** IMPORTANT ****

- Be sure AC line voltage corresponds to control voltage. (See electrical rating chart).
- Install the correct Plug-in Horsepower Resistor® according to armature voltage and motor horsepower. (See Table 4, Page 5.) (supplied separately).
- Recheck connections: AC line to L1 and L2; armature to A+ and A- and F-field (Shunt motors only to F+ and F-). (Note: If motor runs in improper direction, interchange armature leads).
- Install proper AC line fuses and armature fuse as required (See page 9) (sur pilled separately).
- Nominal trimpot settings are as follow (expressed in % of full CW rotation)

TABLE 1: NOMINAL TRIMPOT SETTINGS For detailed instructions see Sec. III	
CL (current limit/torque):	65%
ACCEL (acceleration start):	20%
DECEL (deceleration):	20%

TABLE 2: ELECTRICAL RATINGS

MODEL NUMBER	AC LINE VOLTAGE (VAC)*	RATING WITHOUT AUXILIARY HEATSINK		DC LOAD CURRENT (RMS AMPS)	MAX. CURRENT (RMS AMPS)	MAX. AMPS (AVG. AMPS)	MAX. HP
		AC LOAD CURRENT (RMS AMPS)	DC LOAD CURRENT (RMS AMPS)				
KBMM-125	120	90-130	12.0	8.0	44	24.0	16.0
KBMM-225	240	180	12.0	8.0	114	24.0	16.0
KBMM-225D*	120/240	90/180	12.0	8.0	114	24.0	16.0

*Model KBMM-225D is wired at the factory for 120 VAC input and 80VDC output. It can be converted to 240VAC input to use with 180VDC or 90VDC power source (see page 8 for the details).

FOR TECHNICAL ASSISTANCE CALL TOLL FREE (OUTSIDE NY STATE ONLY) 1-800-221-6570

TABLE 3. GENERAL PERFORMANCE SPECIFICATIONS

Speed range (ratio)	50:1	CL/torque range (% full load)	0-200
Load regulation—armature feedback (0-full load, 50:1 speed range)	(% base speed)	Accel time range (0-full speed) (secs.)	2-10
Load regulation—tachometer feedback (0-full load, 50:1 speed range)	(% set speed)	Decel time range (full 0-speed) (secs.)	2-10
Control linearity (% speed vs. dial rotation)	1*	Min. speed trimpot range (% full speed)	0-30
Line voltage regulation—armature feedback (at full load, ±10% line variation, base speed)	1/2*	Max. speed trimpot range (% full speed)	50-110*
Line voltage regulation—tachometer feedback (at full load, ±10% line variation) (% set speed)	1/2*	IR compensation trimpot range (at specified full load) (volts)	0-24
Control linearity (% speed vs. dial rotation)	2	Maximum allowable ambient temperature at full rating (°C°F)	45/113
		Tachometer feedback input volts (per 1000 RPM)	750

*Performance is for SCR rated PM motors only. Lower performance can be expected with other motor types. Factory setting is for 3% load regulation. To obtain superior regulation, see Sec. III F. Other factory trimpot settings are as follows: CL-150v FL, Accel 2 sec., Decel 2 sec., Min-(0)-speed, Max full speed & IR-6 volts.

PLUG-IN HORSEPOWER RESISTOR®

A Plug-in Horsepower Resistor® must be installed to match the KBMM™ to the motor horsepower and voltage. See Table 4 for the correct value. Plug-in Horsepower Resistors® are stocked by your distributor (supplied separately).

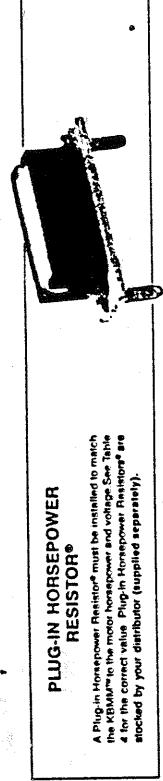


TABLE 4. PLUG-IN HORSEPOWER RESISTOR CHART

MOTOR HORSEPOWER RANGE**	Plug-in Horsepower Resistor Reference Values (Ohms)	# Part No.
90-150V DC 1100-1500	1.0	8533
150-1750	.51	8534
175-190	.35	8535
190-210	.25	8536
215-230	.18	8537
235-250	.11	8538
255-270	.05	8539
275-290	.03	8540
312	.02	8541
342	.015	8542
344	.01	8543
345	.008	8544
346	.006	8545

*Motor horsepower and armature voltage must be specified when ordering so that proper resistor will be supplied.

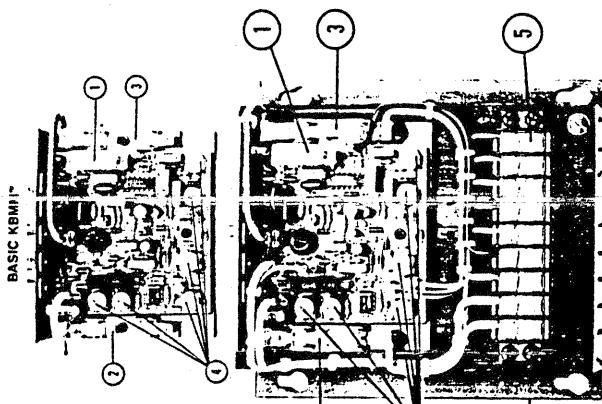
**Current rating of the resistor must be equal to or greater than the motor rating.

***Auxiliary heat sink must be used to achieve HP rating.

FIG. 1. FEATURES AND FUNCTIONS

- (1) Plug-in Horsepower Resistor*
- (2) AC Line Fuse
- (3) Armature Fuse
- (4) Timedot: NIN, MAX, IR, CL, ACCEL & DECEL
- (5) Barrier Terminal Accessory Kit (optional)
- (6) Auxiliary Heatlink (optional)

KBMM™ mounted on KB Auxiliary Heatlink (optional)
and with Barrier Terminal Kit (c. 1.)



INTRODUCTION

The KBMM™ Full Wave Solid State DC Motor Speed Control represents the latest state-of-the-art design achievable through modern technology. Features include:

- **Integrated Circuitry** Used to control and amplify command and reference levels with both closed and open loop feed-back to provide superior motor regulation. (Speed changes due to load, line voltage, or temperature variations are held to minimum levels).
- **High Quality Components** Selected and tested for proven dependability.
- **Transient Protection** Used to prevent failure of the power bridge circuit caused by voltage spikes on the AC Line.
- **High Reliability** When used in accordance with the instructions included in this manual, the KBMM™ will provide years of trouble-free operation. (Five year warranty—see page 18.)

SECTION I. APPLICATION INFORMATION

- A. **Motor Type.** The KBMM™ is designed for Permanent Magnet (PM) and Shunt Wound DC. motors. Controls operated on 120 volt AC inputs are designed for 90 volt SCR rated motors. Controls operated on 240 volt AC inputs are designed for 180 volt SCR rated motors. Use of higher voltage motors will result in degradation of full speed performance. Also, if motor is not an SCR rated type, the actual AC line amperage at full load should not exceed the motor's DC nameplate rating.
- B. **Torque Requirements.** When replacing an AC induction motor with a DC motor and speed control, consideration must be given to the maximum torque requirements. The full load torque rating of the DC motor must be equal to, or greater than, that of the AC motor.
- C. **Acceleration Start.** The KBMM™ contains an adjustable acceleration start feature which allows the motor to smoothly accelerate from 0-tfull speed over a time period of 2:10 seconds. The "ACCSEL" is factory set at 2 seconds.
- D. **Limitations in Use.** The KBMM™ controls are designed for use on machine applications.
- E. **Armature Switching.** Do not switch the armature without taking proper precautions. See Sec. IV.

CAUTION: Consult factory before using on constant horsepower applications such as saws or drill presses. Do not use in explosive atmosphere.

CAUTION: Be sure the KBMM™ is used within its max ratings. Follow all installation instructions carefully (Refer to Section II).

SECTION II. INSTALLATION INSTRUCTIONS

A. Location and Mounting. The KBMM™ controls should be mounted on a flat surface and located in an area where it will not be exposed to contaminants such as water, metal chips, solvents or excessive vibration.

When mounting in an enclosure the air space should be large enough to provide adequate heat dissipation. The maximum allowable ambient temperature at full rating is 45°C/113°F. Consult factory if more information is required.

MECHANICAL SPECIFICATIONS

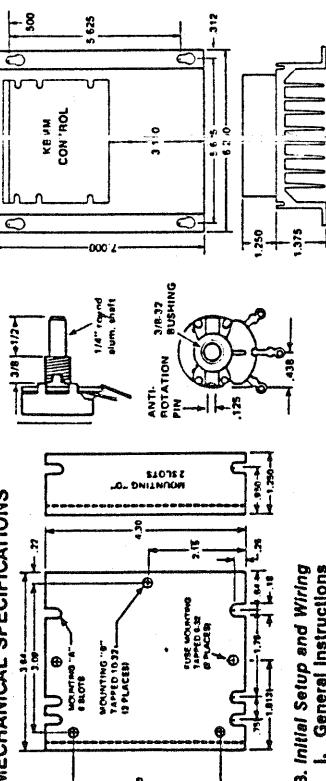


TABLE 5. MINIMUM SUPPLY WIRE SIZE REQUIREMENTS

MAX. MOTOR AMPS (DC AMPS)	MINIMUM WIRE SIZE (AWG) to Only MAX. 50' FOOT RUN		
	90V	180V	MAX. 10' FOOT RUN
6.0	1/2	1	16
12.0	1	2	14
16.0	1 1/2	3	12

*Maximum recommended wire size.

CONNECTION DIAGRAMS

Fig. 3a. Basic KBMM Connection Diagram

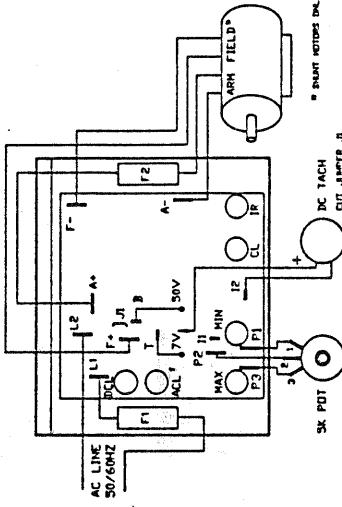
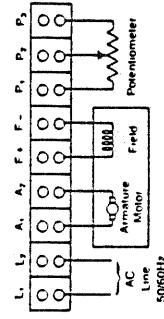


Fig. 3b. KBMM w/Barrier Terminal Kit



I. General Instructions

1. Install proper size Plug-in Horsepower Resistor® (See Table 4, page 5.)
2. The KBMM can be connected to a standard 120V or 240V 50/60 Hz AC line. Be sure the line input voltage corresponds to the control voltage rating and the motor rating (e.g. 90-150VDC motor or 180WDC motor on 240VAC).
3. Follow the recommended supply wire sizes as per Table 5.
4. Follow the NEC and other electrical codes that apply. CAUTION: Separate branch protection must be provided on 240V circuits.
5. Connect control in accordance to connection diagram—See Fig. 3, page 8.

II. Tachometer Connection—All Models (Note: DC Tachs Only)

- (1) For tach feedback, cut jumper J1 on Printed Circuit Board.
- (2) Connect tach as follows:
 - (a) 7 volts/1000 RPM Connect (+) lead to Terminal "T" or "B".
 - (b) 50 volts/1000 RPM Connect (+) lead to Terminal "B".
 - Connect (-) lead to terminal "I₂" or F-

Note: Set IR Comp to minimum for tachometer feedback.

III. DUAL VOLTAGE—Model KBMM-225D Only

The KBMM-225D is a dual voltage input and output control. The unit is factory wired for 120VAC Input and 90VDC output. To change to other voltages, resistors R17 and R19A must be selectively cut from the control as indicated below:

Input Voltage (VAC)	Output Voltage (VDC)	Modifier Required
120	90	None—Factory wired
240	180	Remove one R17 resistor (8.2K) Remove one R17 resistor (8.2K) and one R19A resistor (120K)

*Tachometer feedback is used, do not remove resistor R19A (120K) and 10Ω rheostat connection instructions.

CAUTION: If control is wired to a transformer, it is advisable to switch the secondary to disconnect power. If the primary is switched, additional snubber capacitors may have to be added across the transformer output to prevent damage to the power bridge.

Note: (Shunt motors only) For 90 Volt dc motors with 50VDC fields and 180 Volt dc motors with 100VDC fields use half voltage field connections F₋ and I₋.

CAUTION: Do not bundle potentiometer connections (P₁, P₂, P₃) and Inhibit* connections (I₁, I₂) with AC line or motor wires.

WARNING: Armature Switching. Do not switch the armature in and out of circuit or catastrophic failure will result. If armature switching is required for dynamic brake or reversing, use Models KBPB or KBC-C-R.

C. Voltage Following. All models can be controlled with an isolated analog reference voltage (0-9VDC) in lieu of the main speed potentiometer. The voltage is connected to P₂₍₊₎ and F₋. The control output voltage will linearly follow the input voltage. The source impedance of the input should be 10K ohms or less. The Min trimpot can be used to provide an offset speed. If an offset is not required adjust the Min to 0+ or 0- speed as desired. The Max trimpot is rendered inoperative in the voltage following mode. Use auxiliary trimpot to limit the control range. If the input signal is not isolated, or is a current signal (4-20mA), the KBS-240D Signal Isolator must be used. It will allow direct connection to process controllers and microprocessors.

D. Fusing. The KBMM has provision for a built-in AC line fuse and armature fuse. The AC line fuse protects the control against catastrophic failure. If the fuse blows, the control is miswired, the motor is shorted or grounded, or the KBMM control is defective. The armature fuse provides overload protection for the motor and control. Choose the proper size armature fuse by multiplying the maximum dc motor amps by 1.7. NOTE: Be sure to fuse each ungrounded AC line supply conductor. Do not fuse neutral or grounded conductors. All fuses should be normal blow ceramic 3AG, ABC or equivalent.

CAUTION: 1. The voltage feeding P₂ and F₋ must be isolated from the AC line. Do not ground P₂ or F₋ to set up a zero or ground reference. Do not bundle signal wires to P₂ and F₋ with AC line or motor connections. If signal wires are over 18", use shielded cables.
2. Do not bundle signal wires to P₂ and F₋ with AC line or motor connections.

10

1. AC Line Fuse is chosen according to the maximum rating of the control:

12 Amp fuse for all motors up to ½ HP-90V and 1½ HP-180VDC.

25 Amp fuse for all motors 1 and 1½ HP-90V and 2 and 3 HP-180VDC.

(Use Boss ABC, Litt. 326 ceramic fuse or equivalent.)

2. Armature Fuse can be chosen in accordance with the fuse chart. Note: This armature fuse is calculated based on the approximate full load DC current rating of the motor times a form factor of 1.5. If motor has characteristics not consistent with these approximations, a different fuse value may have to be used. Fuses are available from your distributor. Also available is a Fuse Kit (KB Part #9870) containing 700 assorted fuses.

TABLE 6. ARMATURE FUSE CHART

90VDC HORSEPOWER	180VDC MOTOR	APPROX. DC MOTOR CURRENT (AMPS)	FUSE RATING (AC AMPS)
1/30	1/15	.33	1/2
1/20	1/10	.5	3/4
1/15	1/8	.65	1
1/12	1/6	.85	1-1/4
	1/8	1.3	2
	1/6	1.7	2-1/2
	1/4	2.5	4
	1/3	3.3	5
1/12	1	5.0	8
3/4	1-1/2	7.5	12*
1	2	10.0	15*
1-1/2	3	15.0	25*

*Also used as AC Line Fuse.

SECTION III—ADJUSTMENTS AND CONTROL FUNCTIONS

WARNING: If adjustments are made under power insulated adjustment tools must be used and eye protection must be worn.

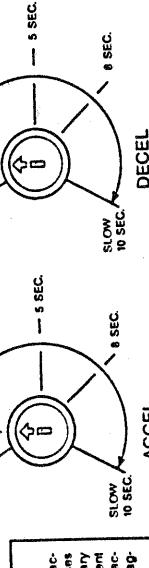
The KBMM has been factory adjusted to provide 0-full speed using the speed control knob. Minimum and Maximum speed trimpots are provided to change the speed from other than 0-full speed. The Acceleration (ACCEL) trimpot is provided to allow for a smooth start over an adjustable time period each time the AC power is applied or the speed pot is rotated. The DECEL trimpot controls the amount of ramp-down time when the speed pot is adjusted to a lower speed. The Current Limit (CL) or torque output adjustment is factory set to approximately 1½ times the motor rating. The IR Compensation (IR) is factory adjusted to provide excellent motor regulation under normal operation.

NOTE: In order for the IR comp and CL trimpot settings to be correct, the proper Pin-on Horsepower Resistor* must be installed for the particular motor and input voltage being used. Do not attempt to change the setting of the trimpots unless absolutely necessary since they are factory adjusted to near optimum settings.

The following procedure, presented in order of adjustment sequence, should be used when readjusting all trimpot functions:

FACTORY SETTING 2 SEC.

Fig. 4 ACCEL/DECEL TRIMPOT ADJUSTMENT



CAUTION!

[PM motors only] Adjusting the acceleration time below 5 seconds increases initial current. It may be necessary to measure the peak initial current and consult with motor manufacturer since field magnet demagnetization may occur.

A. Acceleration Start. The ACCEL is factory set at approx. 2 seconds. To readjust to different times, set the knob to the desired position as indicated in Fig. 4.

B. Deceleration. The DECEL is factory set to provide a ramp-down time of 2 seconds. To change the ramp-down time adjust the DECEL trimpot as indicated in Fig. 4.

C. Minimum Speed Adjustment. If a higher than zero minimum speed is desire, readjust the minimum speed by turning the speed control knob to zero setting (full CCW position). Then adjust the Min. Speed trimpot to the desired setting.

NOTE: The min. speed adjustment will affect the max. speed setting. Therefore, it is necessary to readjust the max. speed after the min. speed setting.

D. Maximum Speed Adjustment. Turn Speed Control Knob to full speed (maximum CW position). Adjust max. speed trimpot to new desired setting.

NOTE: Do not attempt to adjust the max. speed above the rated motor RPM since unstable motor operation may occur. For moderate changes in the max. speed, there will be a slight effect on the min. speed setting.

E. Current Limit (CL/Torque Adjustment). CL circuitry is provided to protect the motor and control against overloads. The CL also limits the inrush current to a safe level during start up. The CL is factory set to approximately 1.5 times the full load rating of the motor. (CL trimpot's nominal setting is approx. 65% of full CW rotation.)

To set the CL to factory specifications adjust as follows:

1. Set speed control knob at approximately 30-50% CW rotation. Set CL trimpot to full CCW position.
2. Connect a DC ammeter in series with the armature lead.
3. Lock shaft of motor (be sure CL pot is in full CCW position). Apply power and rotate CL pot CW slowly until DC ammeter reads 1.5 times motor rating (do not exceed 2 times motor rating, Max. CW position).

NOTE: If only an AC ammeter is available, it can be installed in series with AC input line. Follow above instructions, however, set AC amperage at 1.5 times motor rating.

F. IR Compensation Adjustment. IR compensation is provided to substantially improve load regulation. If the load presented to the motor does not vary substantially, the IR adjustment may be set at a minimum level (approximately 1/4 of full setting). The control is factory adjusted to approximately 30% regulation. If superior performance is desired (less than 1% speed change of base speed from 0 to full load), then the IR comp. should be adjusted as follows:

NOTES: 1. Excessive IR comp. will cause control to become unstable, which causes motor cogging.

2. For tach feedback applications the IR Comp can be set to minimum rotation (full CCW).

1. Set IR comp. trimpot at approximately 25% of CW rotation. Run motor unloaded at approximately 1/3 speed and record RPM.
2. Run motor with maximum load and adjust IR comp. trimpot so that the motor speed under load equals the unloaded speed per step 1.
3. Remove load and recheck unloaded RPM. If unloaded RPM has shifted, repeat procedure for more exact regulation.

The KBMM is now compensated to provide minimal speed change under large variations of applied load.

SECTION IV. SWITCHING CIRCUITS

A. AC Line Switching. The KBMM™ can be turned "on" and "off" using the AC Line. Auto Inhibit® circuitry contained in the KBMM™ automatically resets critical components each time the AC line is interrupted. This, along with Acceleration Start and CL, provides a smooth start each time the AC line is connected.

Warning: Do not disconnect and reconnect the Armature with the AC line applied or catastrophic failure will result. See armature switching.

B. Inhibit™ and Armature Switching. If the armature is to be disconnected and reconnected with AC power applied the Inhibit Circuit must be simultaneously activated and deactivated. Connect L₁ and L₂ together to activate the Inhibit Circuit. When the Inhibit is activated the control output will be electronically extinguished which eliminates arcing. See Fig. (5) for Dynamic brake circuit.

NOTE: Inhibit is not to be used as a failsafe or safety switch.

C. Reversing and Dynamic Brake. KB has developed the APRM® which provides an anti-plug "instant" reversing and solid state dynamic braking. The APRM® is built in as standard in all KBCC-R suffix models and in all KBPB™ models. *Patented

13 14

FIG. (5) SWITCHING CIRCUITS—CONNECTION DIAGRAMS

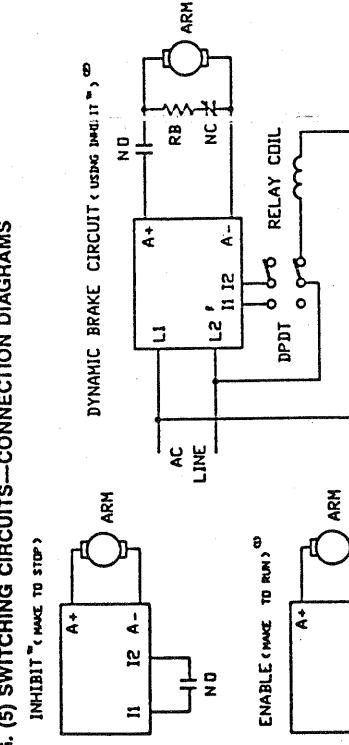
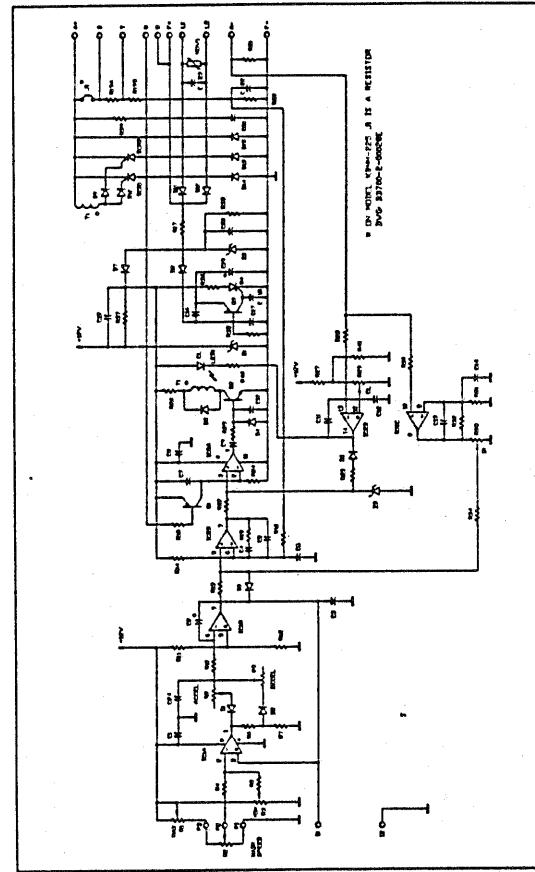


FIG. (6) KBMM™ SCHEMATIC



APPLICATION NOTES:

1. **ENABLE:** Stop time is adjustable with DECEL trimpot. To obtain zero speed when enable is open Min. speed trimpot must be set to zero speed. Two speed operation can be obtained by setting the Min. speed to the desired level.
2. **DYNAMIC BRAKE:** choose RB resistance and wattage according to braking requirements. Inhibit Circuit extinguishes output of control during brake. When armature is reenergized the Inhibit releases and provides a smooth start. Choose relay or contactor with appropriate rating.

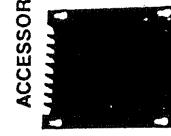
TABLE 7. KBMM™ PARTS LIST

Models	Ckt. Ref.	Value/Rating	Mfg. Type	Function	
				Capacitor	Capacitor
All Models	C1	0.010μd-25V	Ceramic Tubular	Ceramic Tubular	Ceramic Tubular
	C2	0.01μd-25V	Electrolytic	Capacitor	Capacitor
	C3	1.5μd-25V	Electrolytic	Capacitor	Capacitor
	C4	0.47μd-50V	Metal Film	Capacitor	Capacitor
	C5	0.33μd-50V	Metal Film	Capacitor	Capacitor
	C6	0.22μd-25V	Metal Film	Capacitor	Capacitor
	C7	0.15μd-50V	Metal Film	Capacitor	Capacitor
	C8	0.010μd-50V	Metal Film	Capacitor	Capacitor
	C9	100μd-25V	Electric	Capacitor	Capacitor
	C10	47μd-25V	Electric	Capacitor	Capacitor
All Models	C20	0.037μd-10V	Metal Film	Capacitor	Capacitor
	C22	0.022μd-50V	Metal Film	Capacitor	Capacitor
	D1-D10	1A-800V	Diode	Diode	Diode
	D11-D12	1.5A-800V	Diode	Power Diode	Power Diode
	D13-D14	25A-800V	Diode	Power Diode	Power Diode
	D5	15A-800V	Diode	Power Diode	Power Diode
	I21	15MA-20mcd	Diode	Diode	Diode
	I22	0.5A-20V	Transistor	Npn Transistor	Npn Transistor
	I23	0.5A-50V	Transistor	Npn Transistor	Npn Transistor
	Q1	10k-0.3A/W-10%	Transistor	Npn Transistor	Npn Transistor
All Models	R1	5K-5W-20%	Resistor	Resistor	Resistor
	R2	25k-0.3A/W-10%	Resistor	Resistor	Resistor
	R3	33k-0.2A/W-5%	Resistor	Resistor	Resistor
	R4	47k-0.25W-5%	Resistor	Resistor	Resistor
	R5	47k-0.25W-5%	Resistor	Resistor	Resistor
	R6	24k-0.25W-5%	Resistor	Resistor	Resistor
	R7	3.3K-0.25W-5%	Resistor	Resistor	Resistor
	R8	500k-0.25W-10%	Resistor	Resistor	Resistor
	R9	500k-0.25W-10%	Resistor	Resistor	Resistor
	R10	1K-0.25W-5%	Resistor	Resistor	Resistor
All Models	R11	56K-0.25W-5%	Resistor	Resistor	Resistor
	R12	22K-0.25W-5%	Resistor	Resistor	Resistor
	R13	2.2M-0.25W-5%	Resistor	Resistor	Resistor
	R14	1M-0.25W-5%	Resistor	Resistor	Resistor
	R15	12K-0.25W-5%	Resistor	Resistor	Resistor
	R16	12K-0.25W-5%	Resistor	Resistor	Resistor
	R17	0.01Ω-0.1Ω-5%	Resistor	Resistor	Resistor
	R18	100k-1M-5%	Resistor	Resistor	Resistor
	R20	12K-0.25W-5%	Resistor	Resistor	Resistor
	R21*	0.001Ω-0.01Ω-5%	Resistor	Resistor	Resistor

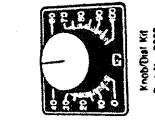
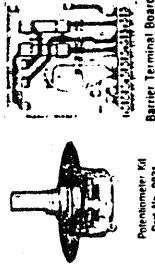
TABLE 7. KBMM™ PARTS LIST (continued)

MODELS	CKT. REF.	VALUE/RATING	MFG. TYPE	FUNCTION
R25		3.3K-0.25W-.5%	Carbon Film	Resistor
R26		47 ohm-0.12W-.5%	Carbon Film	Resistor
R29		25K-0.33W-10%	PTC-10V	CL Triptol
R33		10K-0.33W-10%	PTC-10V	IR Triptol
R36		1.0 ohm-0.25W-.5%	Carbon Comp.	Resistor
R37		1.8K-0.25W-.5%	Carbon Film	Resistor
R38		6.8K-0.25W-.5%	Flameproof	Resistor
R39		1K-0.25W-.5%	Carbon Film	Resistor
R40		4.7K-0.25W-.5%	SCR	Power SCR
SCR1.2		25A-600V	SE055L	Pulse Transformer
T1		1:1	KB Standard	Zener Diode
Z1		12V-1W-.5%	1N4742A	Zener Diode
Z2		22V-1W-.5%	1N4748A	Zener Diode
Z3		18V-1W-.5%	1N4746A	Zener Diode
120V Input KBMM-125	C21,C23 J1 MOV1 R17 R19A	1.0uf-250VDC 22 AWG 150V 4.7K-3W-5%	Metal Film Capacitor Jumper MOV1 Resistor	Capacitor Transient Suppressor Resistor
240V Input KBMM-225	C21 C23 J1 MOV1 R17 R19A	0.07uf-400VDC 0.07uf-200VAC/630VDC 82K-0.25W-5% 275V 12K-7W-5% 62K-2.5W-5%	Metal Film Capacitor Rila or Wima Carbon Film C775LA20A CW-7 Carbon Film	Capacitor Capacitor Resistor Transient Suppressor Resistor
Dual Voltage KBMM-225D	C21 MOV1 R17 R19A	0.07uf-400VDC .047uf-0.25WAC/630VDC 275VAC 12K-7W-5%// 6.2K-3W-5%// 150K-0.25W-5%// 120K-0.25W-5%	Metal Film Rila or Wima V275LA20A CW-7 MOV1 Resistor	Capacitor Capacitor Transient Suppressor Resistor Resistor

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ACCESSORY ITEMS FOR KOMM™ CONTROL is available from your distributor.



LIMITED WARRANTY FORM 125 22E 22ED

For a period of 5 years from date of original purchase KB will repair or replace without charge devices which our examination proves to be defective in material or workmanship. This warranty is valid if the unit has not been tampered with by unauthorized persons, misused, abused, or improperly installed and has been used in accordance with the instructions and/or ratings supplied. The foregoing is in lieu of any other warranty or guarantee expressed or implied, and we are not responsible for any expense (including installation and removal), inconvenience, or consequential damage, including injury to any person, caused by items of our manufacture or sale. Some states do not allow certain exclusions or limitations found in this warranty so that they may not apply to you. In any event, KB's total liability, under all circumstances, shall not exceed the full purchase price of this unit. (Rev. 4/88)

The information contained in this brochure is intended to be accurate. However, the manufacturer retains the right to make changes in design which may not be included herein.



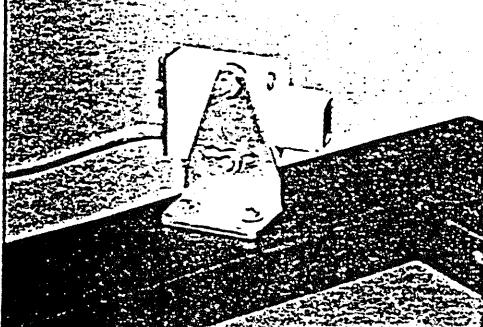
KB Part No.
A40245

KTB Part No
A40245

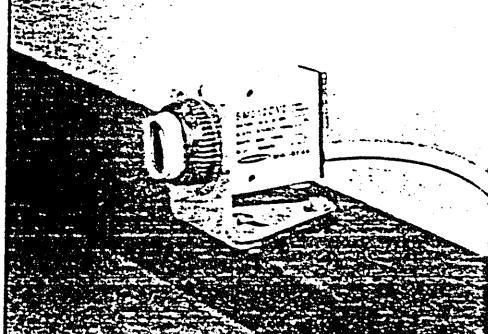
PRINTED IN U.S.A.

Modifications and Accessories (continued)

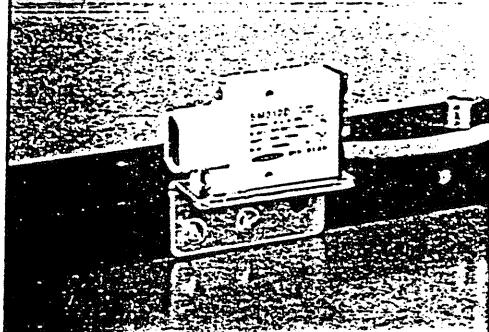
SMB312S Side Mounting Bracket



SMB312PD Barrel Mounting Bracket



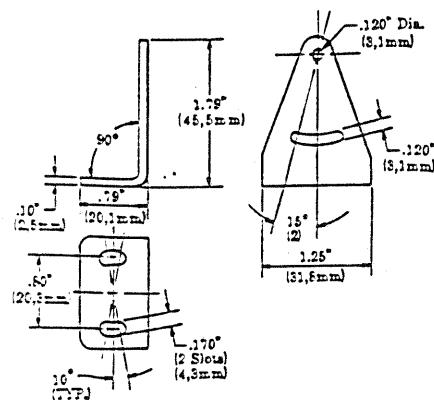
SMB312B Bottom Mounting Bracket



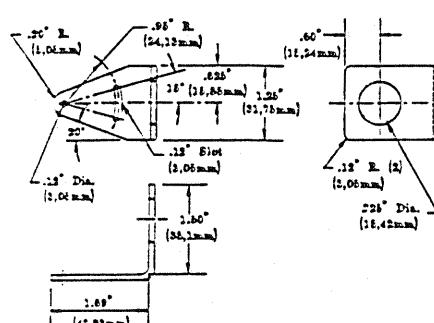
SMB312F Mounting Foot

Diagram illustrating the mounting hardware for the SMB812F sensor, showing dimensions and component labels.

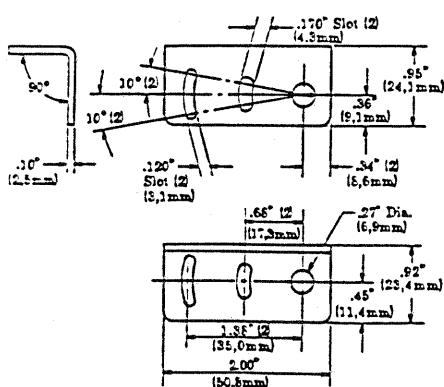
- #4-40 x 0.2" (5.1mm) Deep thread** (Referring to the screw at the top)
- {#4-40 x 1/4" (6.4mm) Screw is supplied}** (Referring to the screw at the bottom)
- SMB812F**
- Mounting foot**
- 1.38" (35.0mm)**
- .090" (2.3mm)**
- Mounting peg**
- .25" Dia. (6.4mm)**
- x .10" High (2.5mm)**
- Screw to hold Mounting foot to sensor body (Supplied)**



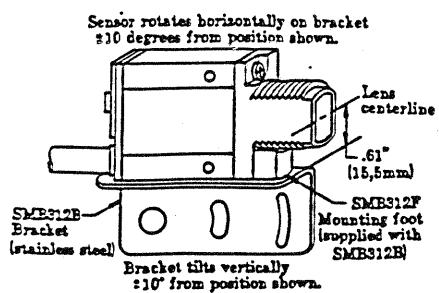
Model SMB312S is a stainless steel 2-axis side mounting bracket for MINI-BEAM sensors. The MINI-BEAM mounts to the bracket using two #4 mounting bolts (supplied). The bracket allows ± 15 degrees of vertical-plane sensor adjustment and ± 10 degrees of bracket adjustment in the horizontal plane.



Model SMB312PD is a stainless steel barrel-mounting bracket for MINI-BEAM sensors. The sensor mounts to the bracket using its black plastic mounting nut (supplied with sensor). The bracket allows ± 15 degrees of movement, and may be reversed and/or rotated from the position shown.



Model SMB312B is a stainless steel 2-axis bottom mounting bracket for MINI-BEAM sensors. The sensor mounts to the bracket using its mounting peg and an SMB312F mounting foot (supplied with the SMB-312B; see below). The bracket allows ± 10 degrees of horizontal-plane sensor adjustment and ± 10 degrees of bracket adjustment in the vertical plane.



Model SMB312F is a rugged plastic fixture that attaches securely beneath the MINI-BEAM sensor's barrel using a special extra-long upper cover mounting screw (supplied). In the bottom of the mounting foot is a brass-threaded screw insert which accommodates a #4-40 x 1/4" mounting screw (also supplied). This mounting screw is used, in conjunction with the sensor's built-in mounting peg, to attach the sensor to the SMB312B mounting bracket (above) or to a customer's own mounting bracket in custom installations.

WARRANTY: Banner Engineering Corporation warrants its products to be free from defects for a period of one year. Banner Engineering Corporation will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

Specifications

SUPPLY VOLTAGE: 10 to 30V dc at less than 25mA (exclusive of load). 10% maximum ripple.

OUTPUT CONFIGURATION: one current sourcing (PNP) and one current sinking (NPN) open collector transistor.

OUTPUT RATING: 150mA maximum each output at 25°C, derated to 100mA at 70°C (derate = 1mA per °C). *Output leakage current less than 1 microamp (off-state).* *Output saturation voltage (PNP output)* less than 1 volt at 10mA and less than 2 volts at 150mA. *Output saturation voltage (NPN output)* less than 200 millivolts at 10mA and less than 1 volt at 150mA.

PROTECTION: protected against false pulse on power-up, inductive load transients, power supply polarity reversal. Outputs are protected against continuous overload or short-circuit of outputs.

RESPONSE TIME: sensors will respond to either a "light" or a "dark" signal of 1 millisecond or longer duration, 500Hz max. (NOTE: 100 millisecond delay on power-up: outputs are non-conducting during this time.)

LIGHT BEAM: visible red (650nm); model SM312LVAG has a polarizing lens filter.

CONSTRUCTION: reinforced VALOX® housing, totally encapsulated, o-ring sealing, acrylic lenses, stainless steel screws. Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13.

CABLE: PVC-jacketed 4-wire cable (6' length) standard. Sensor models SM312LVQD and SM312LVAGQD with QD (Quick-Disconnect) connector are available; mating cable is ordered separately (p. 3).

ADJUSTMENTS: LIGHT/DARK OPERATE select switch and 15-turn slotted brass screw GAIN (sensitivity) adjustment potentiometer (clutched at both ends of travel). Both controls located on rear panel, and protected by a gasketed, clear acrylic cover.

INDICATOR LED: exclusive, patented Alignment Indicating Device system (AID™, US patent #4356393) lights a rear-panel mounted red LED indicator whenever the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate).

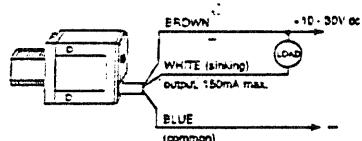
OPERATING TEMPERATURE RANGE: -20 to +70 degrees C (-4 to +158 degrees F).

Hookup Information

NOTE: maximum load capacity of each output is 150mA at 25°C, derated to 100mA at 70°C (see specifications).

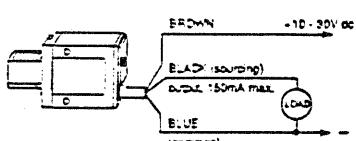
Hookup to a dc relay or solenoid (using sinking output)

The diagram below shows hookup of a dc MINI-BEAM to a dc load using the sensor's sinking output, which is rated at 150mA maximum. The BLACK wire is not used.



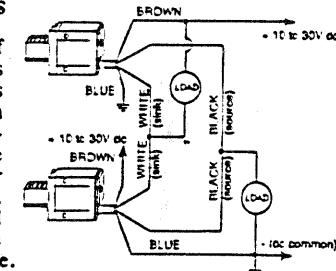
Hookup to a dc relay or solenoid (using sourcing output)

The diagram below shows hookup of a dc MINI-BEAM to a dc load using the sensor's sourcing output, which is rated at 150mA maximum. The WHITE wire is not used.



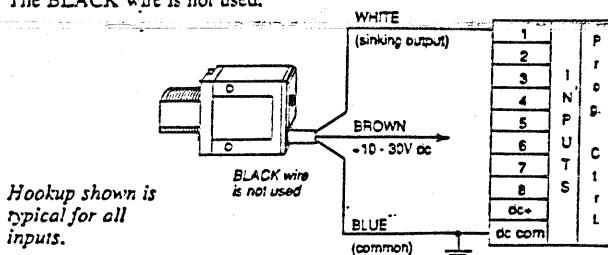
Hookup in parallel with other SM312 Series sensors

Any number of SM312 series MINI-BEAMs may be wired in parallel to a common load to create LIGHT-OR or DARK-OR logic. Light-operate and dark-operate are switch-selectable. Either the sinking or sourcing outputs (or both, as shown) may be tied together. Unused output wires should be removed or tied back and insulated. Series connection of SM312 outputs is not possible.



Hookup to a programmable controller requiring a current sink

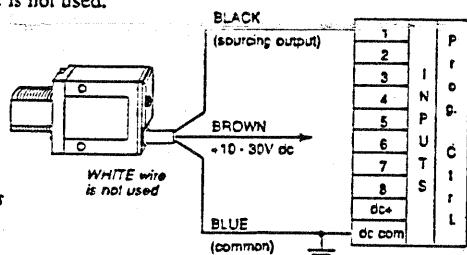
This diagram shows hookup of a dc MINI-BEAM to a programmable controller requiring a current sink, using the sensor's sinking output. The BLACK wire is not used.



Hookup shown is typical for all inputs.

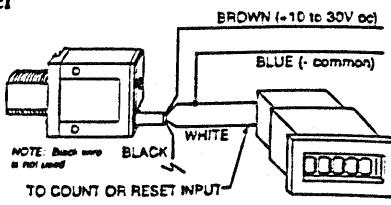
Hookup to a programmable controller requiring a current source

This diagram shows hookup of a dc MINI-BEAM to a programmable controller requiring a current source, using the sensor's sourcing output. The WHITE wire is not used.



Hookup to a counter

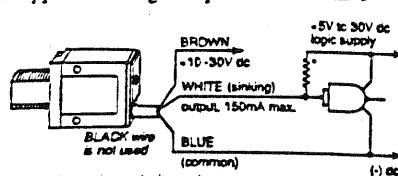
Most counters, totalizers, rate meters, etc. (including battery powered LCD types) accept the NPN (current sinking) output of MINI-BEAM sensors.



A dc MINI-BEAM used with an LCD totalizer makes a very cost-effective counting system.

Hookup to a logic gate

The diagram below shows hookup of a dc MINI-BEAM to a logic gate. A logic zero (0 volts dc) is applied to the gate input when the MINI-BEAM output is energized. When de-energized, a logic one is applied. The logic supply negative must be common to the MINI-BEAM supply negative.



* Use pullup resistor to logic supply

MINI-BEAM™ SM312LV and SM312LVAG

Self-contained DC-operated Retroreflective Mode Sensors



the photoelectric specialist

- Compact, modulated, self-contained visible red retro-reflective sensors for 10-30V dc operation
- SM312LV used with BRT-3 reflector: range 15 feet
- SM312LVAG used with BRT-3 reflector: range 7 feet
- Switch-selectable for light-operate or dark-operate; highly repeatable, 1 millisecond response
- Both sourcing and sinking outputs (150mA maximum each); continuous overload and short-circuit protected
- Includes Banner's exclusive AID™ alignment system
- Rugged, epoxy-encapsulated construction: meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13
- Physically and electrically interchangeable with 18-mm barrel-type photoelectrics

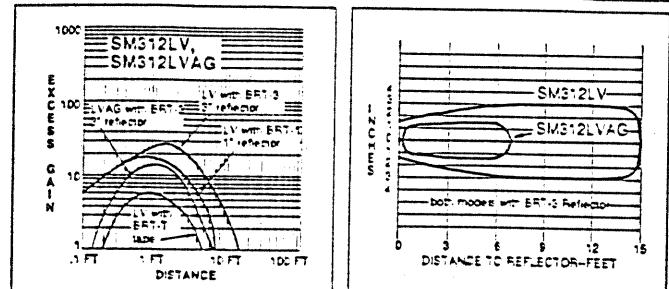
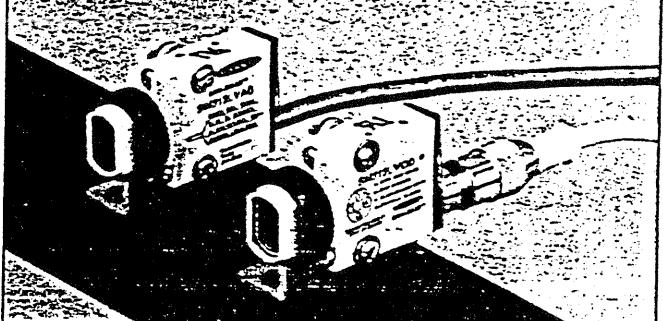
These are small, rugged, self-contained, visible-red retroreflective mode sensors with fast response. Their small effective beam diameter (1/2-inch at 1 foot from the lens) makes them a good choice for sensing relatively small objects, and their visible-red sensing beams make them very easy to align. Typical uses include conveyor applications and situations where sensing is only possible from one side of the process.

Model SM312LVAG has a built-in *anti-glare lens filter* that polarizes the emitted light and filters out unwanted reflections, making it ideal for use in environments unsuitable for conventional retroreflective sensing. NOTE: Because the SM312LVAG's anti-glare design produces somewhat decreased sensing power, it is recommended for use only in relatively clean sensing environments. It should be used *only* with the Banner model BRT-3 reflector.

SM312LV and SM312LVAG sensors consist of a visible-red LED light source, a sensitive phototransistor, an alignment indicator, and a custom-designed state-of-the-art CMOS integrated modulator/demodulator/amplifier circuit. Digital modulation and demodulation make these sensors highly immune to ambient light and electrical "noise".

Alignment and system performance monitoring are greatly simplified by Banner's exclusive "AID™" alignment system (US patent number 4356393) which lights an easily-visible rear panel red LED indicator whenever the sensor sees a "light" condition, and superimposes an LED pulse rate that is proportional to the received light signal strength. The AID™ system indicates optimum sensor alignment and sensitivity setting, and is a valuable aid in installation and alignment.

MINI-BEAM retroreflective mode sensors: SM312LVAG (left) and SM312LVQD with MODC-415 QD cable attached (right).



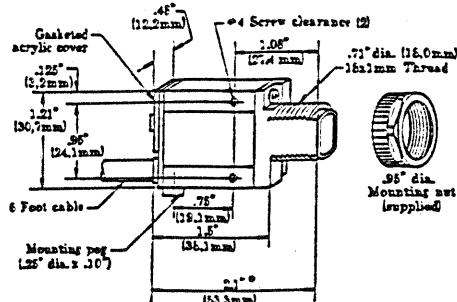
These sensors have dual open-collector transistor outputs: a current sinking NPN output and a current sourcing PNP output, both rated at 150mA (continuous). Low output leakage current and low saturation voltage make these sensors ideal for interfacing to dc loads of up to 150mA, such as small relays and solenoids, as well as to programmable controllers and other solid-state circuitry. The NPN (current sinking) output interfaces directly with Banner CL Series MAXI-AMP™, MICRO-AMP®, "B" Series, and Plug Logic modules to provide a complete control package.

The SM312LV and SM312LVAG operate from 10 to 30V dc at less than 25mA, exclusive of load output current, and are fully protected against false pulse on power-up, inductive load transients, and power supply polarity reversal. Outputs are protected against continuous overload and short-circuit.

A convenient rear-panel control allows a choice of either light- or dark-operate mode. A rugged, clutched, 15-turn slotted brass screw GAIN control potentiometer enables precise adjustment of system sensitivity.

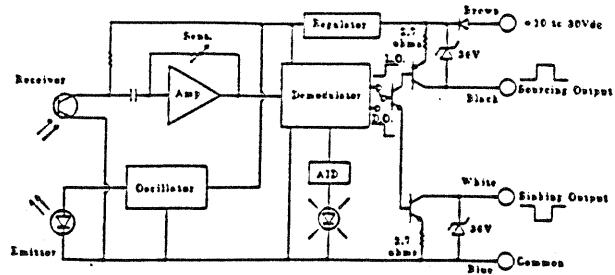
MINI-BEAMs are epoxy-encapsulated and fully-gasketed. Several accessories and modifications are offered (see pages 3 and 4). Quick-disconnect models (specify "QD" in model suffix) are also available.

Dimension Drawing, SM312LV and SM312LVAG*



*"QD" models SM312LVQD and SM312LVAGQD have an integral QD cable connector and require mating QD cable (order separately, see page 3).

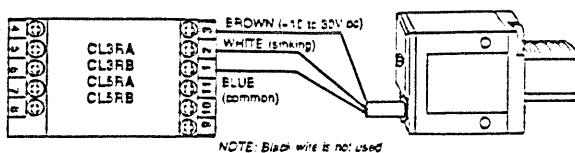
Functional Schematic, SM312LV and SM312LVAG



Hookup Information (continued)

Hookup to MAXI-AMP™ logic

In this diagram, the sinking output of a dc MINI-BEAM sensor is shown connected to the input (terminal #2) of a Banner MAXI-AMP "CL" Series module.

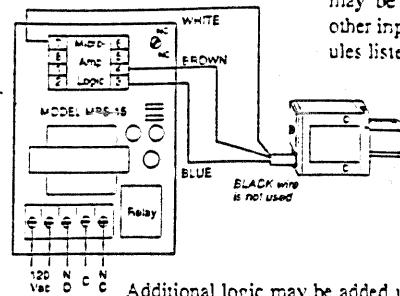


NOTE: Black wire is not used

Hookup to MICRO-AMP® logic (MPS-15 chassis)

The current sinking output (white wire) of the dc MINI-BEAM is shown connected to the primary input (pin 7) of a MICRO-AMP logic module. It

may be connected, instead, to the other inputs. Any of the logic modules listed below may be used.



- MA4-2 One shot
- MA5 On/off delay
- MA4G 4-input "AND"
- MA4L Latch

Additional logic may be added using a model RS-8 socket.

Installation and Alignment

Proper operation of these sensors requires that they be mounted securely and aligned properly. Excessive movement or vibration can result in intermittent or false operation caused by loss of alignment. For best results, final-mount these sensors in an 18-mm hole by their threaded barrel or use the model SMB312S, SMB312B, or SMB312PD mounting bracket (see next page).

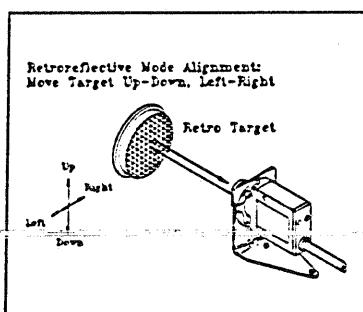
1) Begin with the sensor at the desired distance from the retro target and at the approximate position where it will be mounted. An object at the sensing position should pass through the "core" of the sensor's light beam.

2) Apply power to the sensor, and advance the sensor's 15-turn GAIN control to maximum (clockwise end of rotation). If the sensor is "seeing" the reflected light beam, the alignment LED should be "on". Move the sensor up-down-right-left to obtain the fastest receiver LED pulse rate. (Alternatively, the reflector may be moved.) If a pulse is not observable (too fast to count), reduce the GAIN control (counterclockwise rotation) to obtain a countable pulse rate. (As an aid to alignment, it may be necessary to further reduce the strength of the light signal by tape-masking a portion of the retroreflective target area.)

3) Repeat the alignment motions after each GAIN reduction. When you have found the sensor orientation that produces the fastest pulse rate, mount the sensor (or reflector) solidly in that position. Increase the receiver GAIN to maximum. Test the system by placing the object to be detected into the sensing position. The indicator should go "off". If an "LV" model sensor's indicator does not go "off" at this point, the sensor is reacting to light reflected from the object ("proxing").

If proxing occurs, reduce the GAIN setting until the alignment indicator goes "off", plus two additional full turns. Remove the object from the sensing position and check that the alignment indicator LED comes "on" and pulses at a rate of at least two beats per second. Confirm that the LED goes "off" when the object is replaced.

It will help to mount the sensor so that its light beam is not perpendicular to any flat reflective surfaces on the object (an angle of 10 to 15 degrees is usually sufficient). Also, at distances of a few feet or more, using more than one reflector may increase sensing contrast between object-present and object-absent.



Modifications and Accessories

Upper Covers

A MINI-BEAM upper cover consists of a MINI-BEAM "nose", a lens, and mounting hardware. Depending upon the model of MINI-BEAM in use, they allow sensing mode changes and/or range changes in the field.

The SM312LV uses upper cover model UC-300L, and can be converted to an SM312LVAG by substituting upper cover model UC-300AG. The SM312LVAG uses upper cover model UC-300AG, and can be converted to an SM312LV by substituting upper cover model UC-300L.



High-speed Modification: SM312LVMHS and SM312LVAGMHS DC MINI-BEAM sensors with normal response speed of 1 millisecond may be modified for faster response. Modification "MHS" offers 300 microsecond (0.3 millisecond) response time. This modification is often used when very small targets must be sensed. Note: the high speed modification reduces excess gain to approximately 1/2 of the values shown on the gain curves (page 1).

Cable Length Modification: 30-foot cable

MINI-BEAMs may be supplied with cables longer than the standard 6-foot length. The most readily available cable length is 30 feet. Lengths longer than 30 feet may also be quoted.

Quick-disconnect Cable: 15-foot SO-type 4-wire cables with straight or right-angled QD connector are available for use with dc-powered QD MINI-BEAM sensor models SM312LVQD and SM312LVAGQD. Model MQDC-415 has a straight connector; model MQDC-415RA has a right-angled connector. See the Banner product catalog or data sheet P/N 03519.

Extension Cable (without connectors): Order EC312-100 for a 100-foot length of 4-wire sensor extension cable (brown, blue, black, white).

9 NOTES

9 NOTES

10 WARRANTY AND SERVICE

WARRANTY

Warranty: Kirk-Rudy warrants to the original retail purchaser that this product is free from defects in the material and workmanship, and agrees to repair or replace, at Kirk-Rudy's option, any defective product within 90 days from the date of purchase. This warranty is not transferable. It covers damage resulting from defects in material or workmanship, and it does not cover conditions or malfunctions resulting from normal wear, neglect, abuse or accident. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE.

Limitation of Remedies: If product is proven to be defective within the warranty period stated above, THE EXCLUSIVE REMEDY, AT KIRK_RUDY'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE PRODUCT, provided that the defective product is, at Kirk-Rudy's choice, returned immediately to Kirk-Rudy or authorized service representative designated by Kirk-Rudy, or made available at user's premises in a location suitable for servicing.

Limitation of Liability: Kirk-Rudy shall not otherwise be liable for any losses or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal or equitable theory asserted, including contract, negligence, warranty, or strict liability.

To obtain replacement parts and service, contact an Authorized Kirk-Rudy Dealer. Use Kirk-Rudy part numbers when ordering.

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Kirk-Rudy, Inc.
125 Lorraine Parkway
Woodstock, GA 30188
www.kirkrudy.com