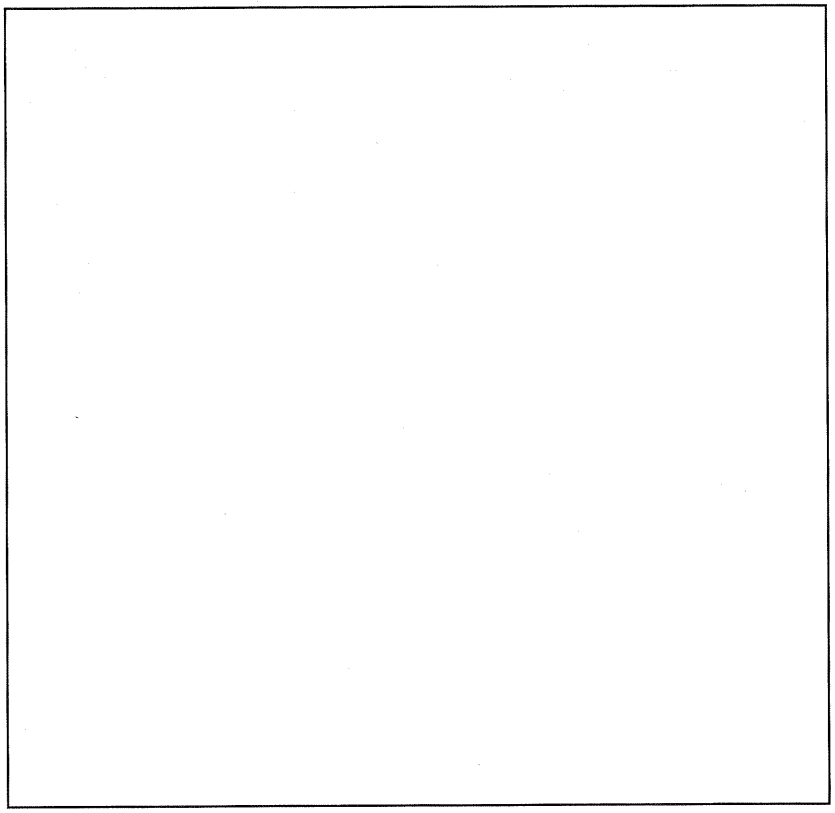
Kirk-Rudy, Inc.

Instruction and Parts Manual KR600 Inserter

Manual



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.

10000-KR600 REV. 1 6/30/03

TABLE OF CONTENTS

1 Important Safety Instructions

Intended Use Statement: The KR600 Inserter is designed to insert (X) number of product inserts (based on the number of insert stations) into a folded open jacket. The jacket is feed out and opened for insertion. The jacket remains open as each product insert is inserted. The jacket with the inserts can be labeled, tip-on, diverted, stacked or shingled. All inserts must be tested and approved for insertion by Kirk-Rudy, Inc.

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

PRODUCT SIZE JACKET	English	Metric
Minimum Size:	6" W x 6" L	152mm W x 152mm L
Maximum Size:	14" W x 17" L	356mm W x 432mm L
Minimum Thickness:	20 lb	
Maximum Thickness:	XX"	XX.Xmm

PRODUCT SIZE INSERT	English	Metric
Minimum Size:	3" W x 5" L	
Maximum Size:	14" W x 17" L	
Minimum Thickness:	20 lb	
Maximum Thickness:		

MACHINE SPECIFICATIONS

MODEL	DESCR.	HP / VOLTAGE/PH/AMP	SEE NOTE	LxWxH	ACFM	MODULE CONFIG	W
600-1	1 Station	2HP, 230V, 1/3PH, 40/20A	1	14'3"x54"x55"	32	10	
600-2	2 Station	2HP, 230V, 1/3PH, 40/20A	1	17'x54"x55"	40	11	
600-3	3 Station	2HP, 230V, 1/3PH, 40/20A	2	19'9"x54"x55"	48	111	
600-4	4 Station	3HP, 230V, 3PH, 40A	2	22'5"x54"x55"	56	121	
600-5	5 Station	3HP, 230V, 3PH, 40A	2	25'7"x54"x55"	64	131	
600-6	6 Station	3HP, 230V, 3PH, 40A	2	28'x54"x55"	72	141	
600-7	7 Station	5HP, 230V, 3PH, 20A	3	30'9"x54"x55"	80	1321	
600-8	8 Station	5HP, 230V, 3PH, 20A	3	33'6"x54"x55"	88	1421	
600-9	9 Station	5HP, 230V, 3PH, 20A	3	35'10"x54"x55"	96	1431	
600-10	10 Station	5HP, 230V, 3PH, 20A	3	39'5"x54"x55"	104	1441	
600-12	12 Station	5HP, 230V, 3PH, 20A	3	44'11"x54"x55"	120	14421	
600-14	14 Station	10HP, 230V, 3PH, 30A	3	50'4"x54"x55"	136	14441	
600-16	16 Station	10HP, 230V, 3PH, 30A	3	55'9"x54"x55"	152	144421	
QSVB7.5	Rotary	7.5HP, 230V, 3PH, 21A 7.5HP, 460V, 3PH, 10A		65"x34"x46"	155		960 lbs

NOTES:

1. MACHINES ARE EQUIPPED WITH INDIVIDUAL VACUUM PUMPS
2. MACHINES ARE EQUIPPED WITH ONE OR TWO LARGE CAPACITY VACUUM PUMPS.
3. MACHINES REQUIRE CUSTOMER SUPPLIED CENTRAL VACUUM OR KIRK-RUDY

3 INSTALLATION

WARNING

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

3.10 Uncrating

A. Position crates so they are close to the site of installation.
B. Remove top and sides from crates.
C. Locate the accessories box which is attached to the skid (crate bottom section). Remove packing list and verify that all components are present or on back order status.
D. Remove straps and blocks that secure machinery.
E. Use a forklift to lift machine from its skid. Be sure to position forks under the main frame in a centrally located position. Use extreme caution so as not to damage fixtures on the machine.
F. The crating material is your property and may be disposed of as you see fit.
G. The machine is on casters and may now be moved into position.

3.20 Initial Set-Up

A. After placing machine into position, elevate the machine by use of the legs supplied.
B. Make sure that the machine is leveled.
c. Place the conveyor in position. Please note that the conveyor may be used in either a right or left side delivery set-up. Note: A straightaway delivery system is optional. This system allows material to be shingled on the conveyor when it is directly aligned with the inserting unit. Elevate and level the conveyor after placing it in position with the supplied legs and pads.

4 OPERATING INSTRUCTIONS

WARNING

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

4.10 General Features

KR600 Inserter Features:

Controlled by a distributed modular Programmable Logic Controller.
Programmable Logic Controller memory is maintained at power off.
Inserter control and set-up simplified by a Touch Screen.
If a feed error occurs, all subsequent feeders are selectively disabled.
Divert gate rejects select bad packages.
Hardware settings independent of product size.
Feeder stations have light towers and lamps indicating feeder status.
Large light tower to indicate stopped time.
Electronic vacuum shutdown.
Production counts displayed.

Quick Set Up:

1. Review safety warnings.
2. Turn on the circuit breaker.
3. Turn operator's console power on.
4. Configure station use.
5. Verify that the two jacket not open beamswitches are operating.
6. Turn on vacuum.
7. Run product.

4.11 Operator's Console:

KR600 Power: Push the green power button to turn power on (button will illuminate). Press the red power button to power off. Release the red power off button.

Stop/Jog/Run: Press the latching stop button to stop the KR600 and divert motors. Press the jog button to jog the KR600 and divert motors. Machine stops when jog is released. There is both a jog button as well as a jog plug for remote jogging. Press and release the run button to run the KR600 and divert motors.

Speed Dials, Left to Right, 0 is minimum, 10 is maximum: KR600 is leftmost, conveyor is center, conveyor speed up is right.

Stop Circuit Status: In addition to the above information, lights are present on the operator's console that displays the stop circuit status. A light illuminates for a given stop.

Rate/Count Indicator: Displays cycles/hour. Also displays number of bundles. To determine rate, a proximity switch is used. This proximity switch and a six magnet wheel are located to the right of the operator's console behind a small access panel.

Jacket Feed: Turning the switch to the left causes jackets to stop feeding. Turning the switch to the right causes jackets to start feeding. Note that there are multiple jacket feed switches. Jackets will feed when at least one switch is enabled and other feed switches will then be disabled.

4.13 Programmable Logic Controller:

A Programmable Logic Controller (PLC) controls the inserter. This unit monitors devices such as beamswitches and double detects and controls outputs based on these inputs. This unit does not require any maintenance. Modifications to the inputs, outputs or program should not be attempted without first consulting Kirk-Rudy.

4.14 Touch Screen:

The touch screen is connected to the PLC. It displays messages sent from the PLC and the touch screen accepts values such as station use and missfeed count and returns these values to the PLC. The touch screen user interface is pedestal mounted above the operator's console and allows the user to configure and access information in the inserter. The information displayed on the touch screen is:

- Product count
- Error information
- Configuration information

Touch Screen Terminology:

This screen has three types inputs: screen change, off/on data, and numerical data.

Screen Change: At power up, the Main Menu screen is displayed. This is the top menu and all other screens are accessed from here. On any other screen there are buttons to go back to the main screen.

Off/On Data: Configuration information (such as station use) is given as off/on data. *If input is off, the button is white. If input is on, the button is blue.*

Numerical Data: Configuration information (such as cam values) is given as numerical data.

When entering numerical data, the user controls where the data is entered, and the values of the data. On any data entry screen, a box encloses the current data item. On some screens, there is a single data item. On other screens, there may be multiple columns and multiple rows. The following six buttons are located on the keypad and control data entry.
The first four control the data entry box position:

Up: Up one position
Dn: Down one position
Lt: Left one position
Rt: Right one position

The remaining two buttons control data acceptance:

Clear: Clears the current data entry
Enter: Accepts the current data. **If the Enter key is not pressed, the new data will not be accepted.**

4.15 Inserter Configuration:

Configuring the inserter will be necessary, and this configuration is maintained when the inserter is turned off.

4.16 Touch Screen Structure: Main Menu

All other screens are accessed from the Main Menu screen. The following items are on the Main Screen:

Position Display: An encoder is mounted to the right of the operator's console, and rotates once per machine cycle (lug to lug distance). This encoder has 60 pulses per revolution, and the possible positions are then 0 to 59.

Product Counter: This counter is composed of two four digit groups. The right group counts from 0000 to 9999, and then increments the left four digits on the next product. This counter can be reset from the Set Up screen.

Lamps: The circular indicators are called lamps and indicate inserter status. When the lamp turns blue it is on, indicating that the display is active. The following is a description of each lamp.

NC: Non-Clutch Stop: A stop button, rail switch, etc. is open, causing the stop circuit to be open. Any stop that is not a clutch stop is a non-clutch stop.

C: Clutch Stop: A clutch stop is open, either on a feeder station or the main line clutch. These clutches open the stop circuit when a mechanical overload (jam) occurs.

MF: Missfeed: A missfeed occurs when a feeder is not feeding properly. To determine where the missfeed occurred, press the *Errors* button to display error information, or the station that had the missfeed will have it's yellow light flashing.

Ol: Oiler: When the oil level is low, this lamp will turn on. Refill the oiler before running the inserter.

CF: Crossfeed: There are two CF lamps. The left one latches when a crossfeed occurs. This is useful because frequently the crossfeed beamswitch is blocked, only to have the material fall away and clear the beamswitch. The right CF lamp indicates the current status of the crossfeed beamswitch.

Jog: This lamp turns on in jog mode.

Run: This lamp turns on in run mode.

Push Buttons:

Set Up: Go to the Set Up screen, which allows the user to set the inserter configuration.

Shift Reg: Go to the Shift Register screen, which displays the feeder station shift register, as well as the shift register from station 16 to the divert gate.

Run Time: Go to the Run Time screen, which displays inserter run time.

Clutch Bypass: When a clutch kicks out, pressing this button will jog the inserter until the clutch drops back in, or until the user releases this button. Pressing a stop button will override clutch bypass, stopping the inserter.

Errors: Go to the Errors screen. Jacket not open, missfeed, crossfeed, and divert are displayed here.

4.17 Set Up Screen:

Station Use/Priority: Go to the Station Use/Priority screen, which allows the user to set station configuration. On the Station Use/Priority screen, press the *Use* button to enable feed from a station. If desired, press *Priority* to enable priority feed checking (disables all feeders after a priority missfeed and diverts the jacket).

Oiler: Go to the Oiler screen, which allows the user to set oiler configuration. On the Oiler screen, the user enters the amount of time to run before oiling, and then the amount of oil time. In the upper right corner, the run/oil time current values are given. If desired, the oiler may be set to always on. An indicator lamp is on when the oiler output is on.

Cross Enable: Enable the crossfeed beamswitch when the button is blue, and disable when the button is white.

Conveyor: The conveyor can be set to off all the time (Off button blue), on all the time (On button blue), or on only when the KR600 is running (Auto button blue).

Error/Jacket: Go to the Error/Jacket screen, which allows the user to set missfeed count, jacket not open detect, and number of cycles to the divert gate.

Miss Cams: Go to the Missfeed Cams screen, which allows the user to set the missfeed cams.

4.18 Shift Register:

The shift register monitors missfeeds and moves that data down the shift register as the material advances. The shifting of data uses a rotary encoder. This encoder is mounted next to the rate display proximity switch, and rotates once per machine cycle (lug to lug distance). This encoder has 60 pulses per revolution, and the possible positions are then 0 to 59. Data is shifted on the cam front edge (first number), and missfeed is performed on the cam back edge (second number).

4.19 Setting Missfeed Cams:

Jog the jacket until it is one inch before the upstream beamswitch. This is the cam start position. The cam end position is 15 more than this value. For example, a cam starting at 10 would finish at 25 (10+15=25). If a cam started at 55, then it's end value would be 70, which is not a valid position. The correct end value would be 55 + 15 - 60 = 10. *When a cam goes from a high to a lower value, this called wrap-around.* To enter this cam, go to the Shift Cams screen and move to the given cam number (using up/down/left/right and page advance). Then enter the cam start and stop values.

In addition, a PLC cam sets the *divert gate open/close* position. When the divert gate opens and closes properly, the jacket to be diverted does so without catching the beginning or end of the jacket, or jackets before or after. To set this cam, jog the jacket until it is one inch before the divert gate. This is the cam start position. The cam end

value is set as early as possible, but not so early as to catch the back edge of the diverted jacket. Note that this cam setting is speed sensitive.

The divert cam cannot "wrap-around" like the feeder station cams. If there is no wrap-around, enter the start and end values and verify that the Invert button is off (white). If there is wrap-around, enter the lower number first and the higher number second. Then press the Invert button so that it is blue. This will cause the cam to invert and perform the wrap-around properly.

The factory setting on the missfeed cams is:

Cam #	Value	Location
1	13/28	Station 1
2	52/07	Station 2
3	26/41	Station 3
4	00/15	Station 4
5	34/49	Station 5
6	07/22	Station 6
7	41/56	Station 7
8	16/31	Station 8
9	50/05	Station 9
10	25/40	Station 10
11	58/13	Station 11
12	33/48	Station 12
13	09/24	Station 13
14	43/58	Station 14
15	17/32	Station 15
16	50/05	Station 16

Divert 09/57 Divert, Invert is off

4.20 Vacuum Blower:

The blower is used to hold down the jacket at the opener wheel. Blue button is on, white button is off.

4.21 Fans:

Material on KR600 conveyor may be held more firmly by activating the fans inside the inserter. Blue button is on, white button is off.

4.22 Feeder Set Up:

Feeder Station Proximity Switch:

Each feeder has a proximity switch which sets the clutch disengage position. To set the clutch proximity switch, jog until the feeder table is on the back stroke and 1/4" from the

backmost position. Then adjust the magnet wheel so that it's magnet is under the proximity switch.

Feeder Station Beamswitches:

Each feeder has an upstream beamswitch which triggers feeding and a missfeed detect beamswitch. These devices do not require any maintenance, but each reflector should be blown off periodically avoid paper dust build up.

Indicator Lights:

Each station has four indicator lights. The red light indicates that a hardware stop (button, clutch or rail switch) has occurred. The yellow light indicates that a missfeed has occurred. If the yellow flashes, then the maximum number of missfeeds has occurred on a station, and the inserter is stopped. The green light indicates that the feeder is enabled, and the blue light indicates that priority mode in on for that feeder.

4.23 Other Machine Functions:

Lamp Test: On power up, the stop lamps are turned on for several seconds to allow the user to verify proper operation.

Jacket Not Open Detect: For the jacket not open detect to operate, the upper beamswitch must be approximately one inch downstream from the lower beamswitch. For material to be inserted into the jacket, it must open. To determine if this occurs, station 1 upstream beamswitch monitors jacket top open and another beamswitch monitors jacket bottom open. The jacket is first seen on the lower beamswitch because it is further upstream. If the lower beamswitch is covered when the upper beamswitch covers, then the jacket has successfully opened.

Light Tower:

The green turns on when the KR600 is in run mode. When the KR600 stops, a timer begins monitoring the stop time. For *15 to 30* seconds, the yellow light turns on. For *30 to 45* seconds, the red light turns on.

Crossfeed/Divert Gate Error Lamp:

A horizontal beamswitch monitors the divert gate for jams. When a jam occurs, an error light will come on and the KR600 will stop. This same error light will flash when the divert gate is open.

Divert Gate:

To open or close, the divert gate will respond to the *divert beamswitch*, the *shift register* and the *divert cam*. The divert gate will open on the cam front edge when the shift register bit is set, and the beamswitch is not covered. The divert gate will close on the cam back edge when the next shift register bit is not set, and the beamswitch is not covered.

Divert changed, beamswitch not covered:

- Close to Open: Gate opens
- Open to Close: Gate closed

Divert changed, beamswitch covered:

- Close to Open: Gate remains closed, bad packages are kept
- Open to Close: Gate remains open, good packages are diverted

When maximum numbers of errors occur (which is set through the missfeed screen), then the inserter will stop and an error will be given.

Red Lion Counter Set-Up:

The Red-Lion counter counts up. Press R to reset the count to zero.

Conveyor Speed Up:

A gap on the conveyor can be created after a number of pieces by using the Predetermined Counter (PDC). Enter the number of pieces to feed onto the conveyor before doing the conveyor speed up. The Predetermined Counter (PDC) counts the pieces and increases conveyor speed for a set amount of time. For information on data entry, refer to the Red Lion PDC booklet in this manual.

4.30 Mechanical Set-up Operations

4.31 Inserter Base

It is essential when changing set-ups that some sequence be followed in accomplishing this. Both speed and accuracy will be served by following this outline.

4.32 Alternate feeder positions.

A. Measure the jacket to determine dimensions. This is important because it determines the position of each of the feeders.
B. With the jacket oriented as it would run, the measurement across the width of the table is important. The feeders have two positions. One is for smaller items. In this configuration the feeder is moved forward on its mounting frame and remounted. For larger pieces, the feeder is positioned in its rearmost position. Typically, the width measurement across the table for the forward feeder position is limited to a maximum of 9 inches. Any measurement beyond this up to 12 inches will require placement of both feeders in the rearmost positions.

4.33 Adjustment of tabletop side rails.

A. After assuring that the feeders are positioned properly, the side rails may be positioned.
B. Place the side rails about the jacket so that approximately ¼" of clearance is available between each edge and the side rail. Be sure that the material will clear any part of the feeders so it will drop freely in the track.

C. Position the side rails over the entire length of the machine in this manner.

4.34 Adjustment of the jacket cover support

A. The cover supports may be adjusted for height and angle of tilt.
B. Ensure that the jacket cover will always pass between the photocell and light source.
C. Try to get maximum clearance between the underside of the cover support and the outfeed end of the feeder belts.
D. Support the cover to such a height that will allow it to be opened to its greatest degree.

4.35 Set-up and adjustment of the vacuum-operated opening wheel.

A. Time the jacket into the track on the tabletop. Move the jacket toward the opening wheel.
B. Use the handwheel of jog functions to move the leading edge of the jacket just past the center of the opening wheel.
C. Release the cap screw that secures the opening wheel to its shaft. Place one of the suction arms in a position just behind the leading edge of the jacket. Secure the opening wheel by tightening the cap screw that was loosened earlier.
D. On either side of the supports for the opening wheel, a knob is located at either side at the bottom of the support. By rotation of the knob, it is possible to raise and lower the opening wheel. This is done so that the suction cup may be positioned close to the surface of the jacket. The cup should not actually contact but be within 1/32th of an inch.
E. After completing the above operations, the vacuum pump supplying the opening wheel should be turned on. The disk vacuum valve is located beside the opening wheel. It has an anti-rotation arm attached to it by two screws. By loosening the screws, the vacuum disk may be rotated on the shaft. The rotation of the disk determines where in the movement of the opening wheel that the vacuum will turn on and off. To find the correct positions for the vacuum valve, rotated the disk in the direction of rotation until the vacuum has turned off on the bottom suction cup over the jacket. Rotate the disk opposite to the direction of rotation until the vacuum turns on at the bottom suction cup over the jacket. Tighten the anti-rotation arm into position.

4.36 Adjustment of the discharge rollers

A. The discharge rollers are used to pull the material away from the lugs on the track and expel it onto the conveyor. In order to adjust these rollers, let us first locate them on the outfeed end of the tabletop.
B. Position a piece of material between the side rails and underneath the discharge rollers.
C. Laterally position the rollers so they are equally spaced.
D. Apply enough down pressure with the roller to assure control of material.

Note: Be sure not to use excessive pressure that causes tracks or marks on the material.

4.37 Set-up of the conveyor

A. Select and place conveyor belts in desired positions.
B. Position knockdown fingers and the conveyor side plate to allow proper shingling of material onto the conveyor.
C. Check to see that both plugs from the conveyor are snugly inserted into the proper receptacles.

4.40 FEEDER

4.41 Feed Roller and belt Adjustment

A. In order to adjust the feed belts, apiece of the particular jacket or insert should be placed between the feeder belts.
B. The top belt should then be lowered to grip the material. This is accomplished by using the knob directly above each belt.
C. The portion of the upper feeder belts above the lower feed rollers may also be adjusted. This is done by turning the feeder with the handwheel on the side to bring the lower feed rollers into the "up" position. A piece of the particular material is placed between the upper belt and lower roller. The knurled knobs located on the top of the bridge are rotated to apply a light grip to the material underneath.

4.42 Adjustment of the gate

A. Advance the shuttle feeder to its full forward positions.
B. Place two pieces of the selected material between the gate and vacuum plate. Lower the gate upon material.
C. As the gate is lowered the material is compressed, slide the top piece of material back and forth. When it becomes difficult to move, the gate has been adjusted. Use the small black knob below the one used for adjustments to lock this gate setting. It can
D. be adjusted further when operations begin.

4.43 Adjustment of the hopper

A. Place the selected material onto the shuttle feeder. Check to make sure that the material is centered so the drive rollers and belts will pull evenly.
B. Slide the left and right side hopper plates to within 1/8" of the material, tighten the knob on each to lock in this position.
C. Move the rear plate and jogger table to within 1/8" of the material. Use the large knob on the left to lock the table and rear hopper guide in the desired postion..

4.50 Timing

4.51 Feeder to Inserter Base Timing

A. Turn light rheostats to the position of lowest intensity. The light rheostats are found within the electrical boxes. On this machine both rheostats are located within the box under the insert feeder.
B. Check to see that each feeder is disengaged. This can be done by locating the large black knob under the handwheel on the left side of each feeder. By pushing the knob in and rotating clockwise, the feeder will be disengaged. To engage, simply rotate the knob counter-clockwise, and pull out. To ensure that the gears mesh, wiggle the handwheel slightly.
C. After having set-up the feeder as described in section 3.20, load the hopper and turn the vacuum pump on for that feeder.
D. Use the handwheel to move a piece of material out through the feeder. Stop before it leaves the belts.
E. Use the jog button or handwheel on the inserter to position the track and lugs.
F. Advance the track until the front of a lug is aligned with the left edge of material in the feeder belts.
G. Use the handwheel on the feeder to move the material out of the belts and onto track. The material should be just ahead of the lug.
H. Rotate the knob counter-clockwise to engage the drive gears.
I. Repeat the above sequence for each feeder.

4.52 Opener Wheel Timing

A. Check to make sure that the height of the opener is adjusted correctly.
B. Place a jacket in the track. Use the jog button to move it under the opener wheel.
C. Move the jacket so that the leading edge is just past center of the wheel.
D. Loosen the screw that locks the opening wheel in position.
E. Rotate the wheel until one of the suction cups is hanging vertically just behing the jacket leading edge. Tighten the wheel in this position.
F. Turn the vacuum for the opener on.
G. Cycle the machine to be sure the opener is working correctly.

4.53 Missing jacket detector timing

If a jacket fails to feed out on the track or fails to open, the feeder is automatically disengaged. This prevents an insert from being fed when there is no jacket present.

A. Located the photocell/light source assembly on the first section of the cover support.
B. Identify the rheostat that controls the light intensity for that assembly. Set it at maximum intensity.
C. Look under the inserter and locate 3 microswitches and the associated actuation cams.
D. Find the switch that actuates the solenoid on the insert feeder.
E. Turn the light intensity to its lowest positions.
F. Cycle the machine several times to be sure that the throwout has engaged.
G. Advance a jacket cover past the photocell/light source approximately 1/3 of its length.

H. Set the cam under the microswitch (see step D) so that the point is actuating the microswitch.
I. Prior to normal operation be sure to return light intensity to maximum.

4.54 Missing Insert detector timing

If an insert fails to feed, a red light on top of the feeder is activated. It serves no other function than to indicate a misfeed. Typically, an insert would be manually placed in the jacket. This may be done on the conveyor as the material is removed. If necessary to stop the machine, the insert may be installed on the track.

A. Locate the photocell/light source assembly between the feed belts and rollers on the feeder.
B. Identify the rheostat that controls the light intensity for that assembly. Set it at maximum intensity.
C. Look under the inserter and located 3 microswitches and the associated activation cams.
D. Find the switch that causes the missed insert light to illuminate.
E. Turn the light intensity to its lowest positions.
F. Loosen that cam that would activate this switch.
G. Feed a piece of material out of the hopper so that ½ of its length blocks the photocell/light source assembly.
H. Set the cam under that microswitch so as to activate it.
I. Cycle the machine to check for proper operation.

5 MAINTENANCE

5.1 LUBRICATION

WARNING

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

The operator should keep the KR600 base clean and lubricated on a daily basis. The base has
An electric automatic central oiling system that is located on the side of the control panel. This unit operates when the machine runs.
The oil recommended is a 20 weight SAE machine oil.

The only other requirement for lubrication is a grease fitting located on the head drive pillow block bearings. This fitting should be routinely greased every month or so, depending on the usage of the equipment.

Daily Functions of Key Operator Labeling Base		
Item	Function	Remarks
Upper & Lower Feed Rollers	Remove glazing and all other foreign materials from feed surfaces.	Use alcohol.
Base (General)	Remove excessive paper dust, ink, glue and all other foreign materials from the table top and inside of base.	Use clean soft rag.
Photocell & Light	Remove excessive paper dust, ink, glue and all other foreign materials .	Use clean soft rag.
Vacuum Pump Filters	Remove paper dust.	Rap edge of filter against a hard surface or vacuum. If unable to clean, replace with new filter.
Vacuum Pump Filter Jars	Clean jars thoroughly.	Use warm water and dry thoroughly. **CAUTION:** Improper replacement or cracked rims of jars can result in a loss of vacuum. Insure jar is installed correctly and has a proper seal.

6 PARTS LISTS AND DIAGRAMS

6.1 PARTS LIST

6.2 DIAGRAMS

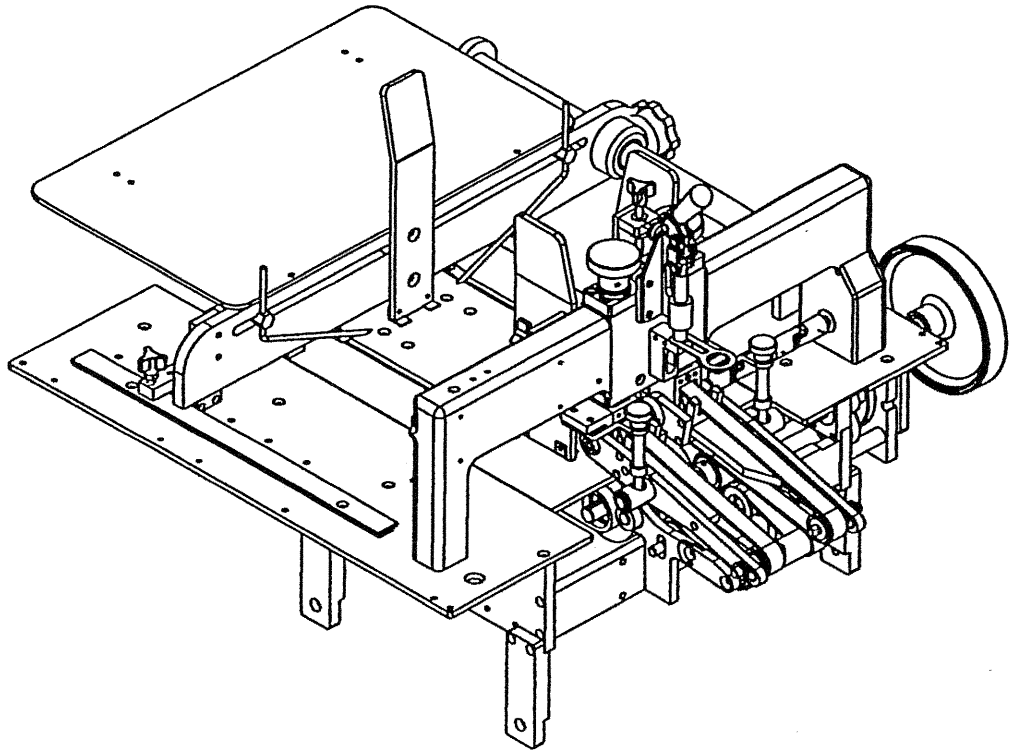
KR512 INFEED SECTION

ASSEMBLY NUMBER	DESCRIPTION
536669-01	ASSY, KR 512 INFEED SECTION
534734-01	ASSY, 324-1 FEEDER (SEE KR324-1 MANUAL)
536416-01	ASSY, OPENING WHEEL DRIVE
533313-02	ASSY, CROSS BAR OPENER
536417-01	ASSY, OPENING WHEEL DRIVE LH
536418-01	ASSY, WORM GEARBOX RH
536419-01	ASSY, OPENING WHEEL DRIVE LH
500754A	ASSY, COUPLING
500757A	ASSY, TIMING PULLEY
505535-1A	ASSY, QUICK DISCONNECT
536420-01	ASSY, WORM GEARBOX LH
536421-01	ASSY, HEAD ADJ. BRACKET LH
536422-01	ASSY, OPENING WHEEL
533405-03	ASSY, VACUUM TRANSFER BAR
SP31216	ASSY, VACUUM WHEEL GUARD
536653-01	ASSY, INFEED SECTION
533749-01	ASSY GEAR BOX RH
535201-02	ASSY, SIDE GUIDES
535818-01	ASSY, GEARBOX REVERSING
535819-01	ASSY, VACUUM SHAFT DRIVE
536651-01	ASSY HOLD DOWN BRUSH
536652-01	ASSY, CHANNEL FRAMES INFD
535446-01	ASSY, FRAME SPACER
535447-01	ASSY, FRAME SPACER
536654-01	ASSY, FRAME SPACER
536655-01	ASSY, OPENING PLOW
536656-01	ASSY, TAKE UP
536657-01	ASSY, KNOCK DOWN
536658-01	ASSY, ROLLER INFEED
536659-01	ASSY, JACKET GUIDE
536662-01	ASSY, PHOTOSENSOR MOUNT
536663-01	ASSY, TAKE UP
536664-01	ASSY, GEARBOX
536703-01	ASSY, MICROSWITCH
536705-01	ASSY, TAKE UP
536707-01	ASSY, VACUUM VALVE
536727-01	ASSY, ELECTRICAL BUTTON BOX
536666-01	ASSY, INFEED CABINET
531168-01	ASSY, 1/2 HP VACUUM PUMP
536706-01	ASSY, VACUUM VALVE

DRAWING #

534734

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	324-1
REQ'D	WHERE USED

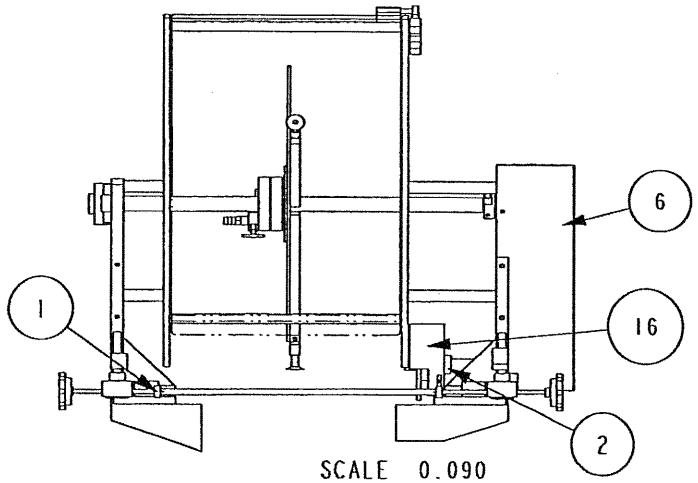
DRAWN BY: TJG	SCALE 0.156	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION		KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 08-Nov-99			MODEL: 324-1	TITLE: ASSY, 324-1 FEEDER	
TRACED BY:	MASTER M			SHEET NO.: 2OF2	DRAWING # 534734-01	

DRAWING #

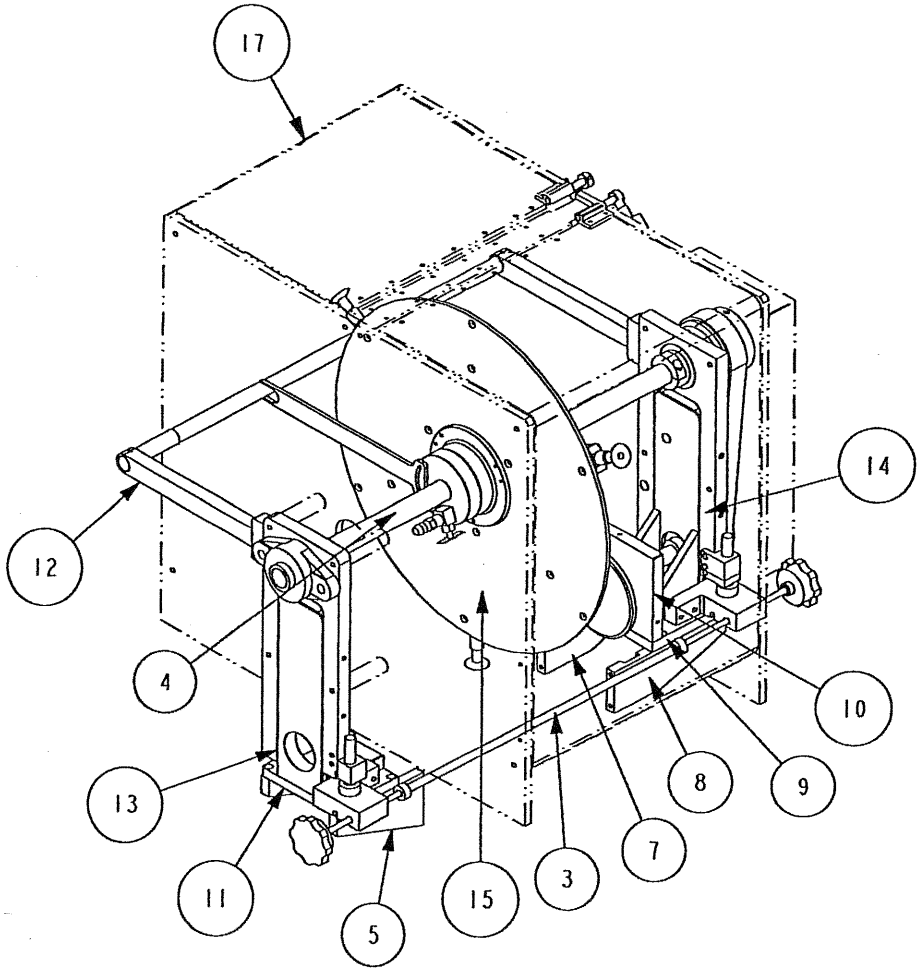
536416-01

ITEM	QTY	PART #	DESCRIPTION
1	2	102200	COLLAR .375
2	1	103805	BEARING - HUB
3	1	500778	SHAFT-WORM GEAR ADJ.
4	1	508549	SHAFT, VACUUM WHEEL
5	2	508793	GUSSET, LH
6	1	500707-1	WLDMNT, BELT GUARD HOUSING
7	1	508794-L	GUSSET, LH
8	1	508794-R	GUSSET, RH
9	1	508795-1	PLATE - BASE
10	1	508797-1	BLOCK - BEARING
11	1	508833-1	PLATE - BASE
12	1	533313-02	ASSY, CROSS BAR OPENER
13	1	536417-01	ASSY, OPENING WHEEL DRIVE LH
14	1	536419-01	ASSY, OPENING WHEEL DRIVE LH
15	1	536422-01	ASSY, OPENING WHEEL
16	1	SP6328	COVER
17	1	SP31216	ASSY, VACUUM WHEEL GUARD

REV NO	DATE	DESCRIPTION	ECN NO	BY



SCALE 0.090



NOTE: SOME GUARDS ARE PHANTOMED FOR CLARITY.

REQ'D	WHERE USED
1	536669-01

DRAWN BY: MY	SCALE 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	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 25-May-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OPENING WHEEL DRIVE
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF2	DRAWING # 536416-01

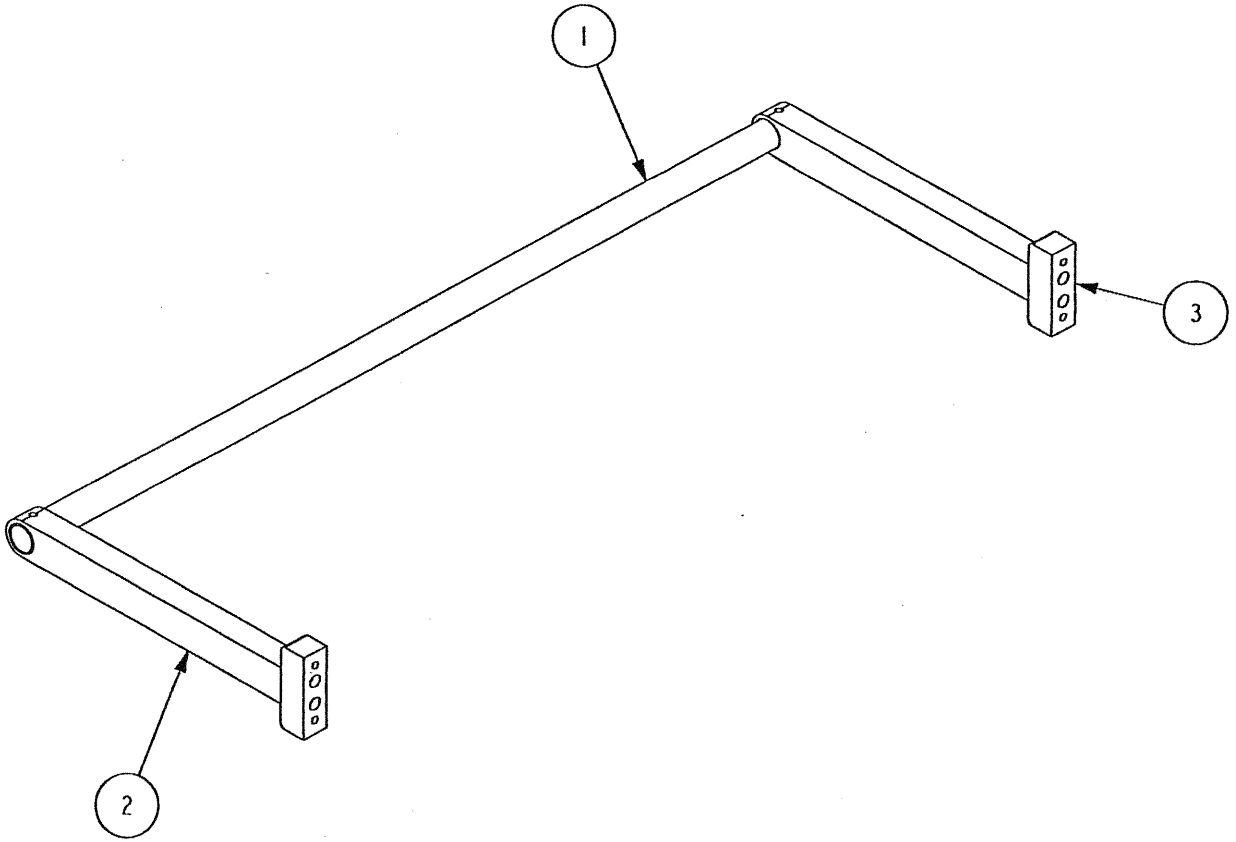
KIRK - RUDY, INC.
KENNESAW, GEORGIA

DRAWING #

53331 2

ITEM	QTY	PART #	DESCRIPTION
1	1	508641	SHAFT
2	2	508730	ARM, SHAFT MTG
3	2	508731	BRACKET, SHAFT MTG

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	535508-01
REQ'D	WHERE USED

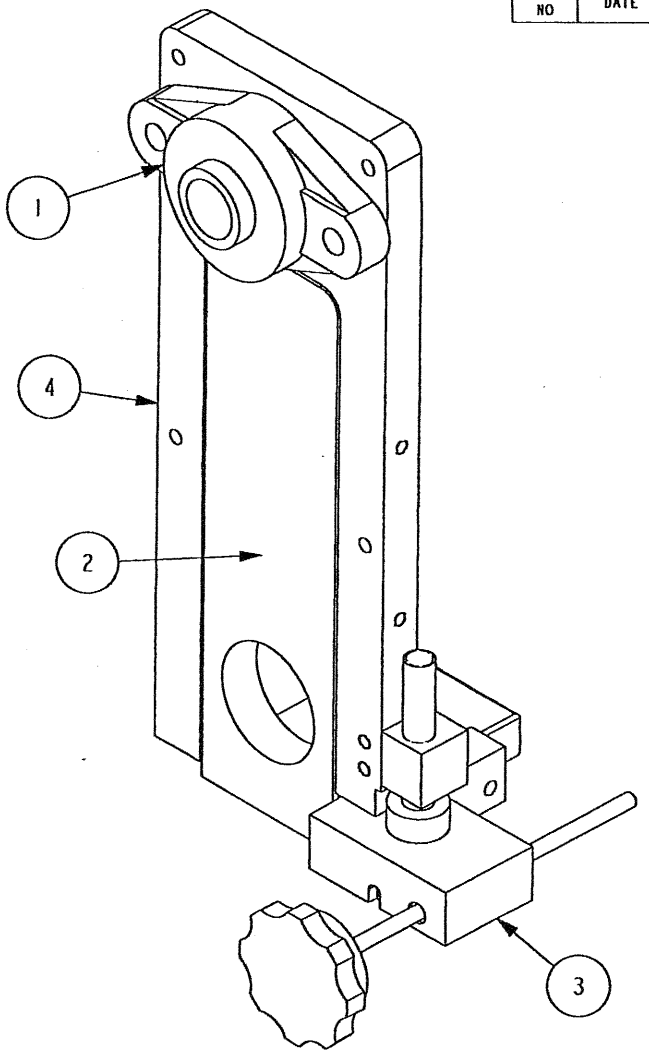
DRAWN BY: TJG	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: XXX	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 8-Feb-99		HEAT TREAT: XXX	MODEL: 512	TITLE: ASSY, CROSS BAR OPENER	
TRACED BY:	MASTER M		FINISH: XXX	SHEET NO.: 1OF1	DRAWING # 533313-02	

DRAWING #

536417-01

ITEM	QTY	PART #	DESCRIPTION
1	1	103610	FLANGE BEARING, 1.000 2-BOLT
2	1	532340-01	BRACKET, HEAD SUPPORT R/H
3	1	536418-01	ASSY, WORM GEARBOX RH
4	1	SP31203	BRACKET, HEAD ADJ. RH

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536416-01

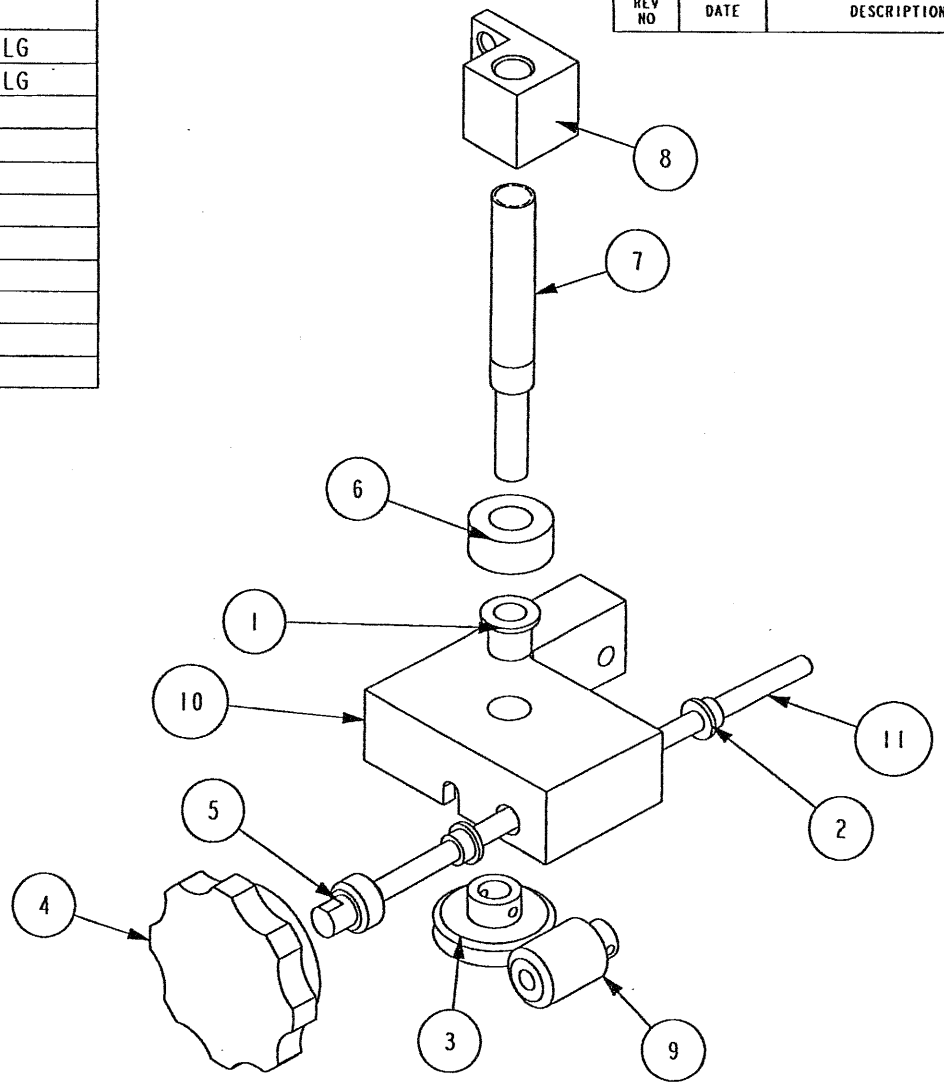
DRAWN BY: MY	SCALE 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-May-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OPENING WHEEL DRIVE LH	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1 OF 1	DRAWING # 536417-01	

DRAWING #

5364. 01

ITEM	QTY	PART #	DESCRIPTION
1	1	100306	BUSHING, FL.375ID.500OD.500LG
2	2	100309	BUSHING, FL.250ID.375OD.250LG
3	1	100900	GEAR, WORM 1620 0.375
4	1	102112	KNOB, PURCHASED
5	1	102115	ADAPTOR, KNOB TO SHAFT
6	1	102205	COLLAR .500
7	1	500774	SHAFT - WORM GEAR
8	1	500776	BRACKET, HEAD ADJUSTMENT
9	1	100900-1	WORM - 16-4 0.250
10	1	500719-R	HOUSING, WORM GEAR
11	1	508981-1	SHAFT, GIBB BOX

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536417-01
REQ'D	WHERE USED

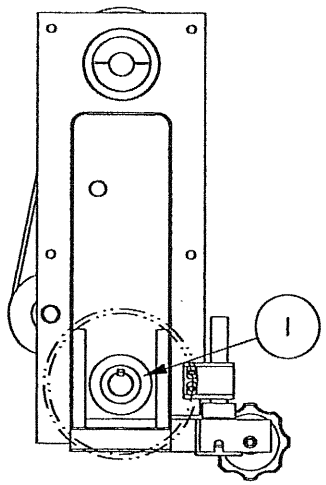
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-May-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, WORM GEARBOX RH	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1 OF 1	DRAWING # 536418-01	

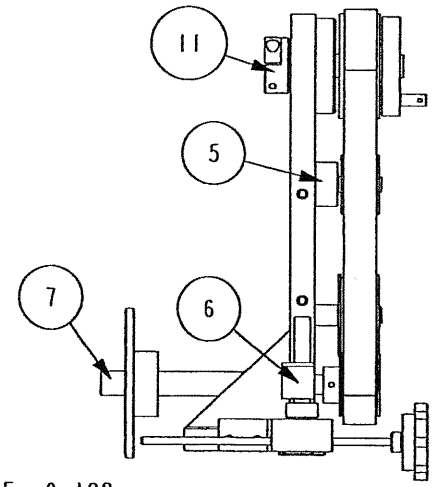
DRAWING #

536419-01

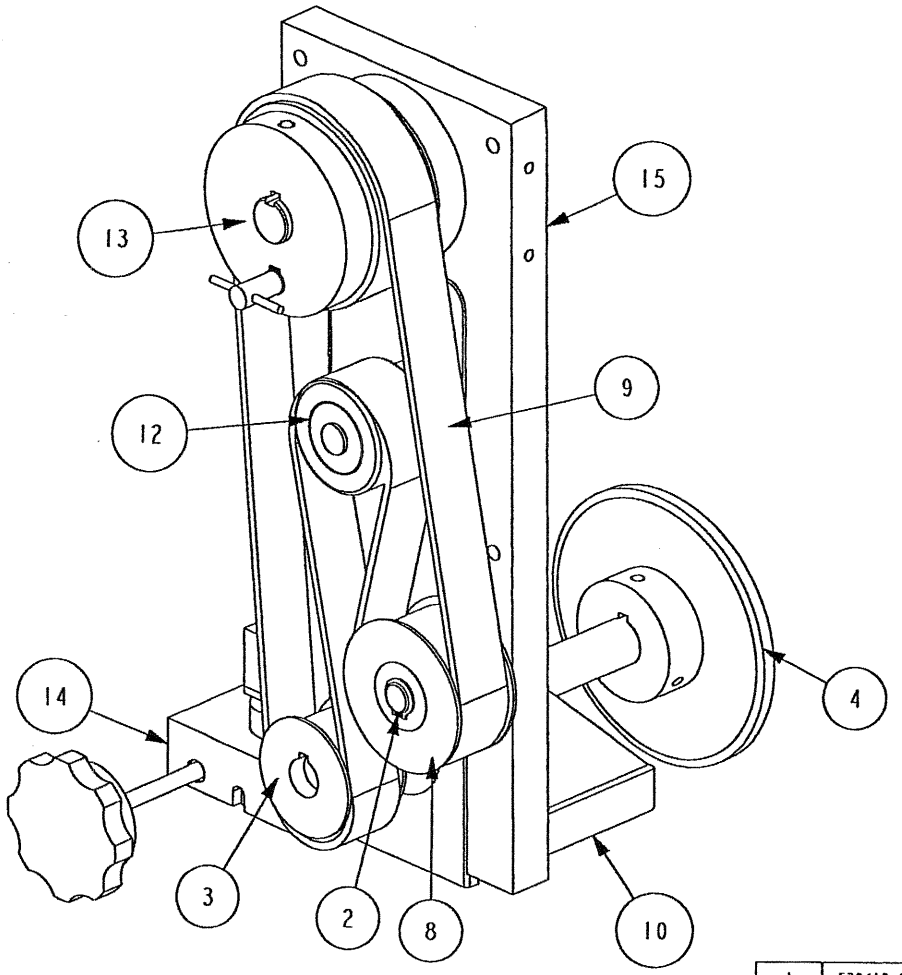
ITEM	QTY	PART #	DESCRIPTION
1	1	103805	BEARING - HUB
2	2	104106	SNAPRING, .500
3	1	108811	PULLEY, TIMING 14L100 .625B .188K
4	1	110547	SPRKT, 40B27 .750B .188K
5	1	500368	STUD, BELT TAKE-UP
6	1	500776	BRACKET, HEAD ADJUSTMENT
7	1	508550	SHAFT - VAC. WHEEL DRIVE
8	1	108812A	ASSY, PULLEY
9	1	108901-1	BELT, TIMING
10	1	500713-L	BRACKET, HEAD SUPPORT L/H
11	1	500754A	ASSY, COUPLING
12	1	500757A	ASSY, TIMING PULLEY
13	1	505535-1A	ASSY, QUICK DISCONNECT
14	1	536420-01	ASSY, WORM GEARBOX LH
15	1	536421-01	ASSY, HEAD ADJ. BRACKET LH

REV NO	DATE	DESCRIPTION	ECN NO	BY





SCALE 0.188



1	536416-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX, .XXX, ANG. / .01, .005, .5	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-May-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OPENING WHEEL DRIVE LH	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536419-01	

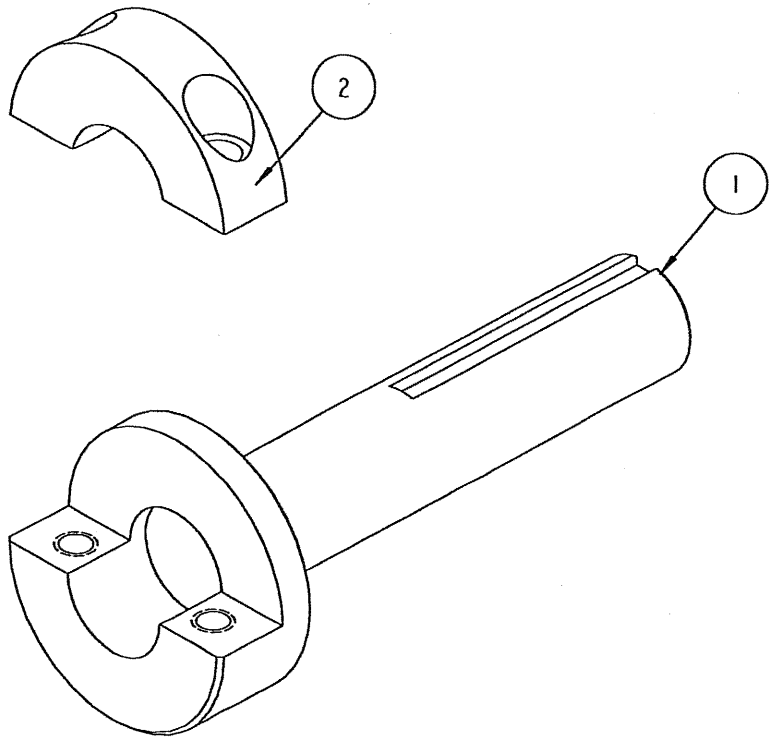
DO NOT SCALE - WORK TO DIMENSIONS ONLY

DRAWING #

500754

ITEM	QTY	PART #	DESCRIPTION
1	1	500754	COUPLING - HEAD DRIVE
2	1	500821	CLAMP-DRIVE HEAD

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED

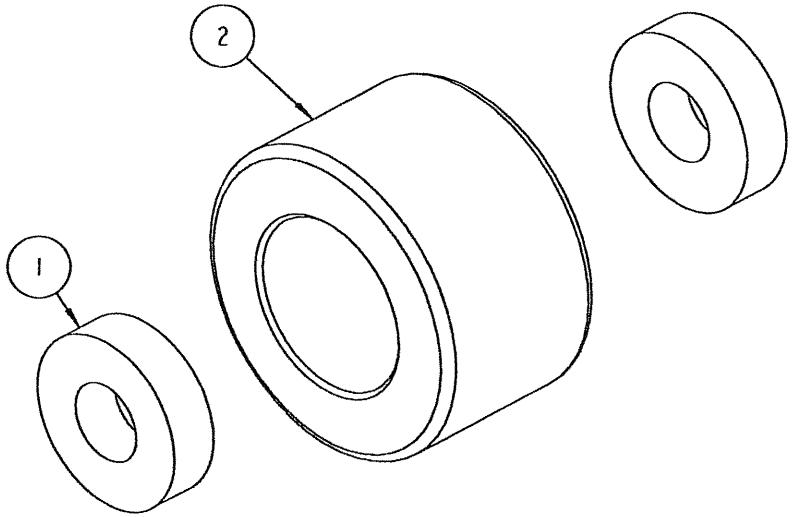
DRAWN BY: NJG	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 18-Jul-97		HEAT TREAT: N/A	MODEL: 215	TITLE: ASSY, COUPLING	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 500754A	

DRAWING #

500757A

ITEM	QTY	PART #	DESCRIPTION
1	2	103108	BEARING - FLAT
2	1	500757	PULLEY, REVERSING (TIMING)

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED

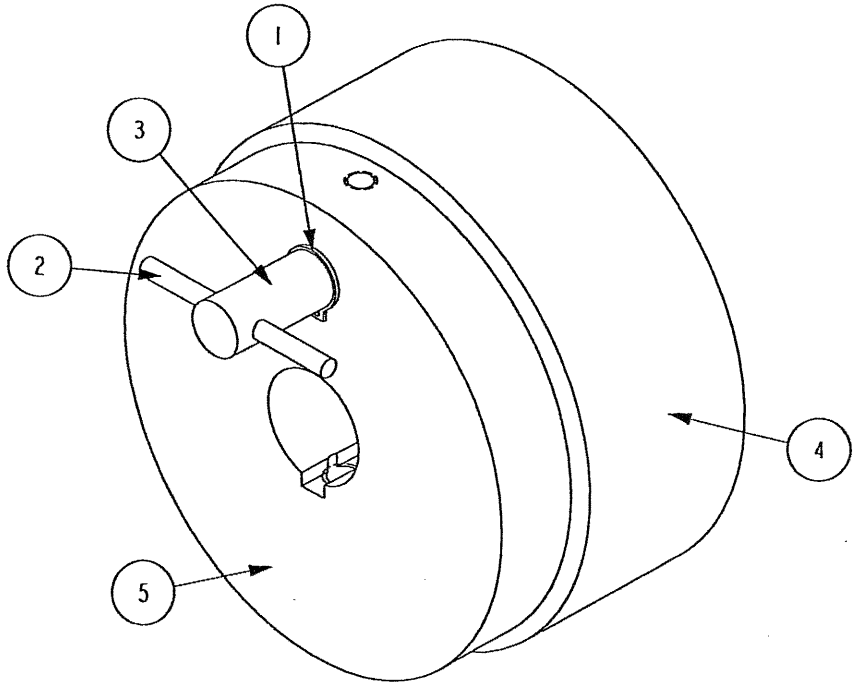
DRAWN BY: NJG	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 22-Jul-97			MODEL: 215	TITLE: ASSY, TIMING PULLEY	
TRACED BY:	MASTER M			SHEET NO.: 1 OF 1	DRAWING # 500757A	

DRAWING #

5055: A

ITEM	QTY	PART #	DESCRIPTION
1	1	104100	SNAPRING, .375
2	1	105426	DOWEL, PIN .125X1.500
3	1	505536	PIN, LOCKING
4	1	108813-1	TIMING PULLEY 28L100
5	1	505535-1	RING, HUB LOCKING

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536419-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	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 25-May-99		HEAT TREAT: N/A	MODEL: X	TITLE: ASSY, QUICK DISCONNECT
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 505535-1A

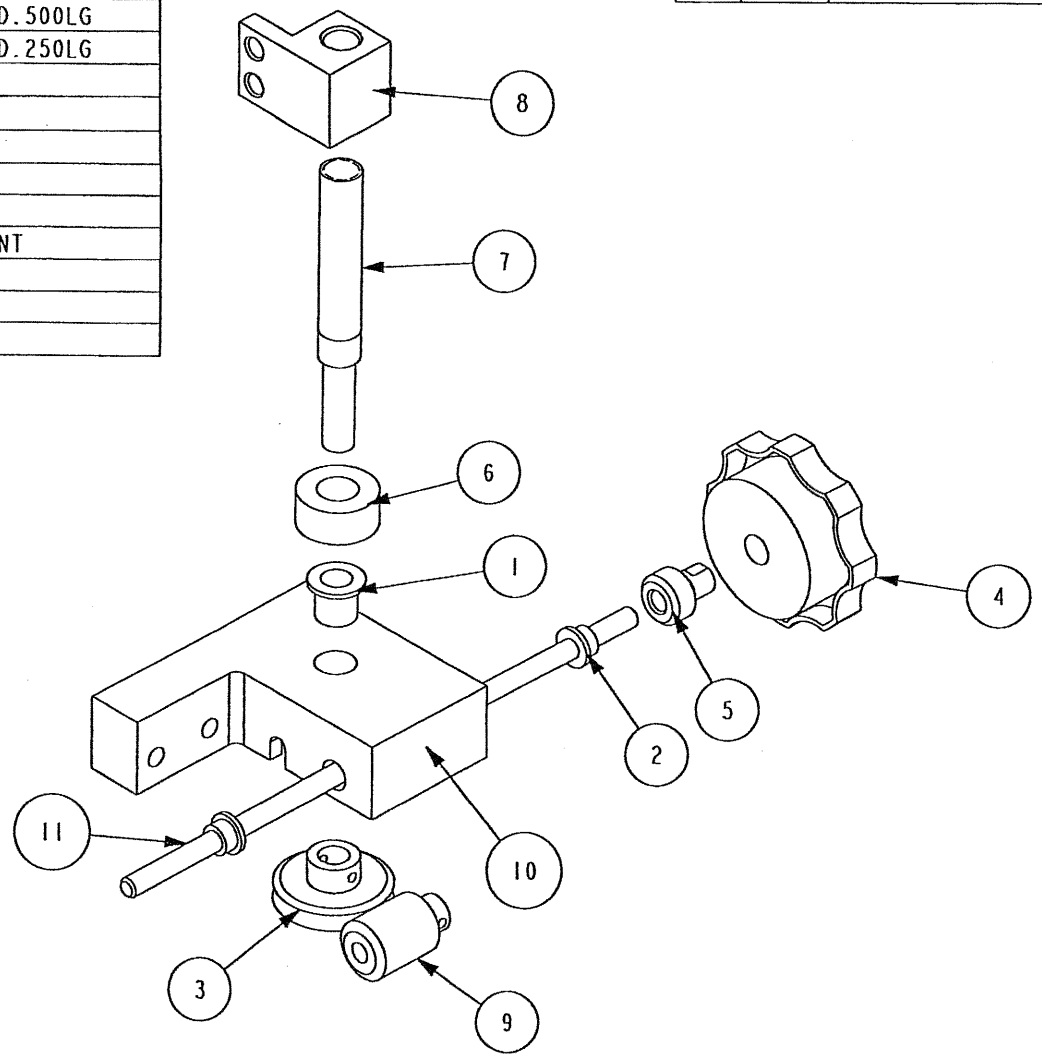
KIRK - RUDY, INC.
KENNESAW, GEORGIA

DRAWING #

536420-01

ITEM	QTY	PART #	DESCRIPTION
1	1	100306	BUSHING, FL.375ID.500OD.500LG
2	2	100309	BUSHING, FL.250ID.375OD.250LG
3	1	100900	GEAR, WORM 1620 0.375
4	1	102112	KNOB, PURCHASED
5	1	102115	ADAPTOR, KNOB TO SHAFT
6	1	102205	COLLAR .500
7	1	500774	SHAFT - WORM GEAR
8	1	500776	BRACKET, HEAD ADJUSTMENT
9	1	100900-1	WORM - 16-4 0.250
10	1	500719-L	HOUSING, WORM GEAR
11	1	508981-2	SHAFT, GIBB BOX

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536419-01
REQ'D	WHERE USED

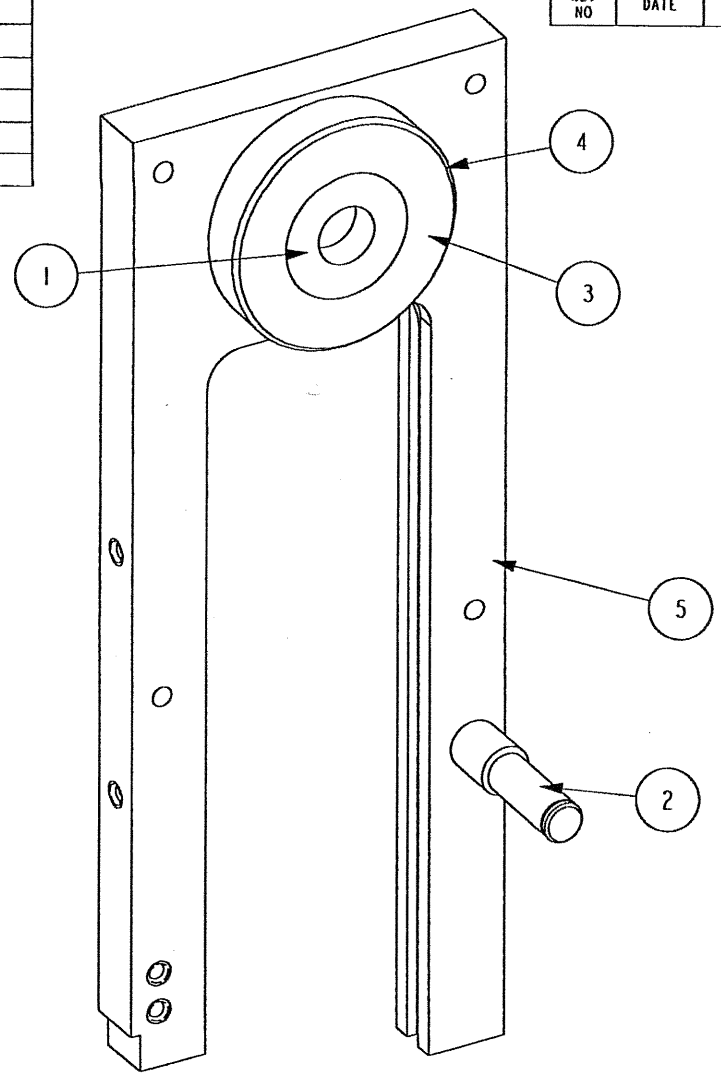
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-May-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, WORM GEARBOX LH	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536420-01	

DRAWING #

536421-01

ITEM	QTY	PART #	DESCRIPTION
1	2	103112	BEARING, FLAT .750
2	1	500758	STUD, REVERSING PULLEY (TIMING)
3	1	500831	HUB-BEARING (HEAD ADJ)
4	1	500831A	ASSY, HUB
5	1	SP31202	BRACKET, HEAD ADJ. LH

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536419-01
REQ'D	WHERE USED

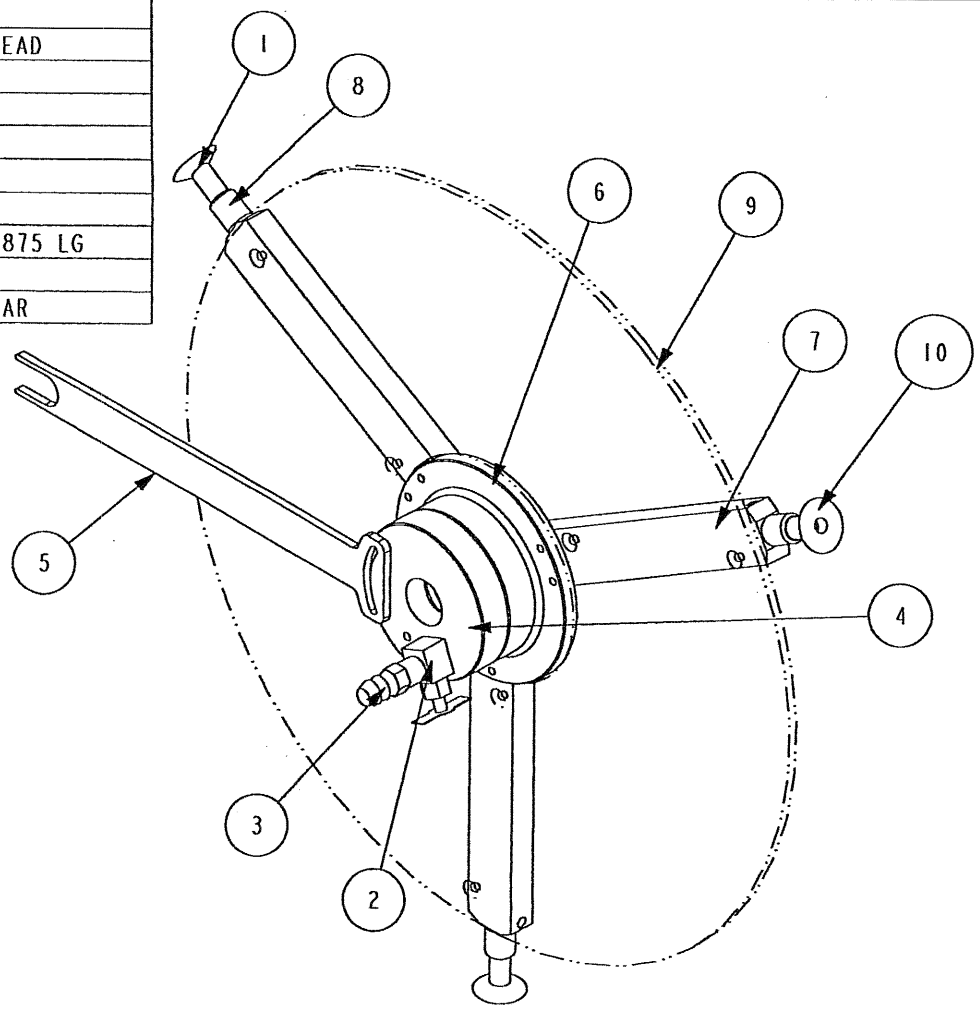
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-May-99			MODEL: 512	TITLE: ASSY, HEAD ADJ. BRACKET LH	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536421-01	

DRAWING #

536422-01

ITEM	QTY	PART #	DESCRIPTION
1	3	190657	CUP, SUCKER
2	1	190659	VALVE, SHUTOFF WEATHERHEAD
3	1	190660	NIPPLE, 1/2 IN TUBING
4	1	508621	DISC, VACUUM VALVE
5	1	508629	ARM, VACUUM DISC
6	1	508708	WHEEL, VACUUM
7	3	508717	ARM, VACUUM
8	3	508736	ADAPTOR, SUCTION CUP 1.875 LG
9	1	508906	PLATE, VACUUM ARM
10	3	533405-03	ASSY, VACUUM TRANSFER BAR

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536416-01
REQ'D	WHERE USED

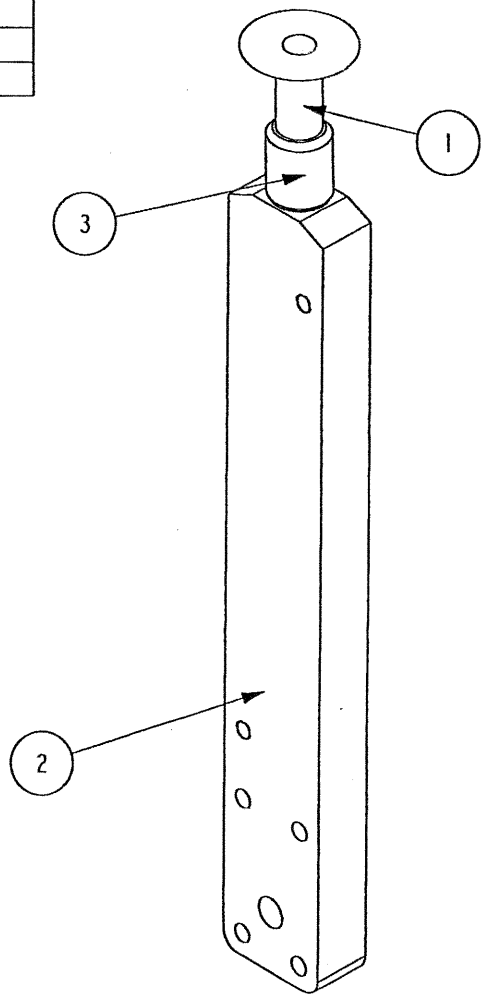
DRAWN BY: MY	SCALE 0.281	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 24-May-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OPENING WHEEL	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536422-01	

DRAWING #

53340 3

ITEM	QTY	PART #	DESCRIPTION
1	1	190657	CUP, SUCKER
2	1	508717	ARM, VACUUM
3	1	508736	ADAPTOR, SUCTION CUP 1.875 LG

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536422-01
REQ'D	WHERE USED

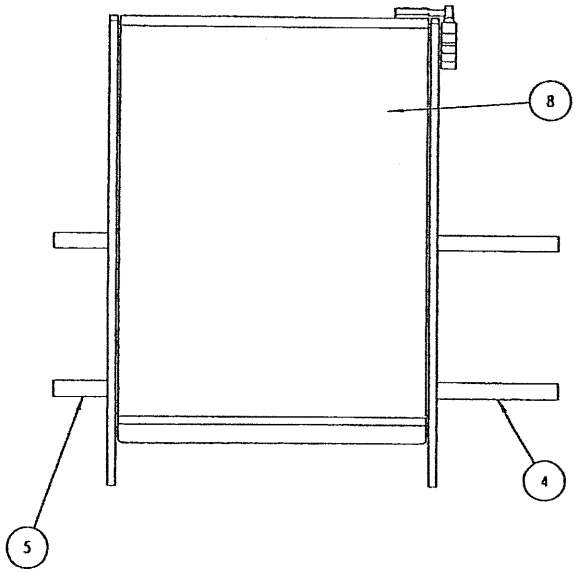
DRAWN BY: MY	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 24-May-99			MODEL: 512	TITLE: ASSY, VACUUM TRANSFER BAR	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 533405-03	

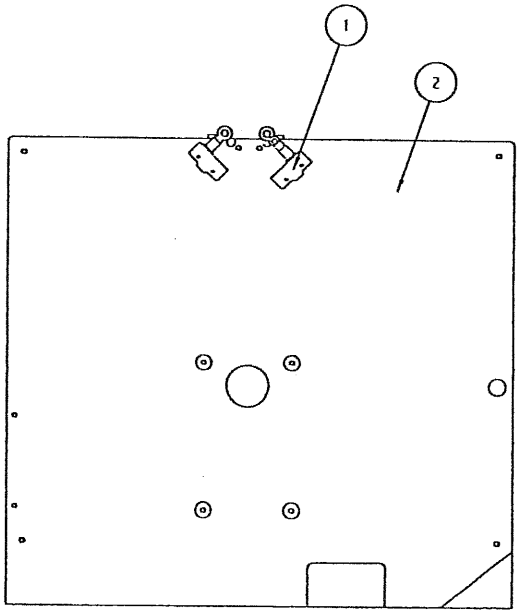
DRAWING #

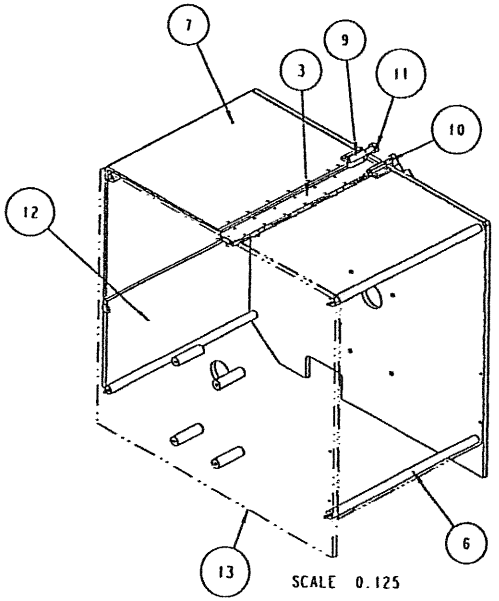
SP31216

REV NO	DATE	DESCRIPTION	ECN NO	BY
1	19-MAY-99	REDRAWN IN PRO/E	6421	MT

ITEM	QTY	PART #	DESCRIPTION
1	2	190104	MICRO SWITCH
2	1	SP31217	PLATE, SIDE GUARD
3	1	SP31218	BAR, HINGE
4	4	SP31219	STAND-OFF, FRONT
5	4	SP31220	STAND-OFF, REAR
6	4	SP31221	ROD, SPREADER
7	1	SP31222	COVER, RIGHT HINGED
8	1	SP31223	COVER, LEFT
9	2	SP31224	BRACKET, LS ACTUATOR
10	2	SP31225	SHAFT, LIM. SW. ACTIVATOR
11	2	SP31226	ACTIVATOR, LIM. SWITCH
12	1	SP31233	PLATE, GUARD
13	1	SP31217-1	PLATE, SIDE GUARD







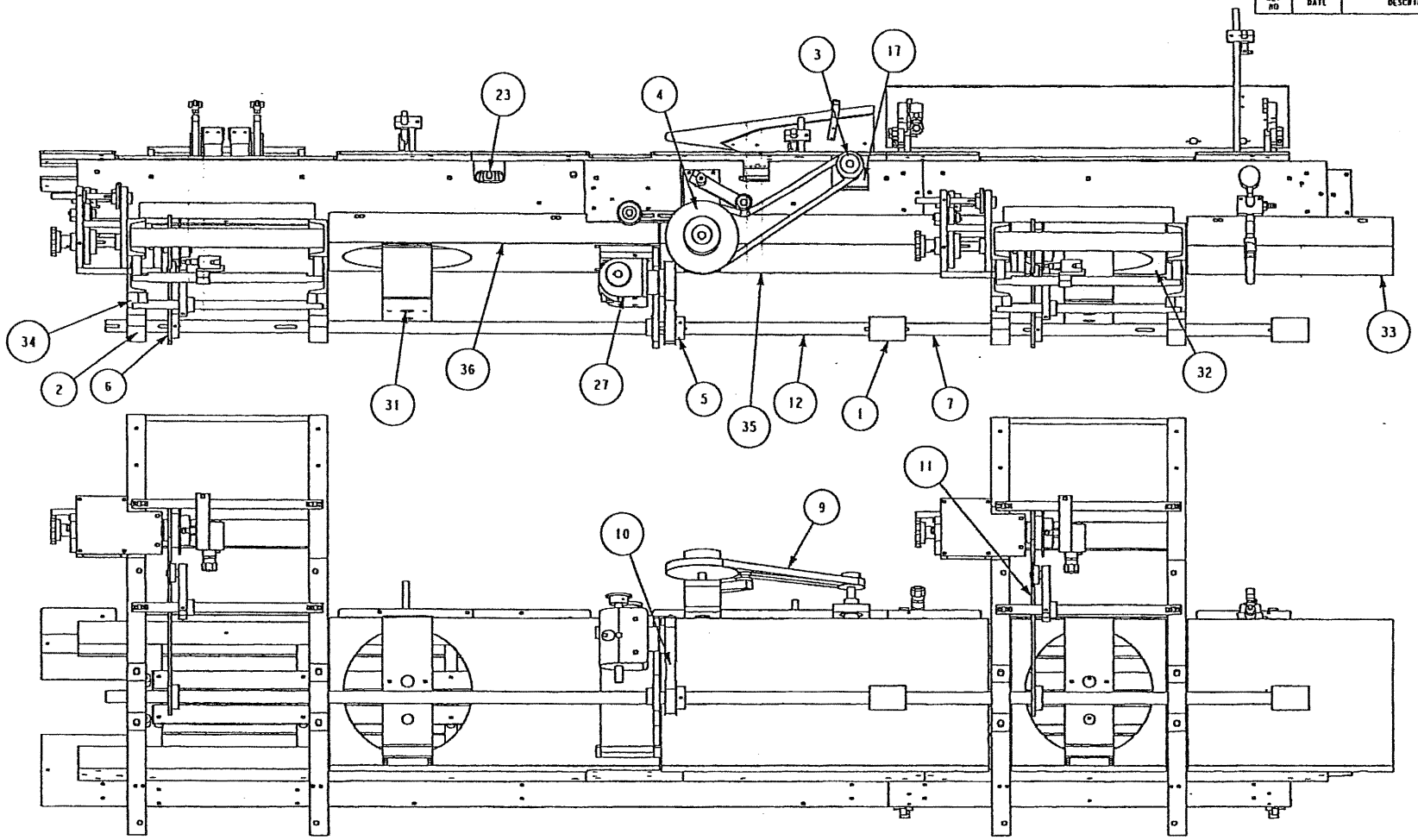
SCALE 0.125

1	SP31200
REQ'D	WHERE USED

DRAWN BY: OG	SCALE 0.188	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX ±.010 ANG. ±1° .XXX ±.005 .X ±.5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	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 14-Aug-95		HEAT TREAT: N/A	MODEL: 512	KIRK - RUDY, INC. KENNESAW, GEORGIA
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO. 1OF1	TITLE: ASSY, VACUUM WHEEL GUARD
					DRAWING # SP31216

DRAWING # 5 -01

REV NO	DATE	DESCRIPTION	ECR NO	BY

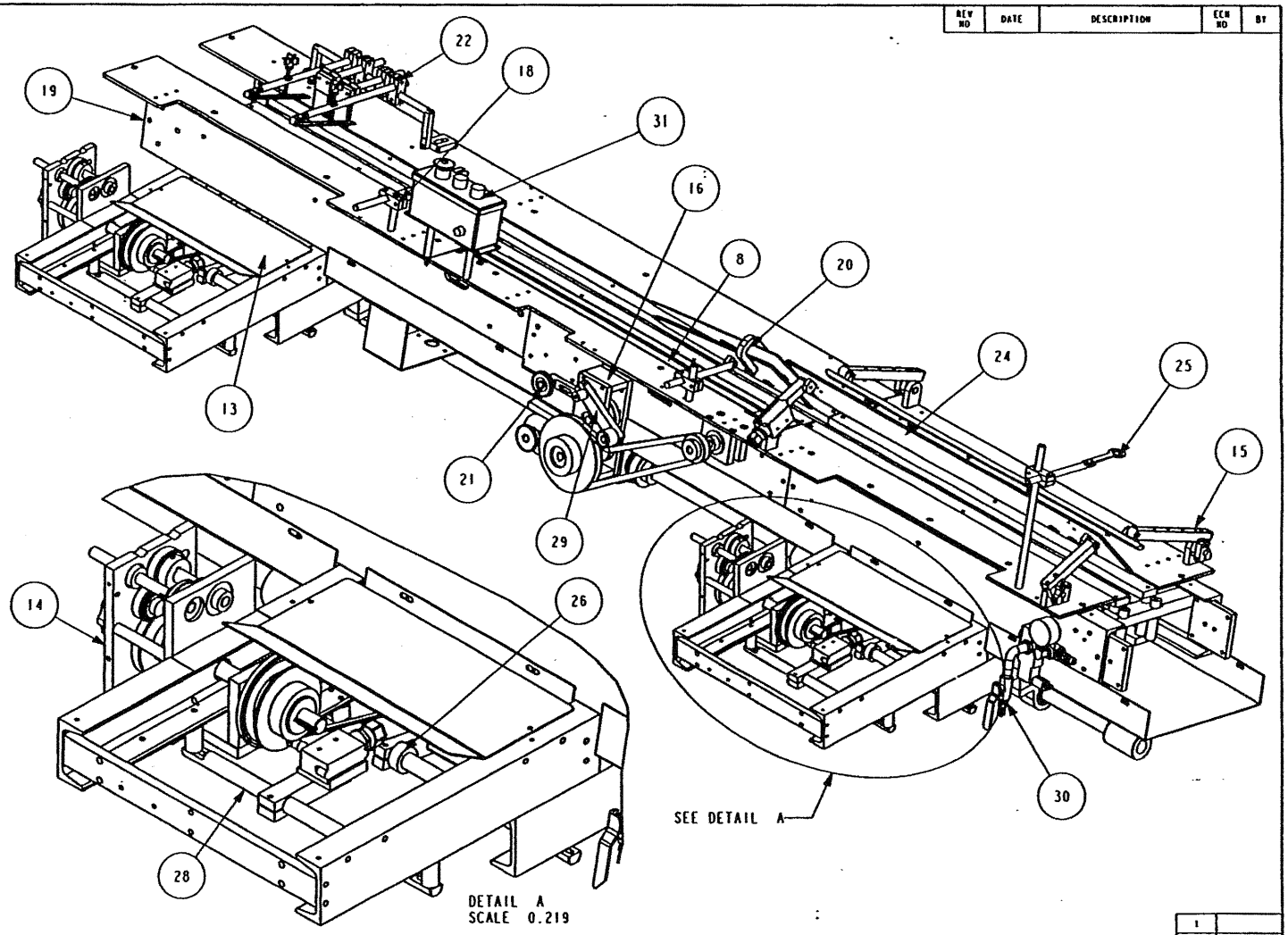


REQ'D	WHERE USED
1	

DRAWN BY: MY	SCALE: 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.01, .XXX ±.005, ANG. ±.5	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: 22-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	KIRK - RUDY, INC. KENNESAW, GEORGIA
TRACED BY:	MASTER: M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 2OF2	TITLE: ASSY, INFFED SECTION
					DRAWING #: 536653-01

536653-01

ITEM	QTY	PART #	DESCRIPTION
1	2	101205	COUPLING
2	4	103706	BEARING, PILLOW BLOCK 1.00 SHAFT
3	1	105041	V-PULLEY, AK22
4	1	105042	V-PULLEY, 1VP60
5	1	108866	PULLEY, TIMING 21L075 1.000B .250K
6	2	110431	SPRKT, 40B16 1.000B .250K
7	1	508852	SHAFT, DRIVE
8	2	105901-3	BELT, FLAT 3/4 X 68.75
9	1	106024-1	V-BELT, AX34
10	1	108927-2	BELT, TIMING 210L075
11	2	110019-5	CHAIN, #40
12	1	508780-1	SHAFT, FRONT DRIVE
13	2	531062-01	FEEDER, CLUTCH COVER
14	2	533749-01	ASSY, GEAR BOX RH
15	1	535201-02	ASSY, SIDE GUIDES
16	1	535818-01	ASSY, GEARBOX REVERSING
17	1	535819-01	ASSY, VACUUM SHAFT DRIVE
18	1	536651-01	ASSY, HOLD DOWN BRUSH
19	1	536652-01	ASSY, CHANNEL FRAMES INFD
20	1	536655-01	ASSY, OPENING PLOW
21	1	536656-01	ASSY, TAKE UP
22	1	536657-01	ASSY, KNOCK DOWN
23	1	536658-01	ASSY, ROLLER INFEED
24	1	536659-01	ASSY, JACKET GUIDE
25	1	536662-01	ASSY, PHOTOSENSOR MOUNT
26	2	536663-01	ASSY, TAKE UP
27	1	536664-01	ASSY, GEARBOX
28	2	536703-01	ASSY, MICROSWITCH
29	1	536705-01	ASSY, TAKE UP
30	1	536707-02	ASSY, VACUUM VALVE
31	1	536727-01	ASSY, ELECTRICAL BUTTON BOX
32	2	SP29101	MOUNT, MOTOR
33	1	SP29102	COVER, FAN INSERT
34	1	SP29103	COVER, FAN INSERT
35	4	SP29108	SPACER, BEARING
36	1	SP29111	COVER, FAN INFEED
37	1	SP29138	COVER, FAN INFEED



DETAIL A
SCALE 0.219

REV NO	DATE	DESCRIPTION	ECN NO	BY

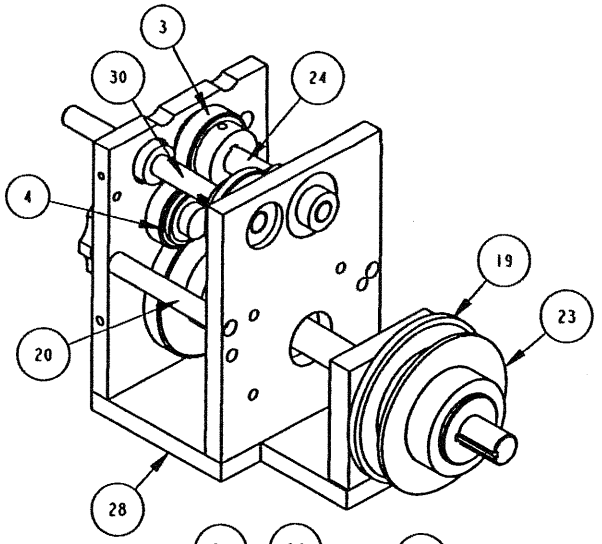
1	
REQ'D	WHERE USED

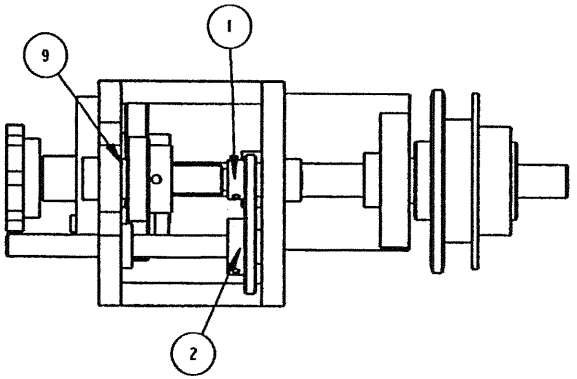
DRAWN BY: MY	SCALE 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .XXX ANG. .XX .XXX .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 16-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, INFEED SECTION	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1 OF 2	DRAWING # 536653-01	

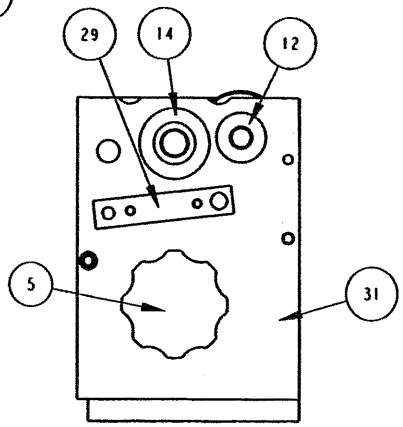
533749-01

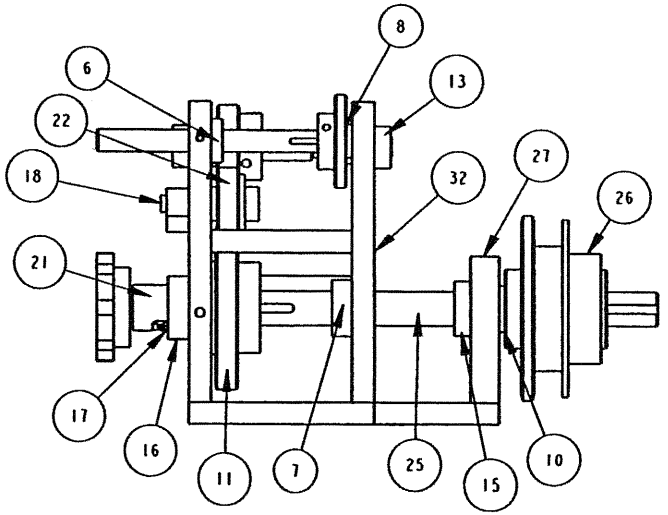
ITEM	QTY	PART #	DESCRIPTION
1	1	101610	GEAR, 2424 .500B .125K
2	1	101611	GEAR, 2448 .500B .125K
3	1	101964	GEAR, 1628 .625B .188K
4	1	101965	GEAR, 1624 1.124B NK
5	1	102112	KNOB, PURCHASED
6	1	102205	COLLAR .500
7	1	102215	COLLAR .750
8	3	102301	SHIM, .500X.750X.125
9	1	102309	SHIM, .625X.875X.125
10	1	102334	SHIM, .750X1.000X.125
11	1	102497	GEAR, 1656 .750B NK
12	4	103108	BEARING, FLAT .500
13	1	103803	BEARING, HUB .500
14	1	103804	BEARING, HUB .625
15	1	103805	BEARING, HUB .750
16	1	103808	BEARING, HUB 1.000
17	1	105413	DOWEL, PIN .250X.750
18	1	107251	BOLT, SHOULDER 1/2X1-1/4
19	1	111111	SPRKT, 40A24 1.7328B
20	2	508785	SPACER, PLATE
21	1	508943	SLEEVE, DISCONNECT
22	1	101965-A	ASSY, IDLER GEAR
23	1	104039-2	CLUTCH, MAYR SIZE 1
24	1	508770-1	SHAFT, FEEDER DRIVE
25	1	508772-1	SHAFT, FEEDER DRIVE
26	1	535748-01	ASSY, CLUTCH & SPROCKET
27	1	SP25232	PLATE, BEARING
28	1	SP25233	PLATE, BOTTOM
29	1	SP25234	PLATE, STUD MOUNTING
30	1	SP25236	SHAFT, CAM
31	1	SP25230-1	PLATE-DISCONNECT
32	1	SP25231-1	PLATE, SUPPORT

REV NO	DATE	DESCRIPTION	ECN NO	BY
1	12/11/2000	CORRECTED CLUTCH PART NUMBER WAS 104040-2		TJG









1	512
REQ'D	WHERE USED

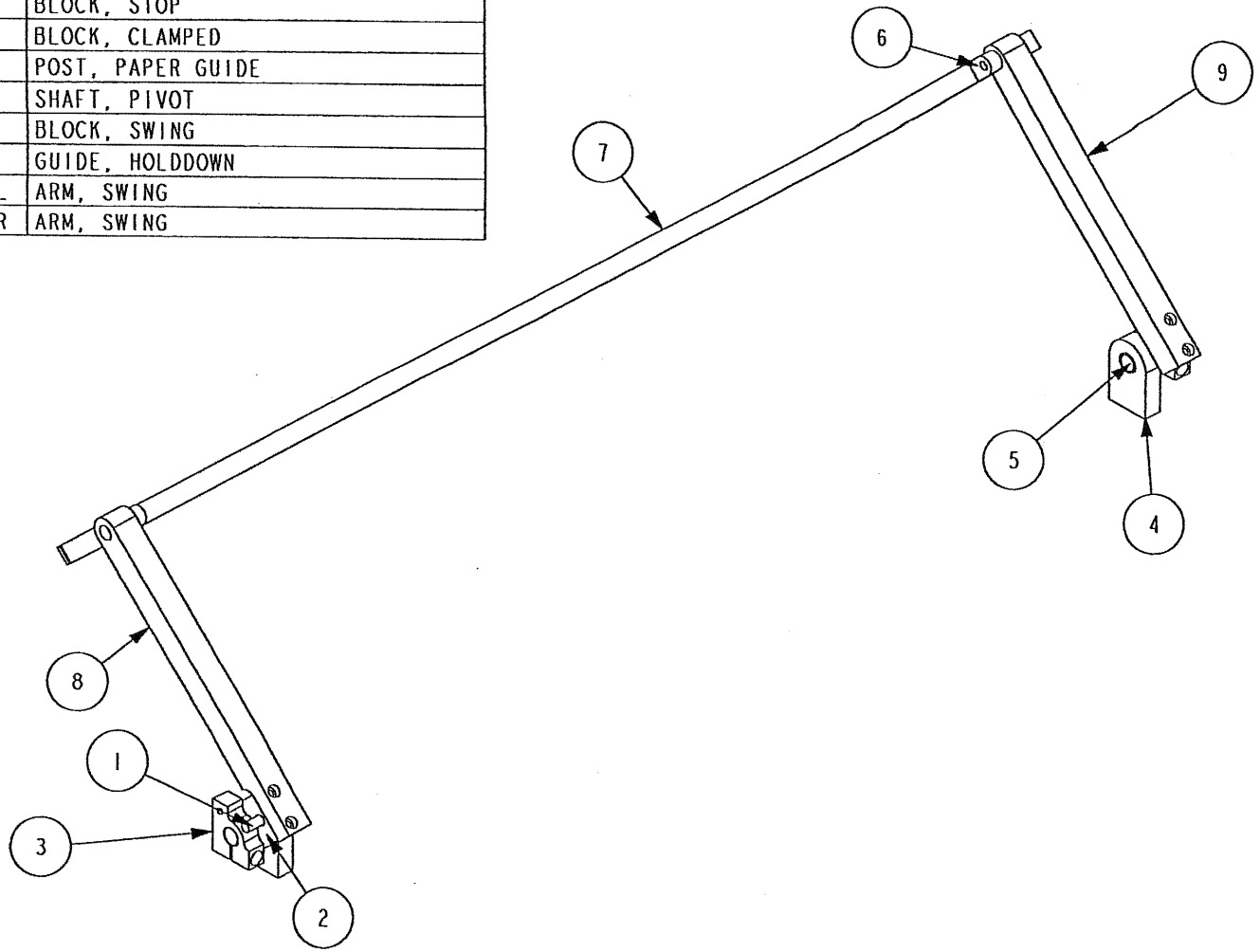
DRAWN BY: RHM	SCALE: 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.010, .XXX ±.005, ANG. ±.5°	MATERIAL: NOTED	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 23-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: NONE	MODEL: 512	TITLE: ASSY, GEAR BOX RH	
TRACED BY:	MASTER	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: NOTED	SHEET NO.: 1 OF 1	DRAWING #: 533749-01	

DRAWING #

535201-02

ITEM	QTY	PART #	DESCRIPTION
1	1	105223	PIN, ROLL 1/4 X 1.000
2	2	508536	BLOCK, STOP
3	2	508537	BLOCK, CLAMPED
4	2	508538	POST, PAPER GUIDE
5	2	508791	SHAFT, PIVOT
6	2	SP12135	BLOCK, SWING
7	1	SP12136	GUIDE, HOLDDOWN
8	1	SP12132-L	ARM, SWING
9	1	SP12132-R	ARM, SWING

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 18-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, SIDE GUIDES	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 535201-02	

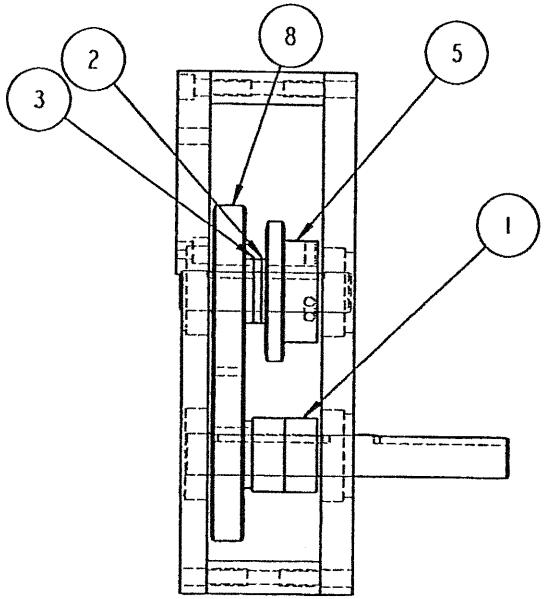
DO NOT SCALE - WORK TO DIMENSIONS ONLY

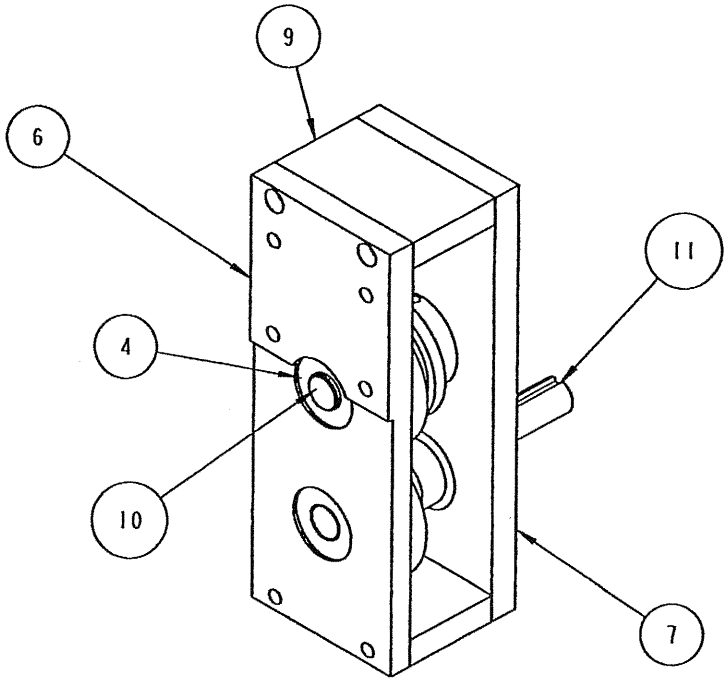
DRAWING #

535818-0.

ITEM	QTY	PART #	DESCRIPTION
1	2	102203	COLLAR .625
2	1	102320	SHIM, .625X1.000X.062
3	1	102657	SHIM, .625X1.000X.125
4	4	103110	BEARING, FLAT .625
5	1	110585	SPRKT, 40B12 .625B .188K
6	1	SP54202	PLATE, BEARING
7	1	SP54203	PLATE, BEARING
8	2	SP54208	GEAR, 1640 .625B .188K
9	2	SP54214	PLATE - SPACER
10	1	SP54215	SHAFT, GEAR
11	1	SP54216	SHAFT, PULLEY

REV NO	DATE	DESCRIPTION	ECN NO	BY





1	535433-01
REQ'D	WHERE USED

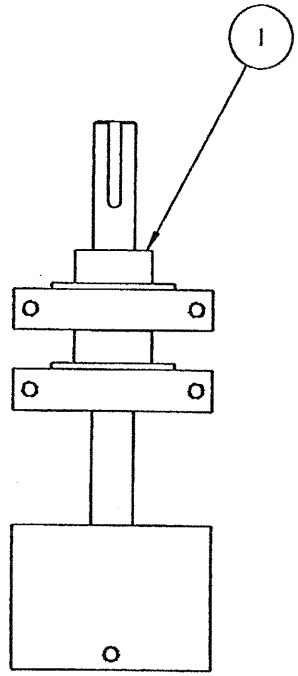
DRAWN BY: TJG	SCALE 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: XXX HEAT TREAT: XXX FINISH: XXX	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 01-Feb-99			MODEL: 512	TITLE: ASSY, GEARBOX REVERSING	
TRACED BY:	MASTER			SHEET NO.: 1OF1	DRAWING # 535818-01	

DRAWING #

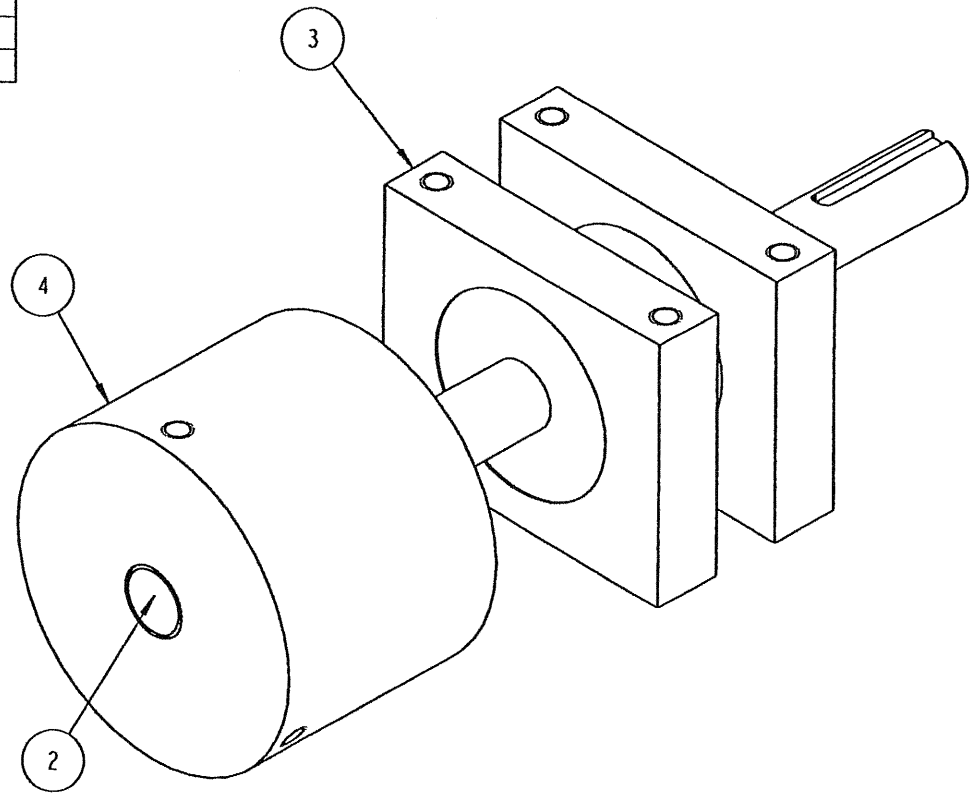
535819-01

ITEM	QTY	PART #	DESCRIPTION
1	2	103812	BEARING - HUB
2	1	508637-1	SHAFT, SHUTTLE FEEDER
3	2	SP54221	BLOCK - BEARING
4	1	SP54211-1	ROLLER, VACUUM BELT DRIVE

REV NO	DATE	DESCRIPTION	ECN NO	BY



SCALE 0.375



1	535433-01
REQ'D	WHERE USED

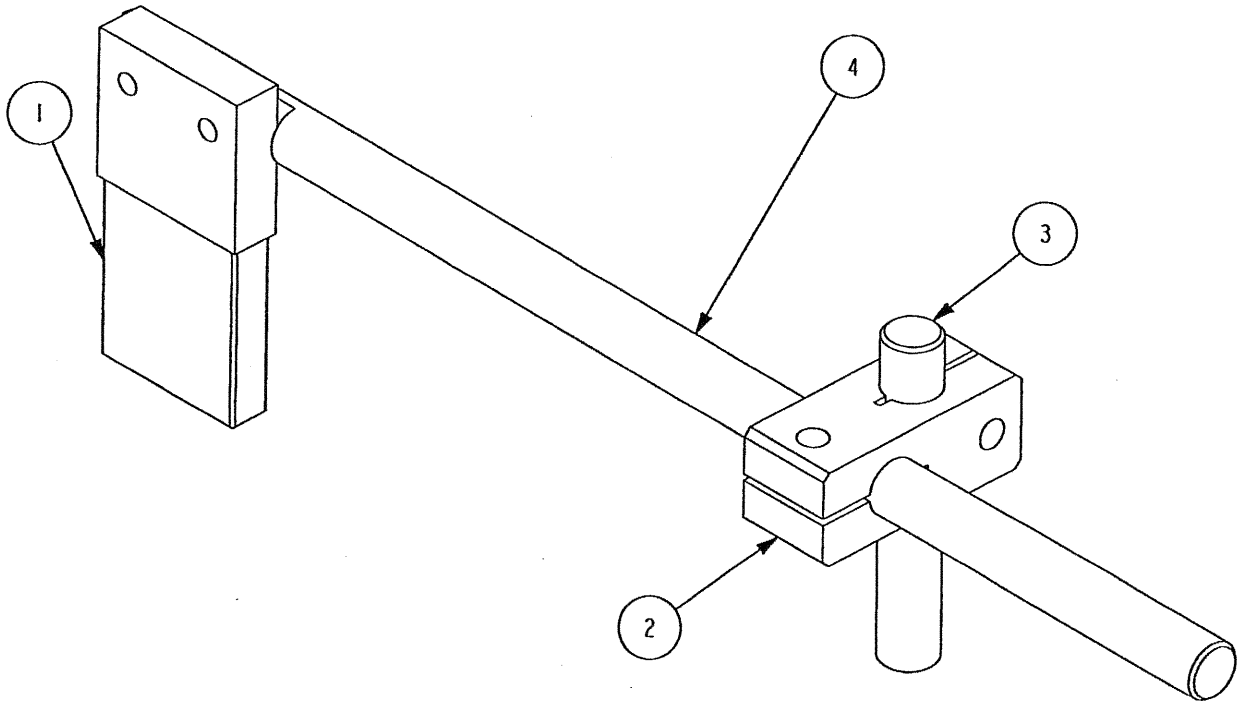
DRAWN BY: TJG	SCALE 0.750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX, .01 / .XXX, .005 / ANG. .5	MATERIAL: XXX	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 10-Feb-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: XXX	MODEL: 512	TITLE: ASSY, VACUUM SHAFT DRIVE	
TRACED BY:	MASTER	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: XXX	SHEET NO.: 1OF1	DRAWING # 535819-01	

DRAWING #

536651

ITEM	QTY	PART #	DESCRIPTION
1	1	504866	BRUSH, PAPER HOLD DOWN
2	1	508593	CLAMP
3	1	508594	POST, OPENER / JUMBO
4	1	SP6349	SHAFT, BRUSH HOLDER

REV NO	DATE	DESCRIPTION	ECN NO	BY



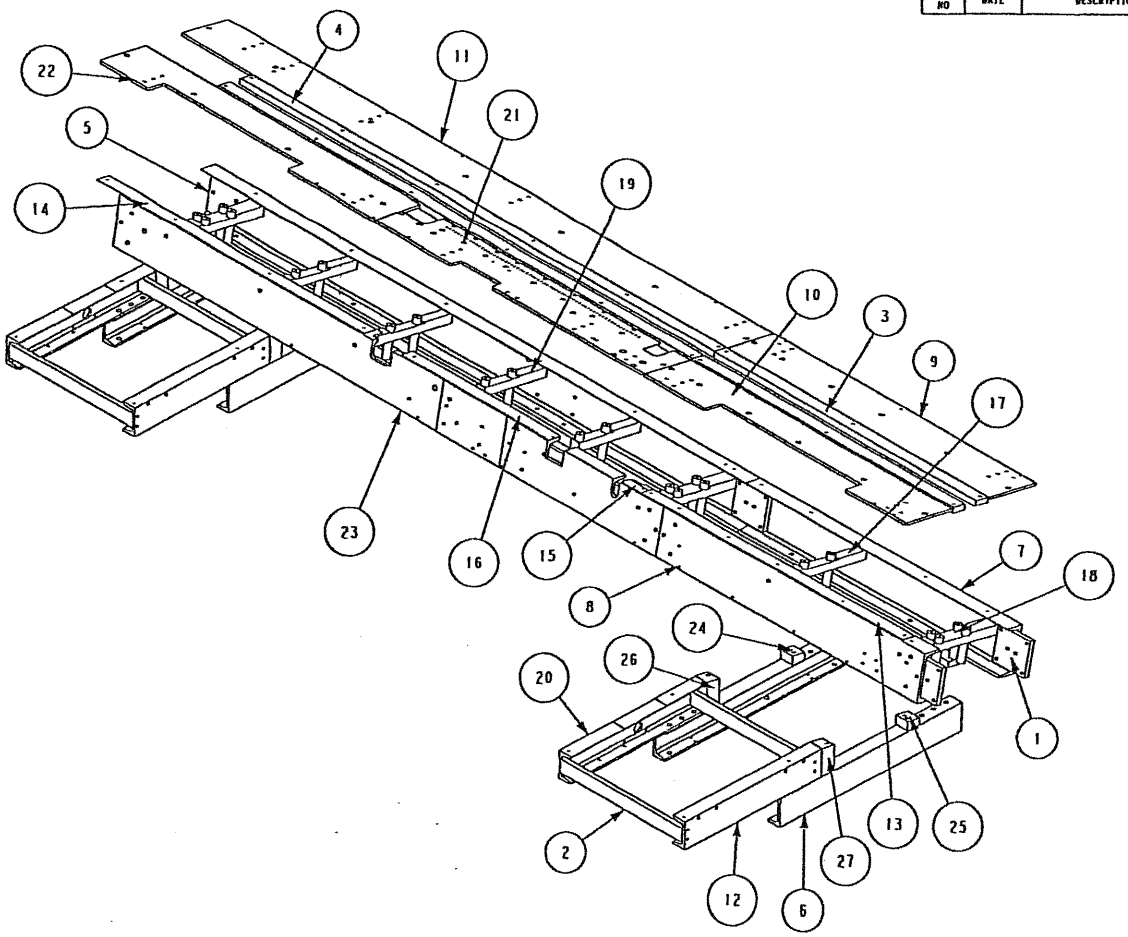
REQ'D	WHERE USED
1	

DRAWN BY: MY	SCALE 0.750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED (.XX .01; .XXX .005; ANG. .5) REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: EG ASSY, HOLD DOWN BRUSH	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536651-01	

DRAWING # 536652-01

ITEM	QTY	PART #	DESCRIPTION
1	4	508554	PLATE, CONNECTING
2	4	508788	BAR-CROSS
3	4	530457	TRACK, FLIGHT 331N
4	4	530459	TRACK, FLIGHT INFEED
5	1	508502-2L	CHANNEL, FRONT SIDE LH
6	4	508603-1	CHANNEL
7	1	508701-L	CHANNEL, LH
8	1	508701-R	CHANNEL, RH
9	1	508711-4L	TOP, TABLE LH
10	1	508711-4R	TOP, TABLE
11	1	508802-3L	TABLETOP, FRONT
12	2	508903-3	CHANNEL, UPPER CROSS
13	1	530701-01	SPACER, TABLETOP
14	1	531064-01	SPACER, TABLETOP VACUUM
15	1	531065-01	SPACER, TABLETOP VACUUM
16	1	531066-01	SPACER, TABLETOP VACUUM
17	3	535446-01	ASSY, FRAME SPACER
18	3	535447-01	ASSY, FRAME SPACER
19	2	536654-01	ASSY, FRAME SPACER
20	2	SP25201	CHANNEL, UPPER CROSS
21	1	SP54201-3	TABLETOP, VACUUM BELT RH
22	1	SP54201-1R	TABLETOP, RH INFEED
23	1	SP54210-R	CHANNEL, RH FRAME
24	2	SP6301-1L	SUPPORT, CHANNEL LH
25	2	SP6301-1R	SUPPORT, CHANNEL RH
26	2	SP6301-L	SUPPORT, CHANNEL LH
27	2	SP6301-R	SUPPORT, CHANNEL RH

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	

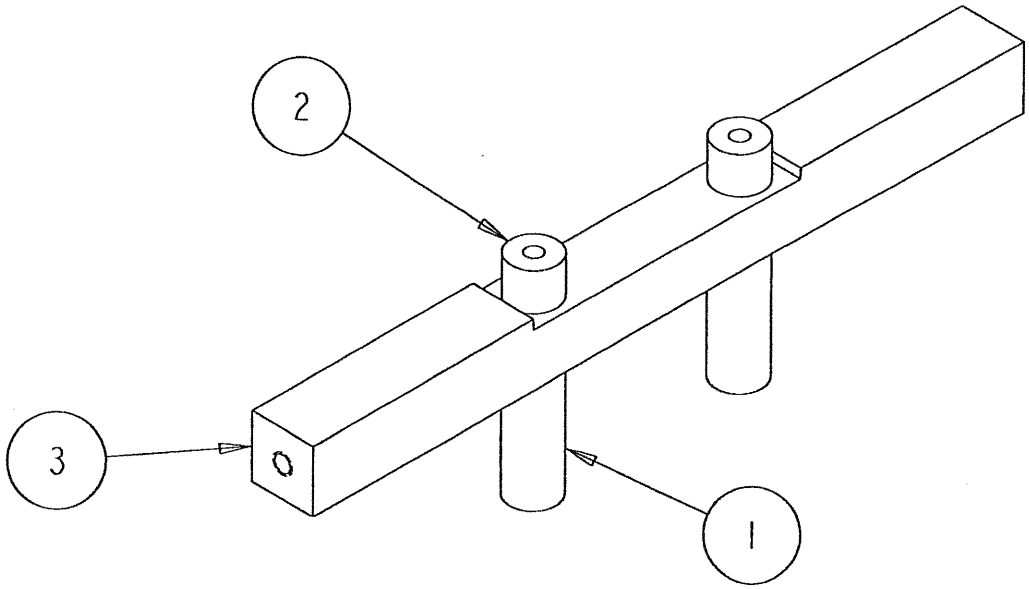
DRAWN BY: MY	SCALE: 0.100	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .XXX ANG. .01 .005 .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO 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: 11-Jun-99		HEAT TREAT: N/A	MODEL: 512	KIRK - RUDY, INC. KENNESAW, GEORGIA
TRACED BY:	MASTER: M		FINISH: N/A	SHEET #: 1OF1	TITLE: ASSY, CHANNEL FRAMES INFD
					DRAWING # 536652-01

DRAWING #

53544

ITEM	QTY	PART #	DESCRIPTION
1	2	102380	SPACER, .257X.750X1.937
2	2	102381	SPACER, .257X.750X.600
3	1	SP6302-1	BAR, CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



4	535510-01
REQ'D	WHERE USED

DRAWN BY: TJG

SCALE: 0.500

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

MATERIAL: XXX

THIRD ANGLE PROJECTION

KIRK - RUDY, INC.
KENNESAW, GEORGIA

CHECKED BY:

DATE: 25-Jan-99

HEAT TREAT: XXX

MODEL: 512

TITLE: ASSY, FRAME SPACER

TRACED BY:

MASTER

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

FINISH: XXX

SHEET NO.: 1OF1

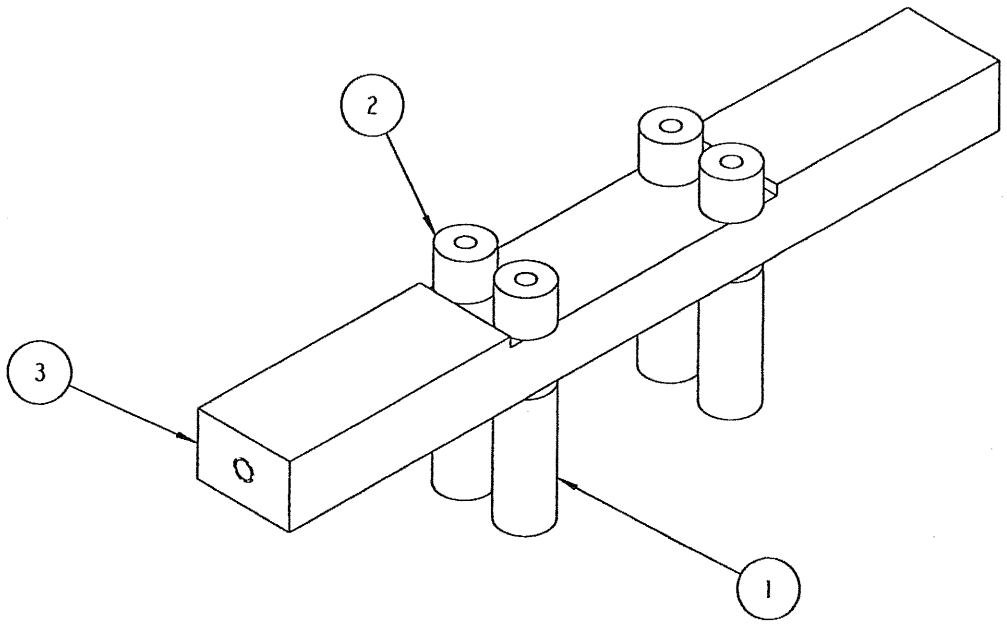
DRAWING #: 535446-01

DRAWING #

535447-01

ITEM	QTY	PART #	DESCRIPTION
1	4	102380	SPACER, .257X.750X1.937
2	4	102381	SPACER, .257X.750X.600
3	1	SP6913-1	BAR, WIDE CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	535510-01
REQ'D	WHERE USED

DRAWN BY: TJG

CHECKED BY:

TRACED BY:

SCALE: 0.500

DATE: 29-Jan-99

MASTER: m

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: XXX

HEAT TREAT: XXX

FINISH: XXX

THIRD ANGLE PROJECTION

MODEL: 512

SHEET NO.: 1OF1

KIRK - RUDY, INC.
KENNESAW, GEORGIA

TITLE: ASSY, FRAME SPACER

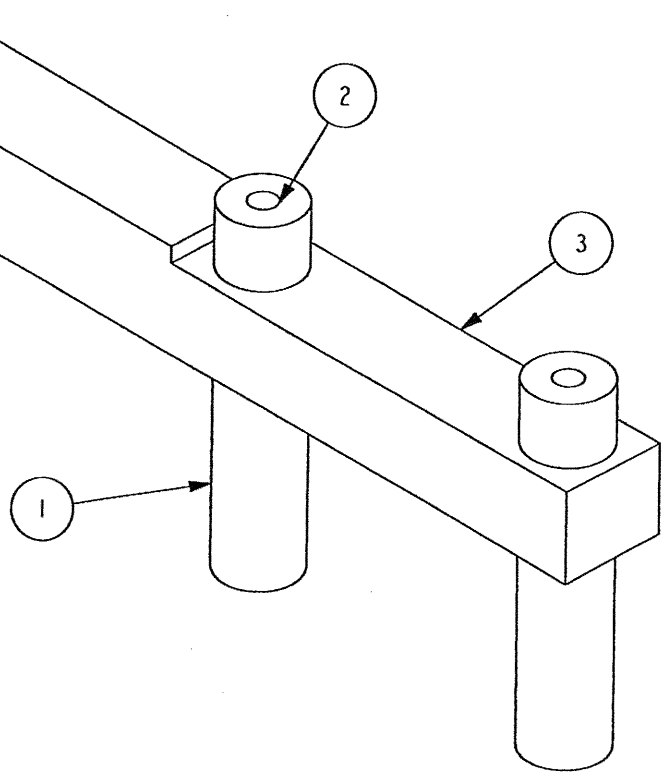
DRAWING #: 535447-01

DRAWING #

53665

ITEM	QTY	PART #	DESCRIPTION
1	2	102380	SPACER, GUIDE BOTTOM
2	2	102381	SPACER, GUIDE BOTTOM
3	1	SP6302-3	BAR, CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



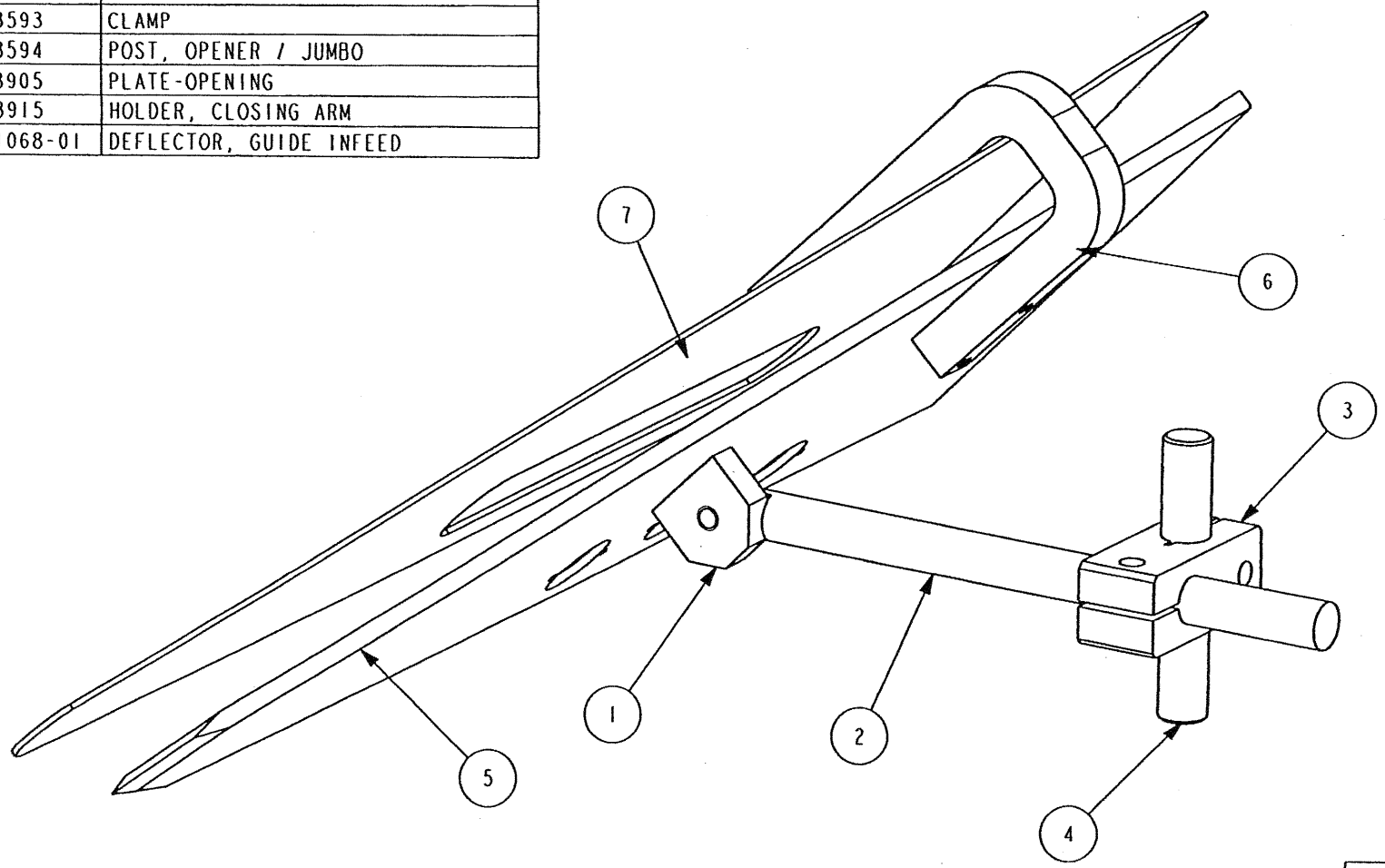
2	536653-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, FRAME SPACER	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536654-01	

536655-01

ITEM	QTY	PART #	DESCRIPTION
1	1	508535	BLOCK-SWING
2	1	508570	ROUND BAR
3	1	508593	CLAMP
4	1	508594	POST, OPENER / JUMBO
5	1	508905	PLATE-OPENING
6	1	508915	HOLDER, CLOSING ARM
7	1	531068-01	DEFLECTOR, GUIDE INFEED

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

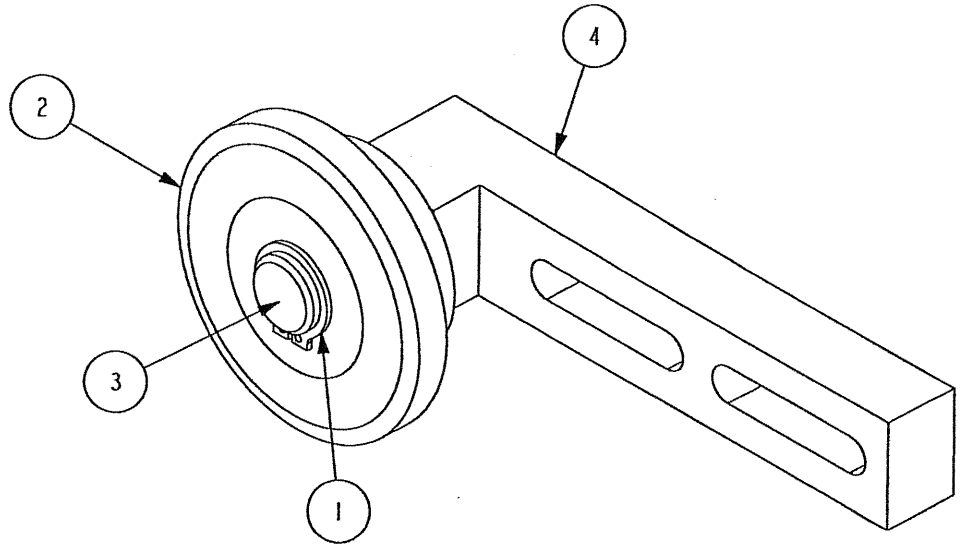
DRAWN BY: MY	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OPENING PLOW	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536655-01	

DRAWING #

536656-01 1

ITEM	QTY	PART #	DESCRIPTION
1	1	104106	SNAPRING, .500
2	1	110449A	SPROCKET ASY
3	1	508682-1	STUD, IDLER GEAR
4	1	508857-1	BLOCK, TAKE UP

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

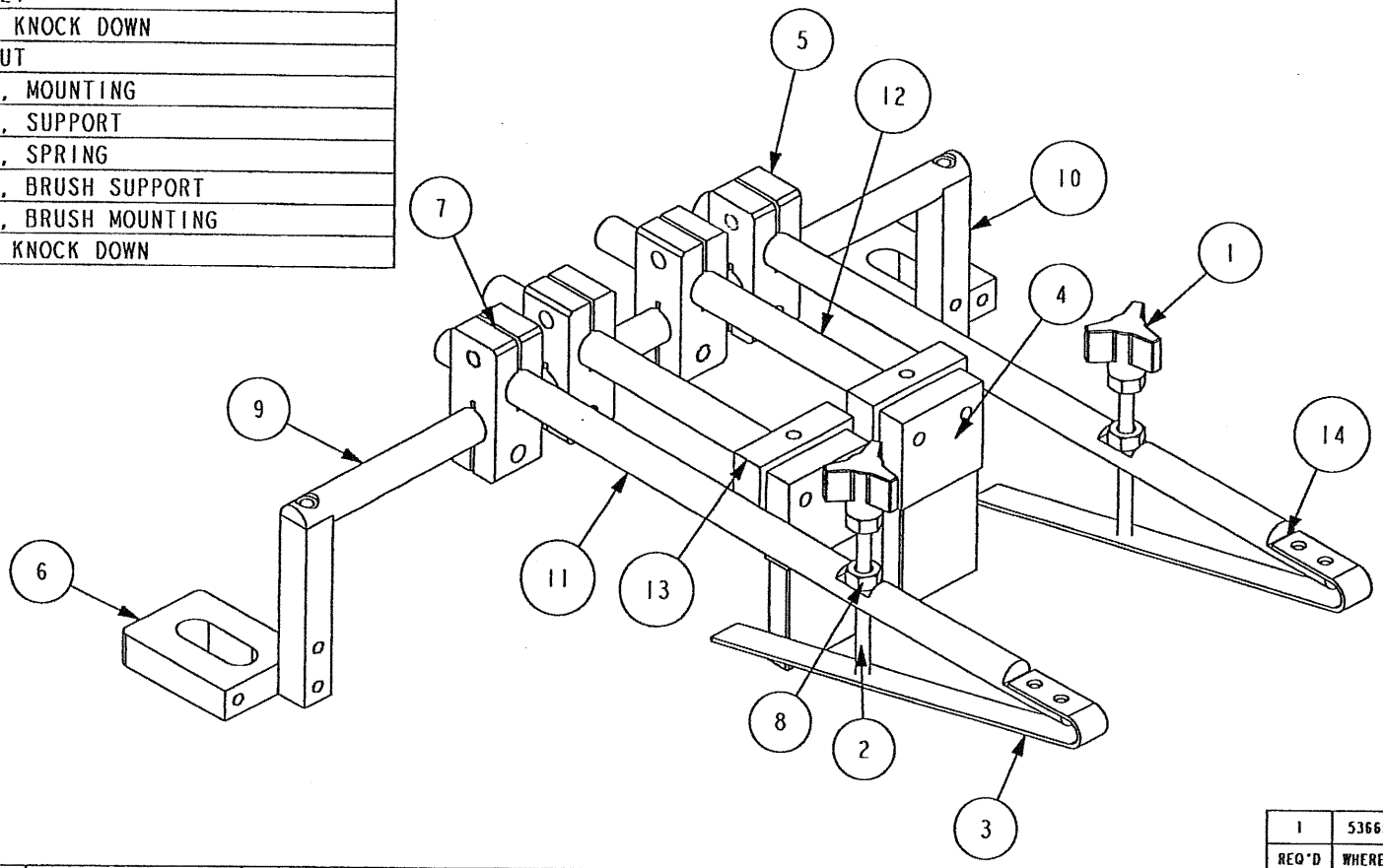
DRAWN BY: MY	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Jun-99			MODEL: 512	TITLE: ASSY, TAKE UP	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536656-01	

DRAWING #

536657-01

ITEM	QTY	PART #	DESCRIPTION
1	2	102117	KNOB
2	2	105628	ROD, 10-32 THD X 3.00
3	2	501904	SPRING, KNOCK DOWN
4	2	504866	BRUSH, PAPER HOLD DOWN
5	4	508593	CLAMP
6	2	508737	BRACKET
7	1	532880-01	ASSY, KNOCK DOWN
8	4	RHN010	HEX NUT
9	1	SP6360	SHAFT, MOUNTING
10	2	SP6361	BLOCK, SUPPORT
11	2	SP6362	SHAFT, SPRING
12	2	SP6363	SHAFT, BRUSH SUPPORT
13	2	SP6364	BLOCK, BRUSH MOUNTING
14	2	SP6362-A	ASSY, KNOCK DOWN

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.438	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	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 14-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, KNOCK DOWN
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536657-01

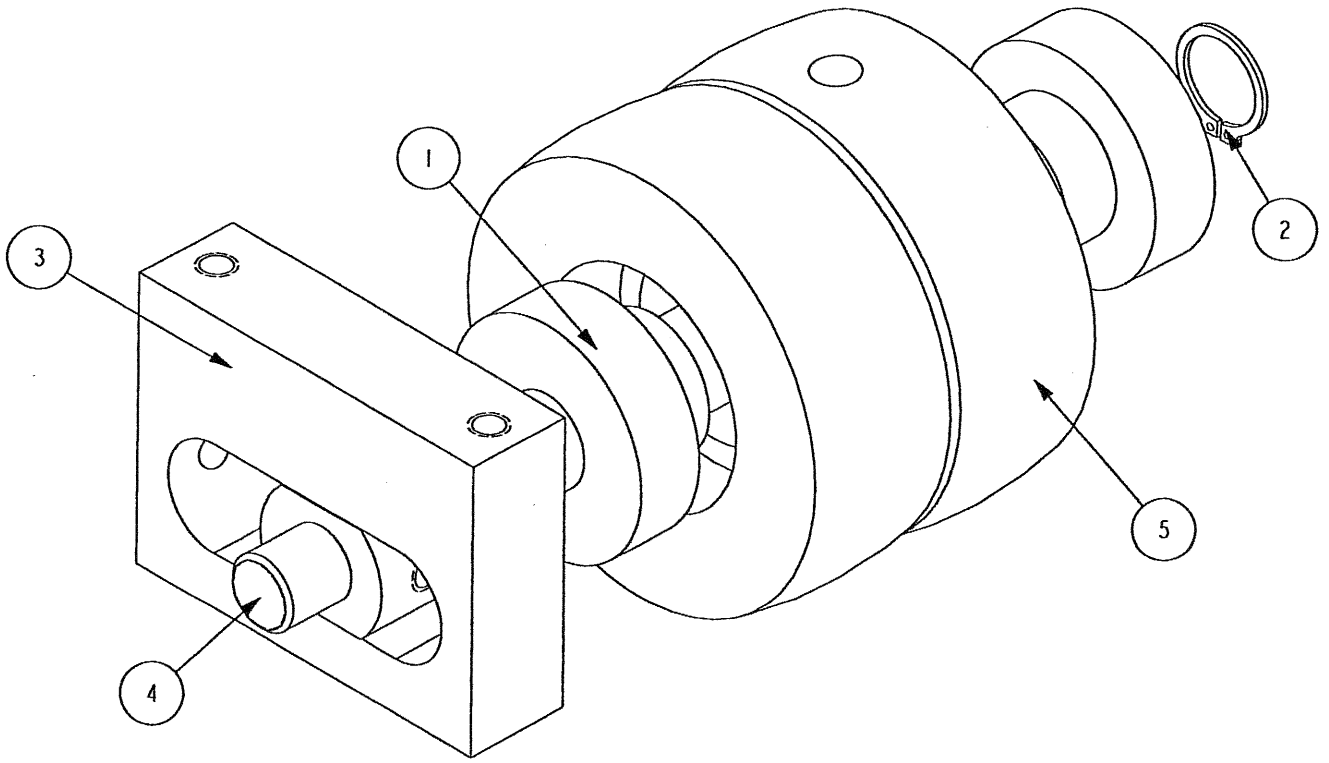
KIRK - RUDY, INC.
KENNESAW, GEORGIA

DRAWING #

53665. 1

ITEM	QTY	PART #	DESCRIPTION
1	2	103804	BEARING, HUB .625
2	1	104104	SNAPRING, .625
3	1	SP54222	BLOCK - BELT TAKE-UP
4	1	SP54223	STUD, BELT TAKE-UP
5	1	SP54212-1	ROLLER-IDLER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	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 14-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, ROLLER INFEED
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536658-01

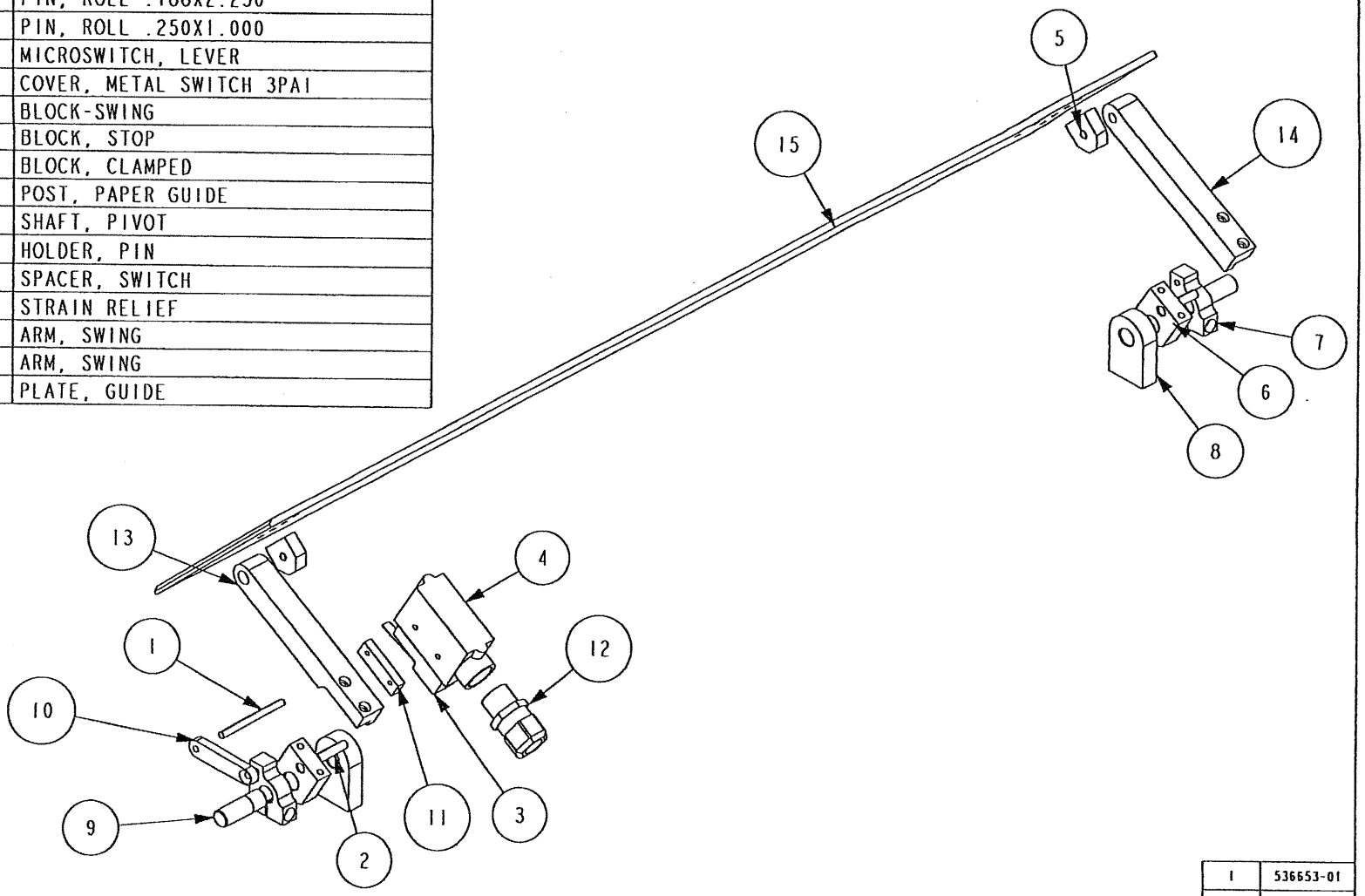
KIRK - RUDY, INC.
KENNESAW, GEORGIA

DRAWING #

536659-01

ITEM	QTY	PART #	DESCRIPTION
1	1	105212	PIN, ROLL .188X2.250
2	2	105213	PIN, ROLL .250X1.000
3	1	190101	MICROSWITCH, LEVER
4	1	201134	COVER, METAL SWITCH 3PA1
5	2	508535	BLOCK-SWING
6	2	508536	BLOCK, STOP
7	2	508537	BLOCK, CLAMPED
8	2	508538	POST, PAPER GUIDE
9	2	508791	SHAFT, PIVOT
10	1	508884	HOLDER, PIN
11	1	508888	SPACER, SWITCH
12	1	200323-1	STRAIN RELIEF
13	1	508518-L	ARM, SWING
14	1	508518-R	ARM, SWING
15	1	508608-3	PLATE, GUIDE

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

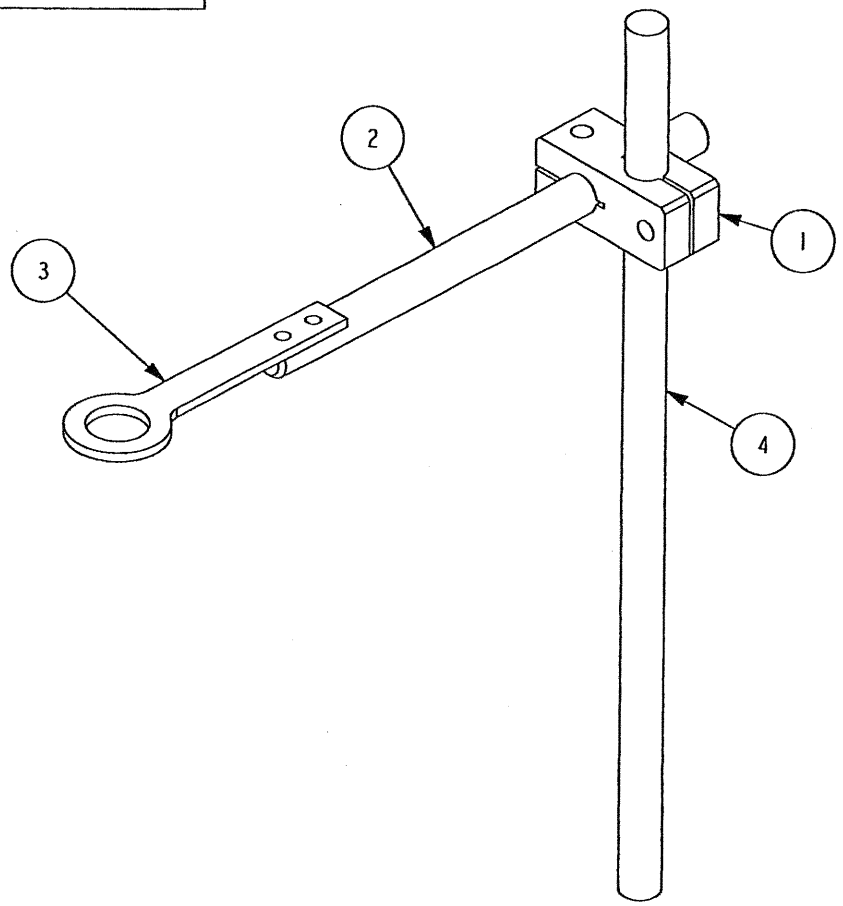
DRAWN BY: MY	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 15-Jun-99			MODEL: 512	TITLE: ASSY, JACKET GUIDE	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536659-01	

DRAWING #

53666 !

ITEM	QTY	PART #	DESCRIPTION
1	1	508593	CLAMP
2	1	508995	SHAFT-PHOTOCELL MOUNT
3	1	508996	BRACKET, PHOTOCELL
4	1	508842-1	SHAFT

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536653-01

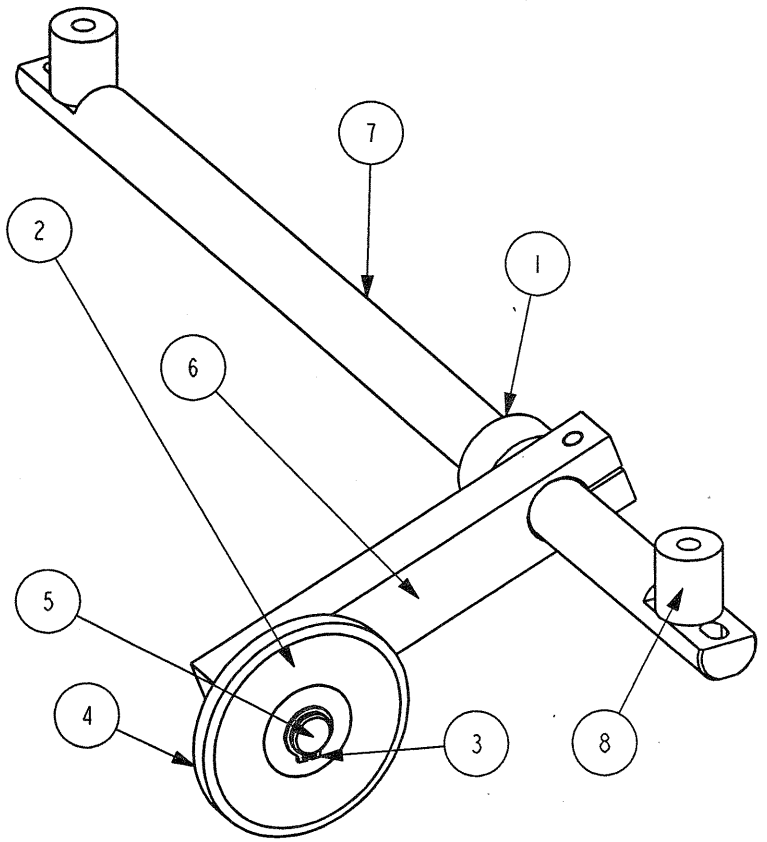
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 17-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, PHOTOSENSOR MOUNT	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536662-01	

DRAWING #

536663-01

ITEM	QTY	PART #	DESCRIPTION
1	1	102215	COLLAR .750
2	2	103108	BEARING, FLAT .500
3	1	104106	SNAPRING, .500
4	1	110469	SPRKT, 40B15 1.125B NK
5	1	508540	STUD
6	1	508684	ARM, TAKE UP
7	1	508781	SHAFT, TAKE UP
8	2	530712-01	SPACER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

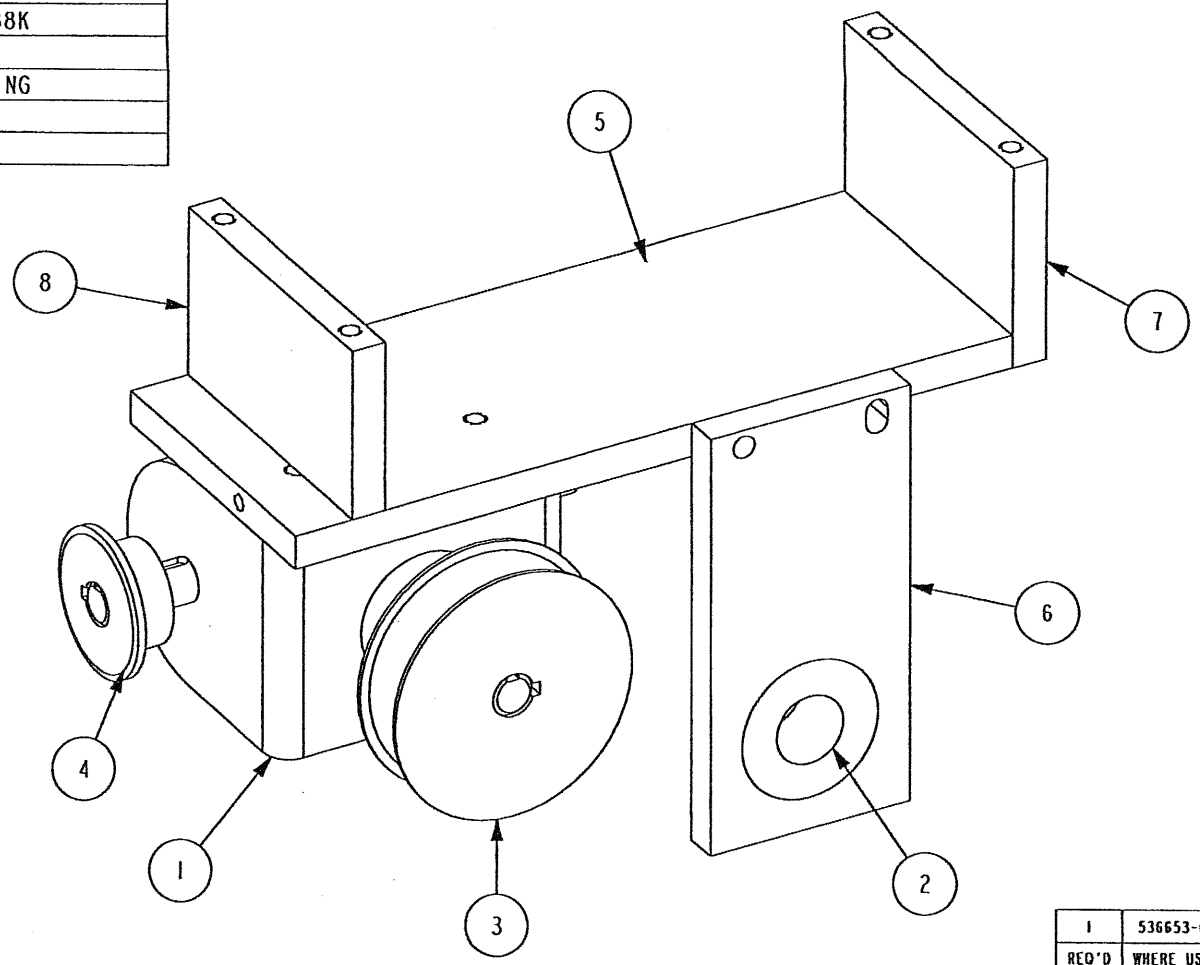
DRAWN BY: MY	SCALE 0:500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. WOODSTOCK, GA 30188 USA	KIRK - RUDY, INC. WOODSTOCK, GEORGIA
CHECKED BY:	DATE 17-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, TAKE UP	
TRACED BY:	MASTER: M	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536663-01	
		DO NOT SCALE - WORK TO DIMENSIONS ONLY				

DRAWING #

53666 I

ITEM	QTY	PART #	DESCRIPTION
1	1	101302	GEARBOX-VR15E
2	1	103808	BEARING, HUB 1.000
3	1	108817	PULLEY, TIMING 28L075 .625B .188K
4	1	110234	SPRKT, 35B16 .625B .188K
5	1	SP6309	PLATE, GEARBOX 15E
6	1	SP6310	PLATE, LINESHAFT BEARING
7	1	SP29105	SUPPORT - GEARBOX
8	1	SP29106	SUPPORT PLATE

REV NO	DATE	DESCRIPTION	ECN NO	BY



I	536653-01
REQ'D	WHERE USED

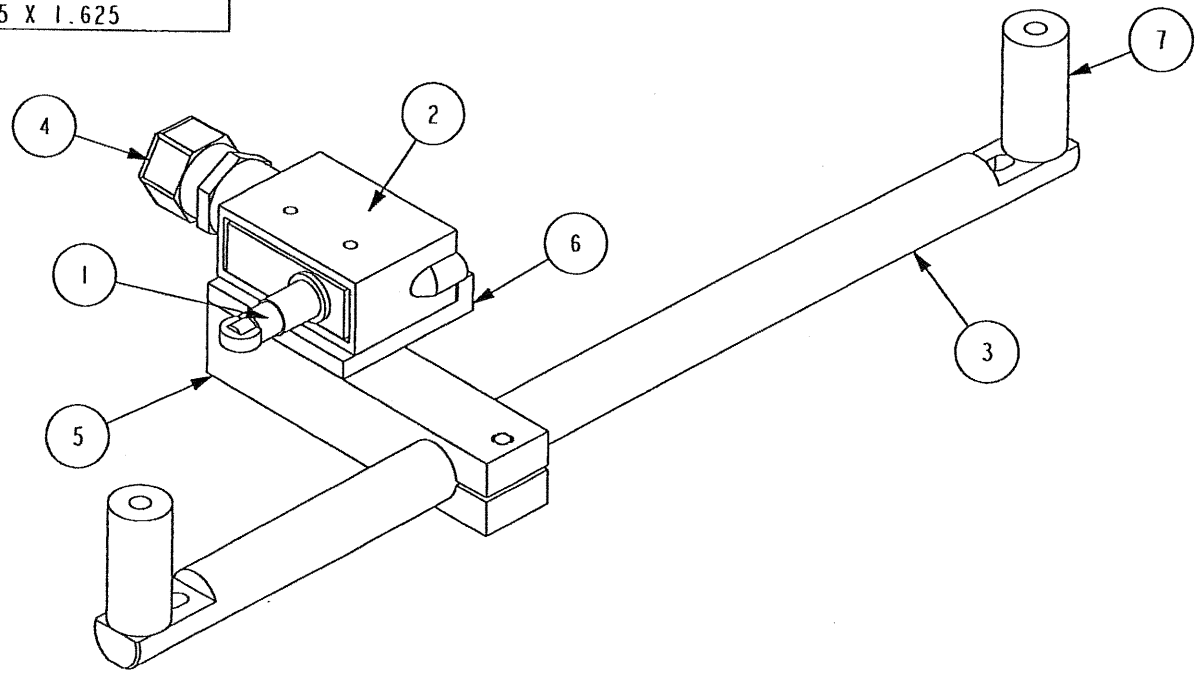
DRAWN BY: MY	SCALE 0.438	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 22-Jun-99			MODEL: 512	TITLE: ASSY, GEARBOX	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536664-01	

DRAWING #

536703-01

ITEM	QTY	PART #	DESCRIPTION
1	1	201049	SWITCH, MICRO BZ-2RQ181-A2
2	1	201134	COVER, METAL SWITCH 3PAI
3	1	508781	SHAFT, TAKE UP
4	1	200323-1	STRAIN RELIEF
5	1	536701-01	BAR, MOUTNING
6	1	536702-01	PLATE, MICROSWITCH MOUTNING
7	2	536704-01	SPACER, .257 X .75 X 1.625

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	536653-01
REQ'D	WHERE USED

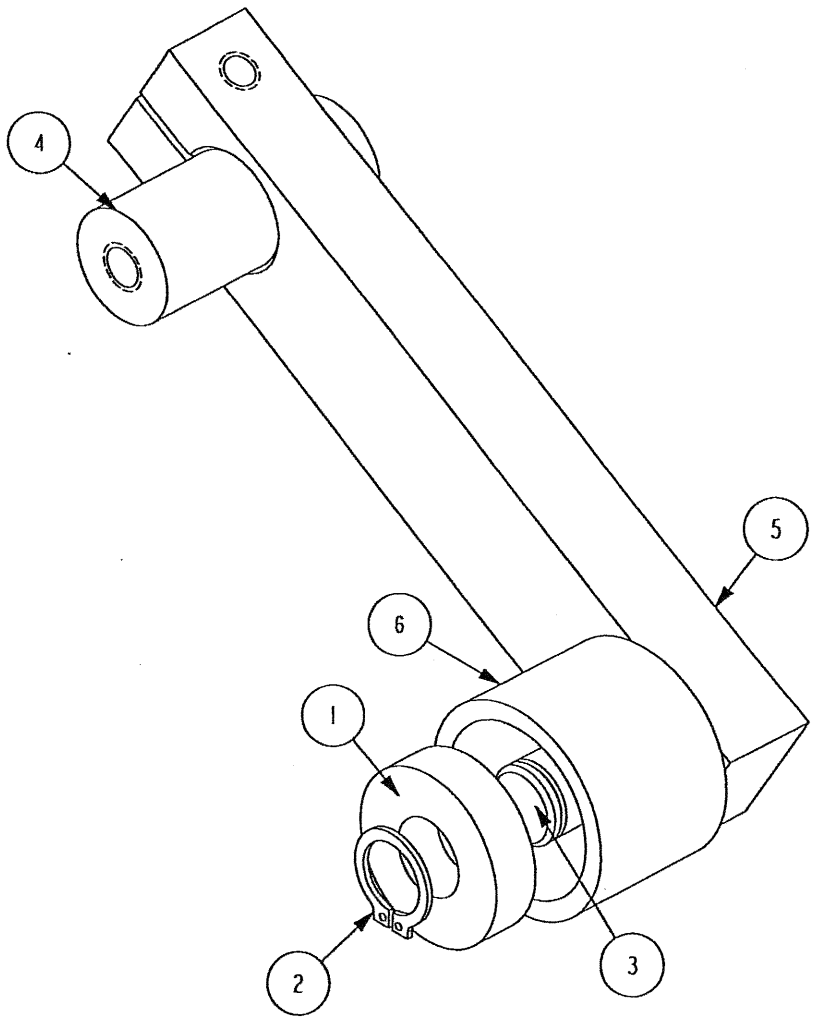
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 23-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, MICROSWITCH	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536703-01	

DRAWING #

53670 1

ITEM	QTY	PART #	DESCRIPTION
1	1	103108	BEARING, FLAT .500
2	1	104106	SNAPRING, .500
3	1	508540	STUD
4	1	508664	SPACER, PUMP SUPPORT
5	1	508684	ARM, TAKE UP
6	1	516045	ROLLER, BELT TAKEUP

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

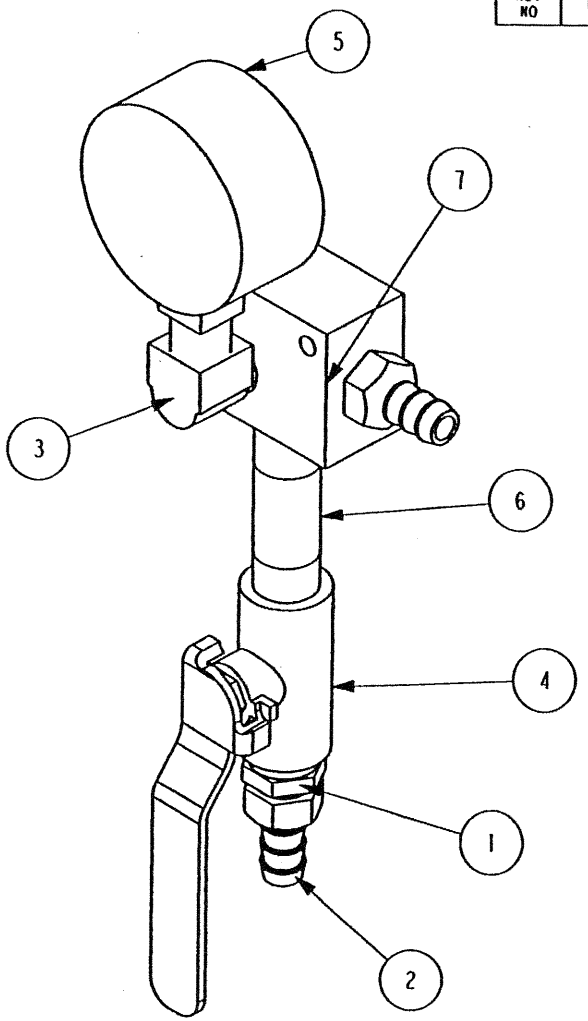
DRAWN BY: MY	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 28-Jun-99			MODEL: 512	TITLE: ASSY, TAKE UP	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536705-01	

DRAWING #

536707-01

ITEM	QTY	PART #	DESCRIPTION
1	1	109545	HEX BUSHING, 1/4 TO 3/8
2	2	190604	NIPPLE, VACUUM LINE
3	1	190606	FITTING - 90 DEG 1/4 NPT
4	1	190828	BALL VALVE, DYNAQUIP VMH2A9 3/8
5	1	200100-1	GAUGE, VACUUM GAST 822/823
6	1	200100-13	NIPPLE, STEEL
7	1	527952-1	BLOCK, VACUUM VALVE/GAUGE

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	512
REQ'D	WHERE USED

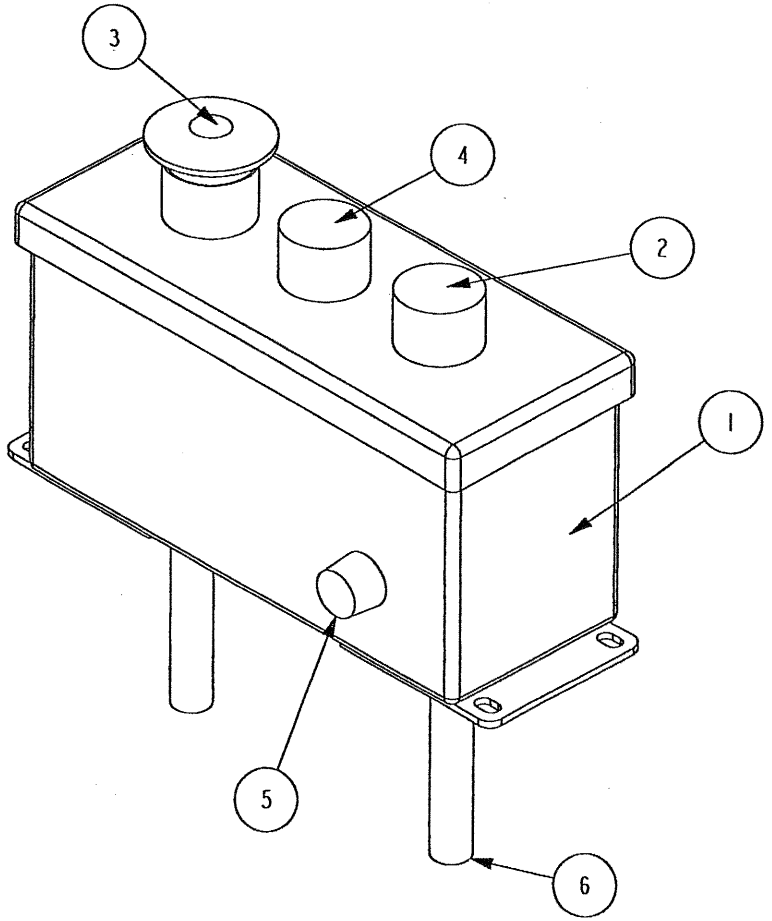
DRAWN BY: MY	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, VACUUM VALVE	
TRACED BY:	MASTER m		FINISH: N/A	SHEET NO.: 1 OF 1	DRAWING # 536707-01	

DRAWING #

53672. 01

ITEM	QTY	PART #	DESCRIPTION
1	1	200267-1	ELECTRICAL SWITCH BOX, 2 HOLE
2	1	201124-2	BUTTON, START
3	1	201125-4	BUTTON, MUSHROOM STOP
4	1	201126-1	BUTTON, JOG
5	1	209204-3	LENS, RED LIGHT
6	2	SP52707	SHAFT, SPACER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

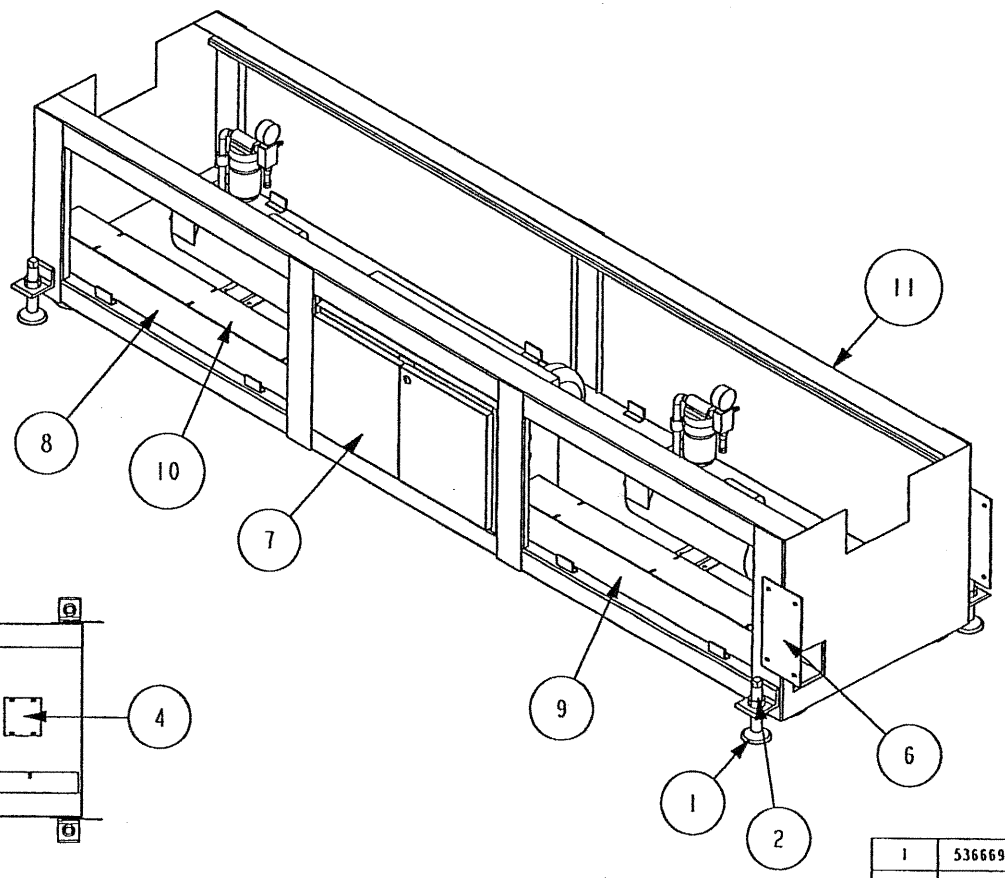
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: XXX	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 20-Aug-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: XXX	MODEL: 512	TITLE: ASSY, ELECTRICAL BUTTON BOX	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: XXX	SHEET NO.: 1OF1	DRAWING # 536727-01	

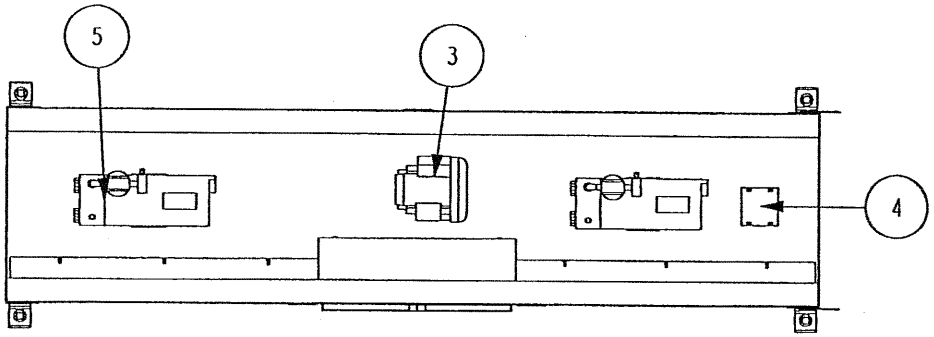
DRAWING #

536666-01

ITEM	QTY	PART #	DESCRIPTION
1	4	190634	FOOT, MOUNTING
2	4	191010	LEVELING BOLT, CABINET
3	1	200120	BLOWER, GAST
4	1	200257	BOX, ELECTRICAL 4.5 X 4.5
5	2	531168-01	ASSY, 1/2 HP VACUUM PUMP
6	2	536665-01	PLATE, SPLICE
7	1	536667-01	WLDMNT, ELECTRICAL BOX
8	1	536695-01	CHANNEL, WIRING 37 IN
9	1	536696-01	CHANNEL, WIRING 37 IN
10	2	536699-01	COVER, WIRING CHANNEL 37 IN
11	1	SP34401	WLDMNT, INFEED SECTION

REV NO	DATE	DESCRIPTION	ECN NO	BY





SCALE 0.047

1	536669-01
REQ'D	WHERE USED

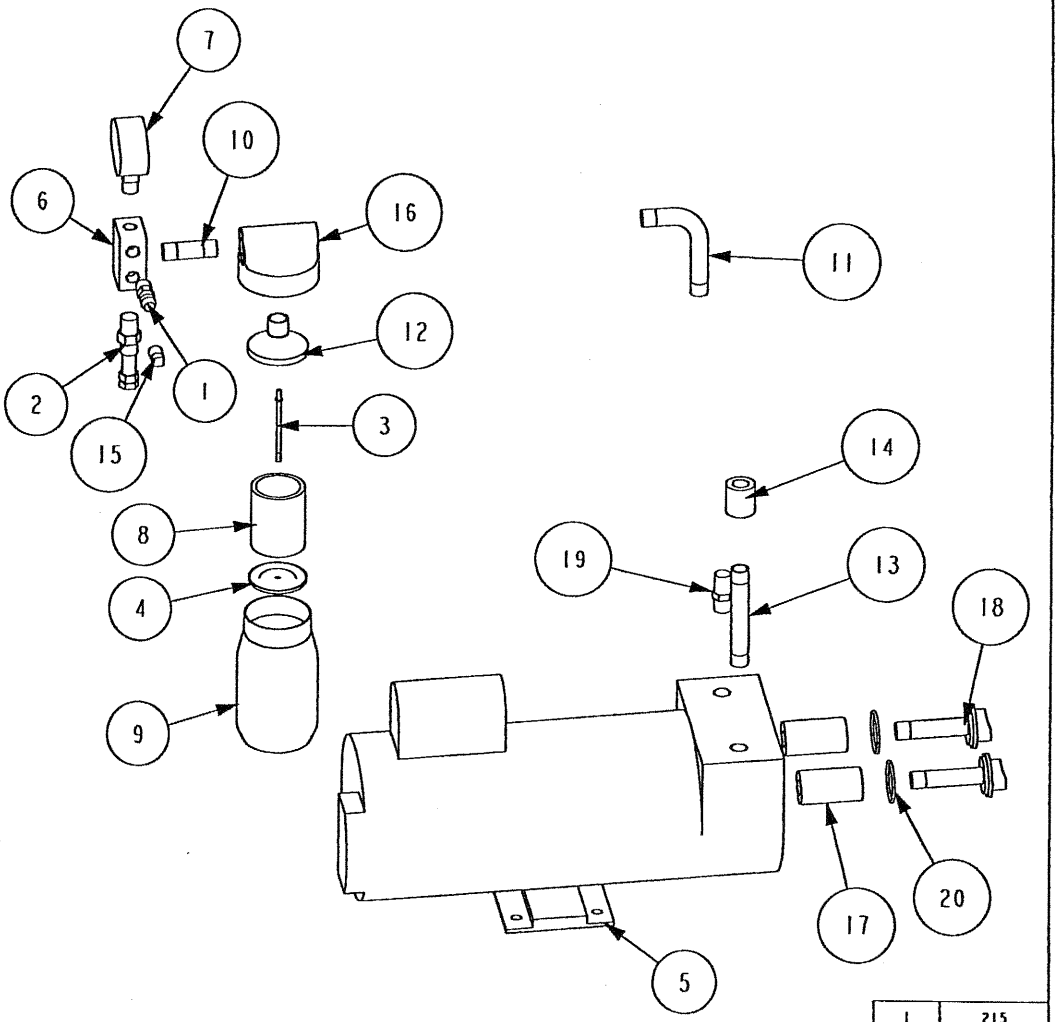
DRAWN BY: MY	SCALE 0.062	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 28-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, INFEED CABINET	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536666-01	

DRAWING #

531168-

ITEM	QTY	PART #	DESCRIPTION
1	1	190660	NIPPLE, 1/2 IN TUBING
2	1	200102	VALVE, RELIEF GAST 822/823
3	1	200108	STEM GAST 822/823
4	1	200109	PLATE GAST 822/823
5	1	200124	PUMP, VACUUM GAST
6	1	501645	BLOCK, CONNECTOR (VACUUM PUMP)
7	1	200100-1	GAUGE, VACUUM GAST 822/823
8	1	200100-2	FILTER, VACUUM GAST 822/823
9	1	200100-3	JAR, GLASS GAST 822/823
10	1	200100-13	NIPPLE, STEEL
11	1	200100-14	ELBOW, PIPE GAST 822/823
12	1	200100-16	COUPLING GAST 822/823
13	1	200100-21	NIPPLE, STEEL
14	1	200100-22	COUPLING, STEEL
15	1	200100-23	PLUG, SQUARE HEAD GAST 822/823
16	1	200100-26	COVER FOR AB992 GAST 822/823
17	2	200124-2	FILTER, FELT GAST 823
18	2	200124-4	END CAP, AK510 GAST 823
19	1	200124-5	MUFFLER, SINTERED GAST 823
20	2	200124-6	O-RING, GASKET GAST 823

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	215
REQ'D	WHERE USED

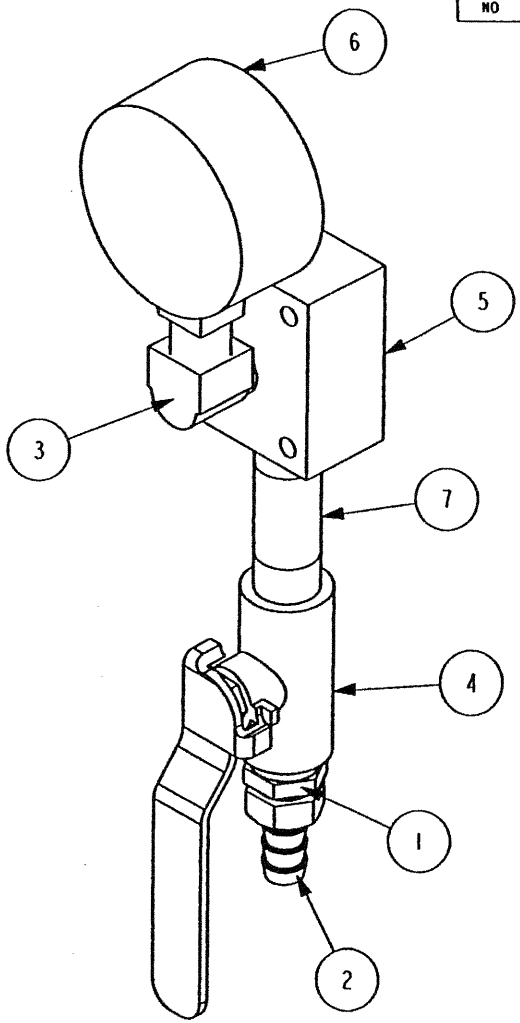
DRAWN BY: MY	SCALE 0.156	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: NOTED	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 20-Jun-97		HEAT TREAT: NONE	MODEL: X	TITLE: ASSY, 1/2 HP VACUUM PUMP	
TRACED BY:	MASTER M		FINISH: NONE	SHEET NO.: 1OF1	DRAWING # 531168-01	

DRAWING #

536706-01

ITEM	QTY	PART #	DESCRIPTION
1	1	109545	HEX BUSHING, 1/4 TO 3/8
2	2	190604	NIPPLE, VACUUM LINE
3	1	190606	FITTING - 90 DEG 1/4 NPT
4	1	190828	BALL VALVE, DYNAQUIP VMH2A9 3/8
5	1	527952	BLOCK, VACUUM VALVE/GAUGE
6	1	200100-1	GAUGE, VACUUM GAST 822/823
7	1	200100-13	NIPPLE, STEEL

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	512
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 25-Jun-99			MODEL: 512	TITLE: ASSY, VACUUM VALVE	
TRACED BY:	MASTER m			SHEET NO.: 1 OF 1	DRAWING # 536706-01	

KR512 MODULAR SECTION

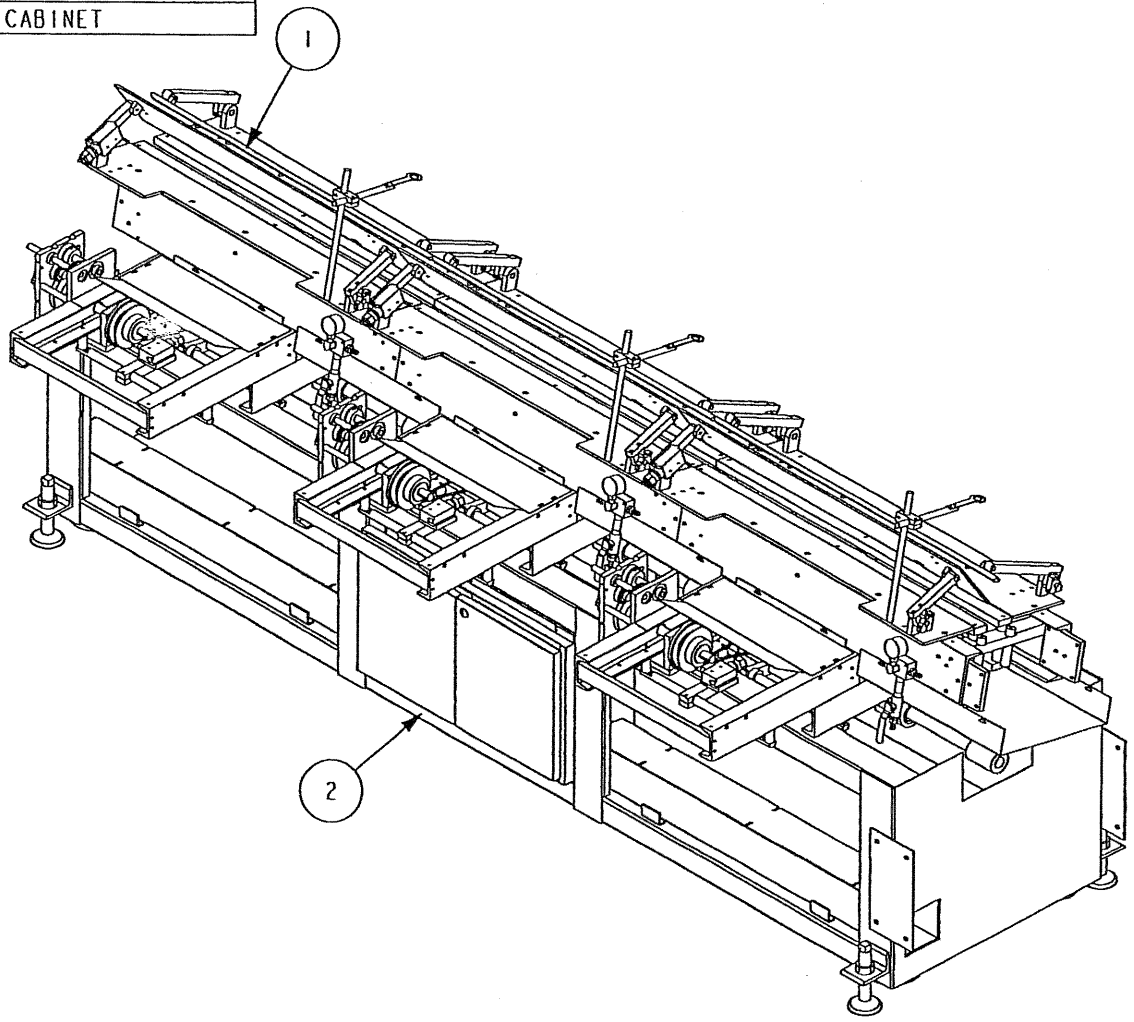
ASSEMBLY NUMBER	DESCRIPTION
536838-01	ASSY, KR 512 3 STATION
534734-01	ASSY, 324-1 FEEDER (SEE KR324-1 MANUAL)
536708-01	ASSY, MODULAR STATION
533749-01	ASSY, GEAR BOX RH
535201-02	ASSY, SIDE GUIDES
536659-01	ASSY, JACKET GUIDE
536662-01	ASSY, PHOTOSENSOR MOUNT
536663-01	ASSY, TAKE UP
536703-01	ASSY, MICROSWITCH
536707-01	ASSY, VACUUM VALVE
536709-01	ASSY, CHNL FRAMES MODULAR STATION
535446-01	ASSY, FRAME SPACER
535447-01	ASSY, FRAME SPACER
536836-01	ASSY, CABINET 3 STATION

DRAWING #

536838-01

ITEM	QTY	PART #	DESCRIPTION
1	3	536708-01	ASSY, MODULAR STATION
2	1	536836-01	ASSY, 3 STATION CABINET

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	512
REQ'D	WHERE USED

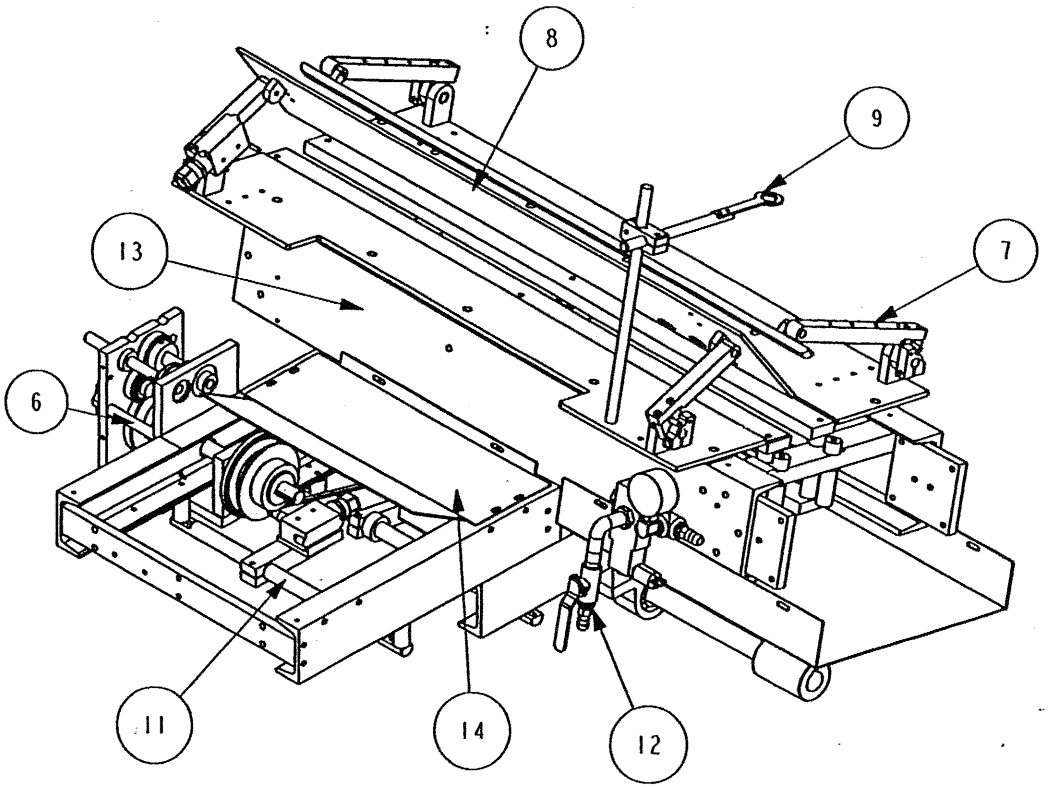
DRAWN BY: MY	SCALE 0.070	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 19-Aug-99			MODEL: 512	TITLE: ASSY, KR512 3 STATION MODULAR	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536838-01	

DRAWING #

536708

ITEM	QTY	PART #	DESCRIPTION
1	1	101205	COUPLING
2	2	103706	BEARING, PILLOW BLOCK 1.00 SHAFT
3	1	110431	SPRKT, 40B16 1.000B .250K
4	1	508852	SHAFT, DRIVE
5	1	110019-6	CHAIN, #40
6	1	533749-01	ASSY, GEAR BOX RH
7	1	535201-02	ASSY, SIDE GUIDES
8	1	536659-01	ASSY, JACKET GUIDE
9	1	536662-01	ASSY, PHOTOSENSOR MOUNT
10	1	536663-01	ASSY, TAKE UP
11	1	536703-01	ASSY, MICROSWITCH
12	1	536707-02	ASSY, VACUUM VALVE
13	1	536709-01	ASSY, CHNL FRAMES MODULAR STATI
14	1	536726-01	COVER, FEEDER CLUTCH
15	1	SP29101	MOUNT, MOTOR
16	1	SP29102	COVER, FAN INSERT
17	1	SP29103	COVER, FAN INSERT
18	2	SP29108	SPACER, BEARING

REV NO	DATE	DESCRIPTION	ECN NO	BY
1	12/27/2001	ADDED CORRECT VACUUM VALVE ASSEMBLY	6772	RSH



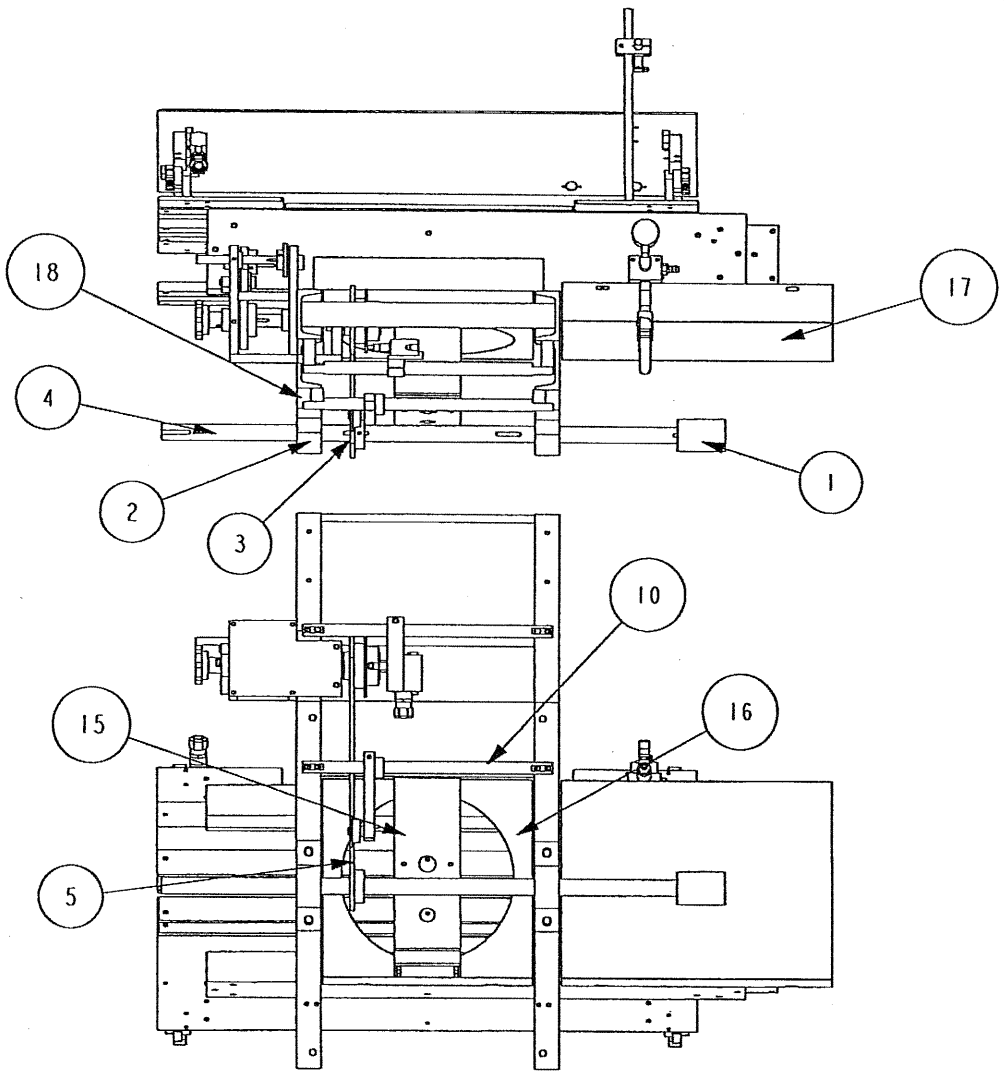
REQ'D	WHERE USED
1	536838-01

DRAWN BY: JLG	SCALE 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 29-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, MODULAR STATION	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF2	DRAWING # 536708-01	

DRAWING #

536708-01

REV NO	DATE	DESCRIPTION	ECN NO	BY



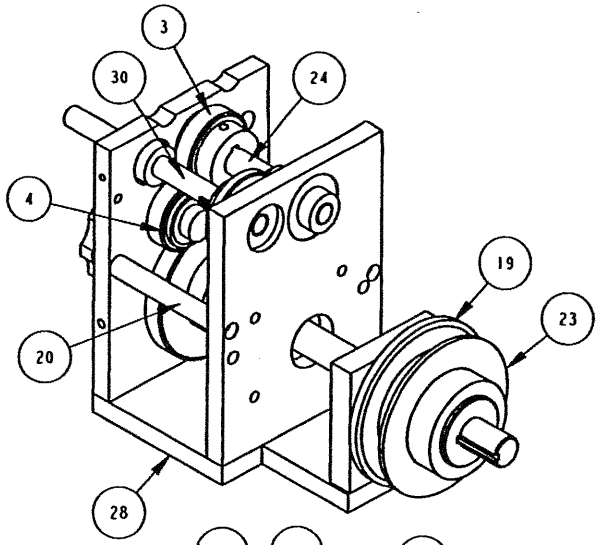
ITEM	DRAWING #
1	536838-01
REQ'D	WHERE USED

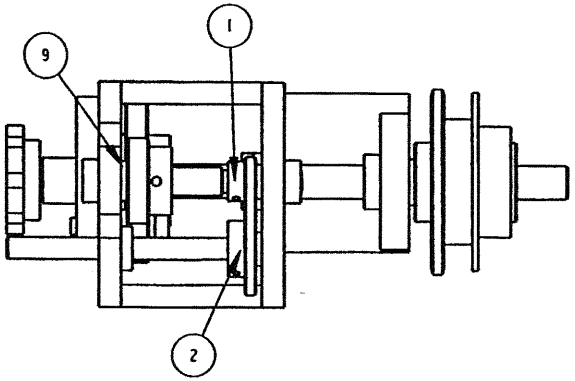
DRAWN BY: JLG	SCALE 0.094	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 .XXX .005 ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 29-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, MODULAR STATION	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 2OF2	DRAWING # 536708-01	

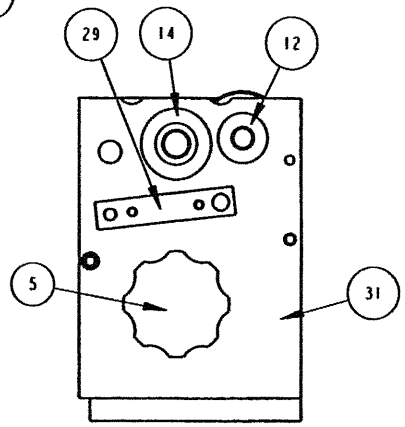
533749-01

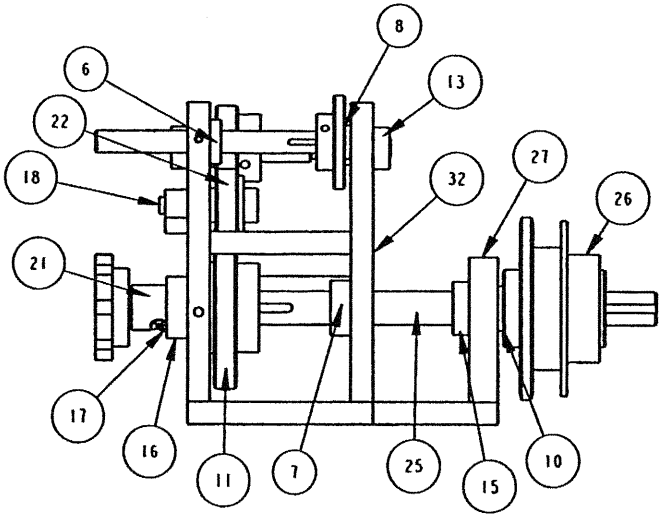
ITEM	QTY	PART #	DESCRIPTION
1	1	101610	GEAR, 2424 .500B .125K
2	1	101611	GEAR, 2448 .500B .125K
3	1	101964	GEAR, 1628 .625B .188K
4	1	101965	GEAR, 1624 1.124B NK
5	1	102112	KNOB, PURCHASED
6	1	102205	COLLAR .500
7	1	102215	COLLAR .750
8	3	102301	SHIM, .500X.750X.125
9	1	102309	SHIM, .625X.875X.125
10	1	102334	SHIM, .750X1.000X.125
11	1	102497	GEAR, 1656 .750B NK
12	4	103108	BEARING, FLAT .500
13	1	103803	BEARING, HUB .500
14	1	103804	BEARING, HUB .625
15	1	103805	BEARING, HUB .750
16	1	103808	BEARING, HUB 1.000
17	1	105413	DOWEL, PIN .250X.750
18	1	107251	BOLT, SHOULDER 1/2X1-1/4
19	1	111111	SPRKT, 40A24 1.7328B
20	2	508785	SPACER, PLATE
21	1	508943	SLEEVE, DISCONNECT
22	1	101965-A	ASSY, IDLER GEAR
23	1	104039-2	CLUTCH, MAYR SIZE 1
24	1	508770-1	SHAFT, FEEDER DRIVE
25	1	508772-1	SHAFT, FEEDER DRIVE
26	1	535748-01	ASSY, CLUTCH & SPROCKET
27	1	SP25232	PLATE, BEARING
28	1	SP25233	PLATE, BOTTOM
29	1	SP25234	PLATE, STUD MOUNTING
30	1	SP25236	SHAFT, CAM
31	1	SP25230-1	PLATE-DISCONNECT
32	1	SP25231-1	PLATE, SUPPORT

REV NO	DATE	DESCRIPTION	ECN NO	BY
1	12/17/2000	CORRECTED CLUTCH PART NUMBER WAS 104040-2		TJG









REQ'D	WHERE USED
1	512

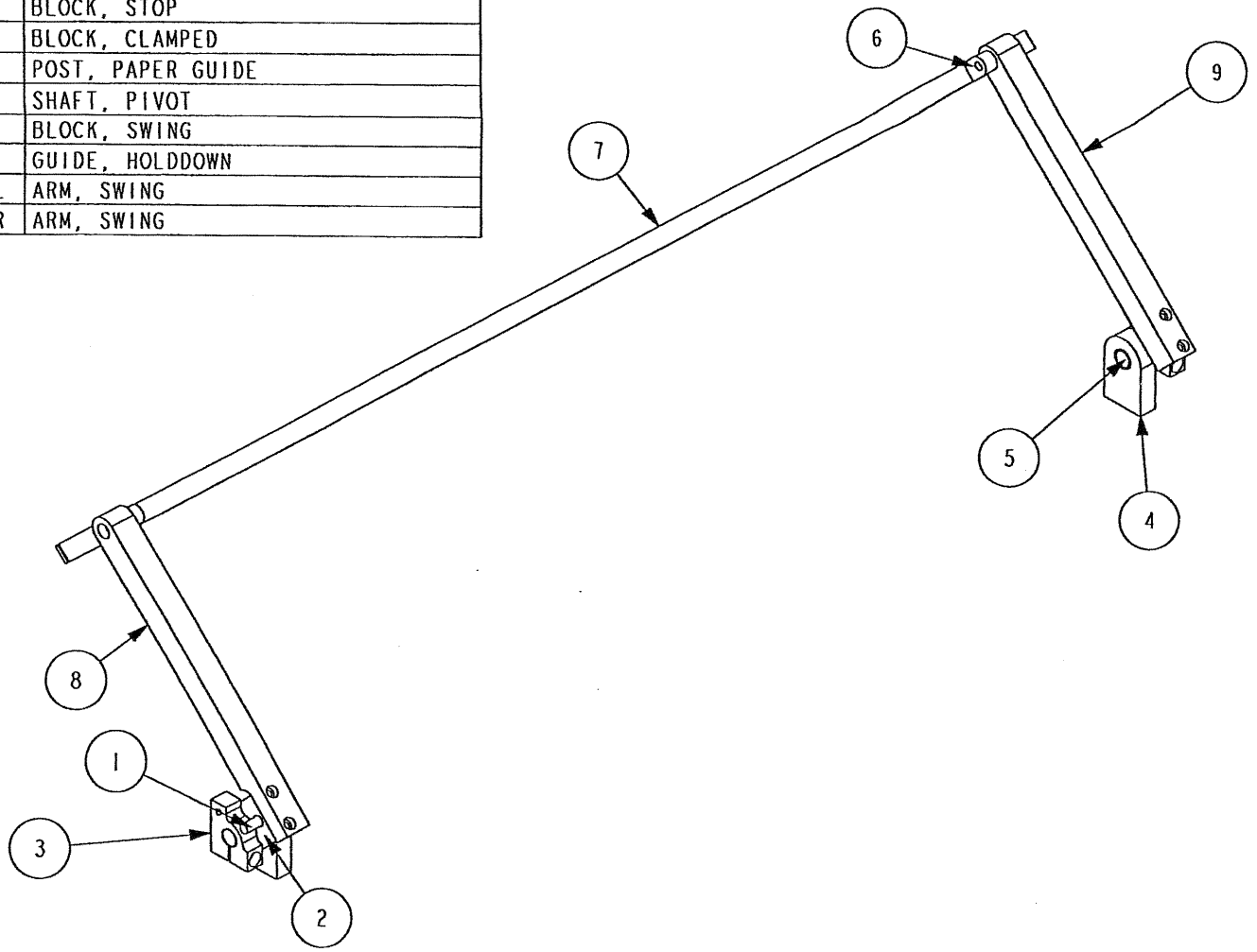
DRAWN BY: RHM	SCALE: 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.030, .XXX ±.005, ANGLES ±.5. REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: NOTED	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL. 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
CHECKED BY:	DATE: 23-Jun-99		HEAT TREAT: NONE	MODEL: 512	KIRK - RUDY, INC. KENNESAW, GEORGIA
TRACED BY:	MASTER		FINISH: NOTED	SHEET NO: 1OF1	TITLE: ASSY, GEAR BOX RH
					DRAWING #: 533749-01

DRAWING #

535201-02

ITEM	QTY	PART #	DESCRIPTION
1	1	105223	PIN, ROLL 1/4 X 1.000
2	2	508536	BLOCK, STOP
3	2	508537	BLOCK, CLAMPED
4	2	508538	POST, PAPER GUIDE
5	2	508791	SHAFT, PIVOT
6	2	SP12135	BLOCK, SWING
7	1	SP12136	GUIDE, HOLDDOWN
8	1	SP12132-L	ARM, SWING
9	1	SP12132-R	ARM, SWING

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536653-01

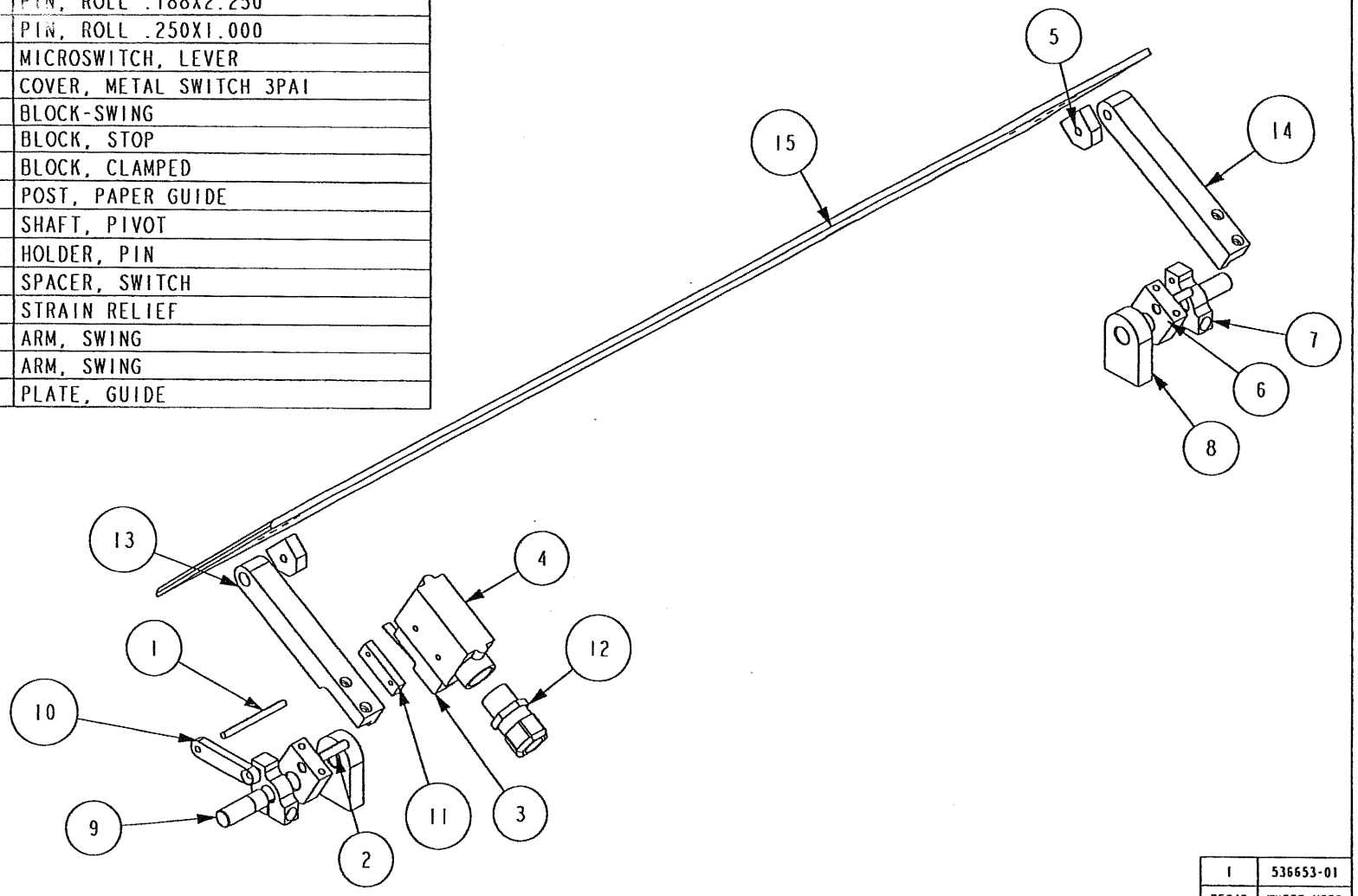
DRAWN BY: MY	SCALE: 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 18-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, SIDE GUIDES	
TRACED BY:	MASTER: M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING #: 535201-02	

DRAWING #

536659-01

ITEM	QTY	PART #	DESCRIPTION
1	1	105212	PIN, ROLL .188X2.250
2	2	105213	PIN, ROLL .250X1.000
3	1	190101	MICROSWITCH, LEVER
4	1	201134	COVER, METAL SWITCH 3PAI
5	2	508535	BLOCK-SWING
6	2	508536	BLOCK, STOP
7	2	508537	BLOCK, CLAMPED
8	2	508538	POST, PAPER GUIDE
9	2	508791	SHAFT, PIVOT
10	1	508884	HOLDER, PIN
11	1	508888	SPACER, SWITCH
12	1	200323-1	STRAIN RELIEF
13	1	508518-L	ARM, SWING
14	1	508518-R	ARM, SWING
15	1	508608-3	PLATE, GUIDE

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536653-01

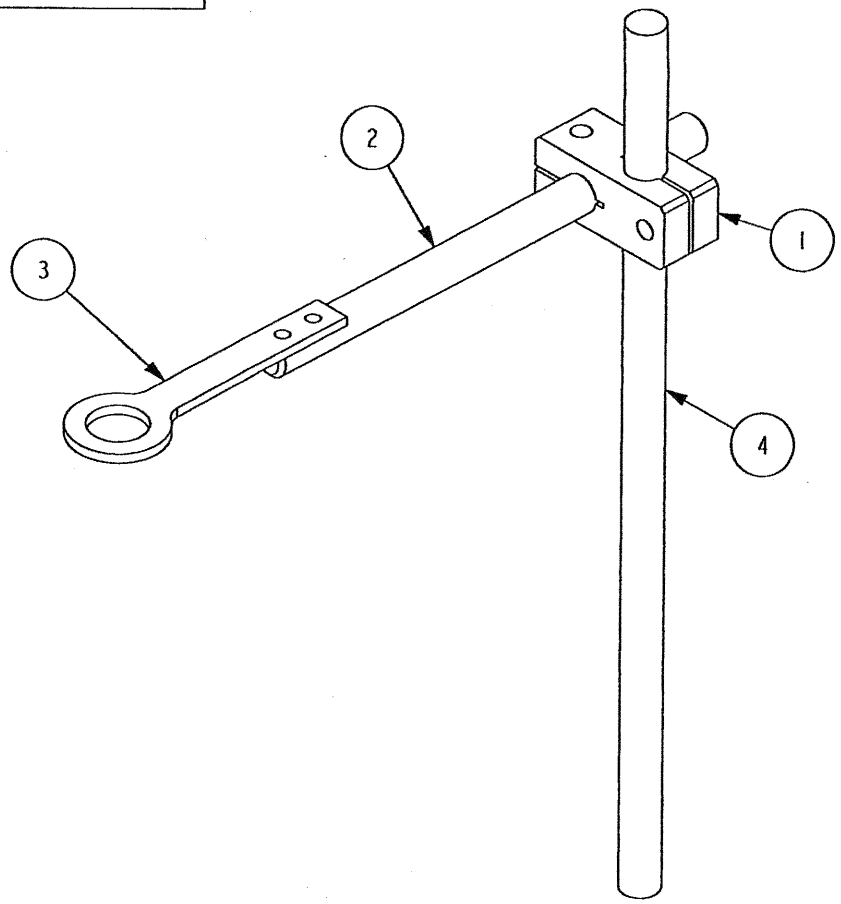
DRAWN BY: MY	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 15-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, JACKET GUIDE	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536659-01	

DRAWING #

536662-01

ITEM	QTY	PART #	DESCRIPTION
1	1	508593	CLAMP
2	1	508995	SHAFT-PHOTOCELL MOUNT
3	1	508996	BRACKET, PHOTOCELL
4	1	508842-1	SHAFT

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536653-01

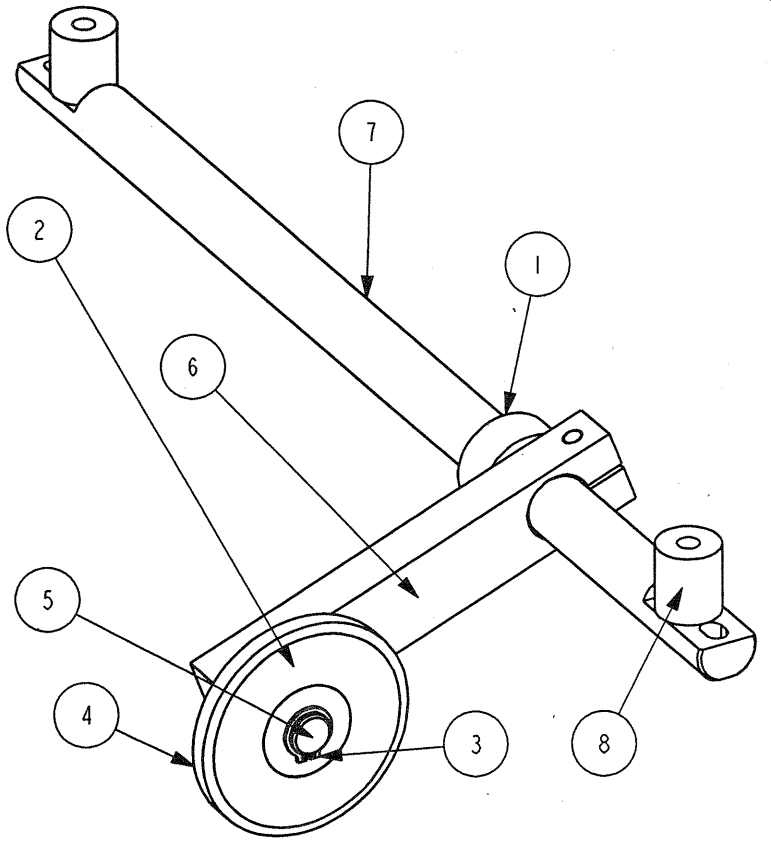
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 17-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, PHOTOSENSOR MOUNT	
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536662-01	

DRAWING #

536663-01

ITEM	QTY	PART #	DESCRIPTION
1	1	102215	COLLAR .750
2	2	103108	BEARING, FLAT .500
3	1	104106	SNAPRING, .500
4	1	110469	SPRKT, 40B15 1.125B NK
5	1	508540	STUD
6	1	508684	ARM, TAKE UP
7	1	508781	SHAFT, TAKE UP
8	2	530712-01	SPACER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

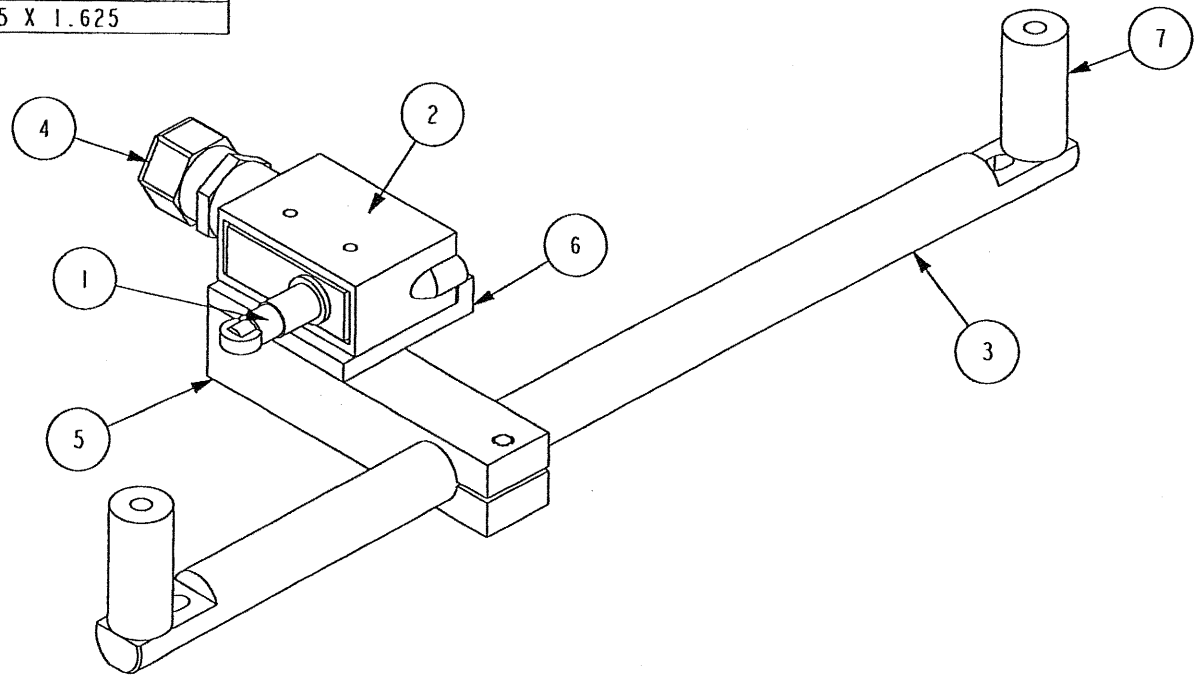
DRAWN BY: MY	SCALE 0:500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. WOODSTOCK, GA 30188 USA	KIRK - RUDY, INC. WOODSTOCK, GEORGIA
CHECKED BY:	DATE 17-Jun-99			MODEL: 512	TITLE: ASSY, TAKE UP	
TRACED BY:	MASTER: M			SHEET NO.: 1 OF 1	DRAWING # 536663-01	

DRAWING #

536703-01

ITEM	QTY	PART #	DESCRIPTION
1	1	201049	SWITCH, MICRO BZ-2RQ181-A2
2	1	201134	COVER, METAL SWITCH 3PA1
3	1	508781	SHAFT, TAKE UP
4	1	200323-1	STRAIN RELIEF
5	1	536701-01	BAR, MOUTNING
6	1	536702-01	PLATE, MICROSWITCH MOUTNING
7	2	536704-01	SPACER, .257 X .75 X 1.625

REV NO	DATE	DESCRIPTION	ECN NO	BY



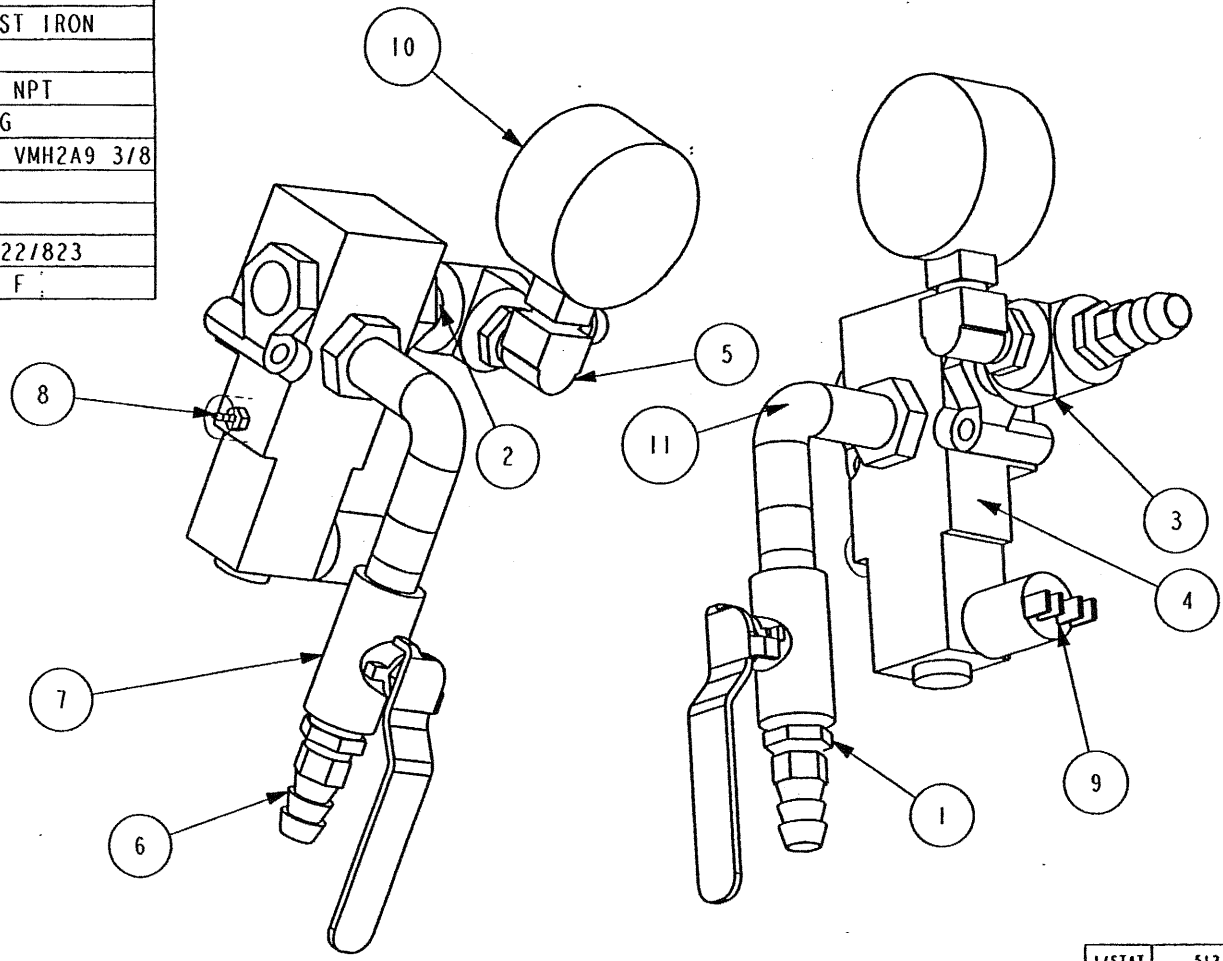
2	536653-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE: 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED (.XX .01 / .XXX .005 / ANG. .5) REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 23-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, MICROSWITCH	
TRACED BY:	MASTER: M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536703-01	

536707

ITEM	QTY	PART #	DESCRIPTION
1	3	109545	HEX BUSHING, 1/4 TO 3/8
2	2	109577	NIPPLE, STEEL
3	1	109581	TEE, 3/8" FITTING CAST IRON
4	1	109677	VALVE, AIR 24VDC
5	1	190606	FITTING - 90 DEG 1/4 NPT
6	2	190660	NIPPLE, 1/2 IN TUBING
7	1	190828	BALL VALVE, DYNAQUIP VMH2A9 3/8
8	1	190863	NIPPLE, CLIPPARD
9	1	200400	PLUG, 2-PIN
10	1	200100-1	GAUGE, VACUUM GAST 822/823
11	1	200124-9	ELBOW, 3/8 NPT M W/ F

REV NO	DATE	DESCRIPTION	ECN NO	BY



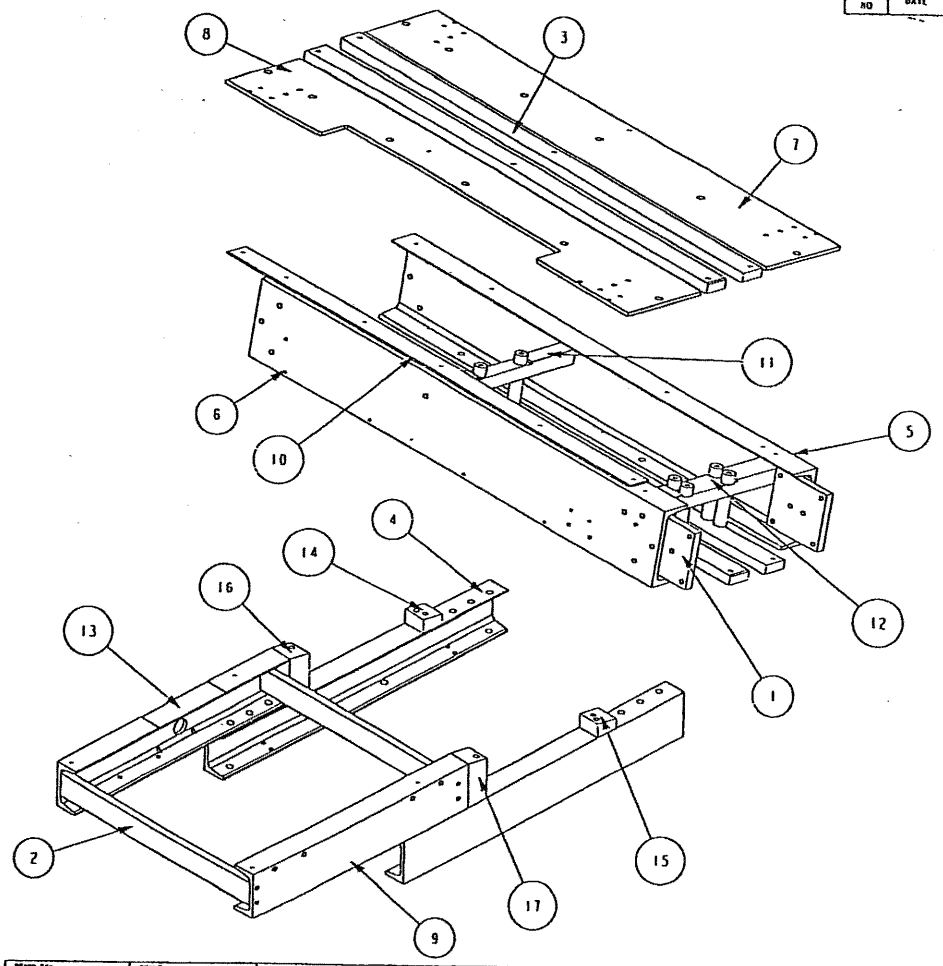
I/STAT	512
REQ'D	WHERE USED

DRAWN BY: RSH	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 1-NOV-01			MODEL: 512	TITLE: ASSY, VACUUM VALVE	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536707-02	

ITEM	QTY	PART #	DESCRIPTION
1	2	508554	PLATE, CONNECTING
2	2	508788	BAR-CROSS
3	4	530457	TRACK, FLIGHT 331N
4	2	508603-1	CHANNEL
5	1	508701-L	CHANNEL, LH
6	1	508701-R	CHANNEL, RH
7	1	508711-4L	TOP, TABLE LH
8	1	508711-4R	TOP, TABLE
9	1	508903-3	CHANNEL, UPPER CROSS
10	1	530701-01	SPACER, TABLETOP
11	1	535446-01	ASSY, FRAME SPACER
12	1	535447-01	ASSY, FRAME SPACER
13	1	SP25201	CHANNEL, UPPER CROSS
14	1	SP6301-1L	SUPPORT, CHANNEL LH
15	1	SP6301-1R	SUPPORT, CHANNEL RH
16	1	SP6301-L	SUPPORT, CHANNEL LH
17	1	SP6301-R	SUPPORT, CHANNEL RH

536709-01

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	

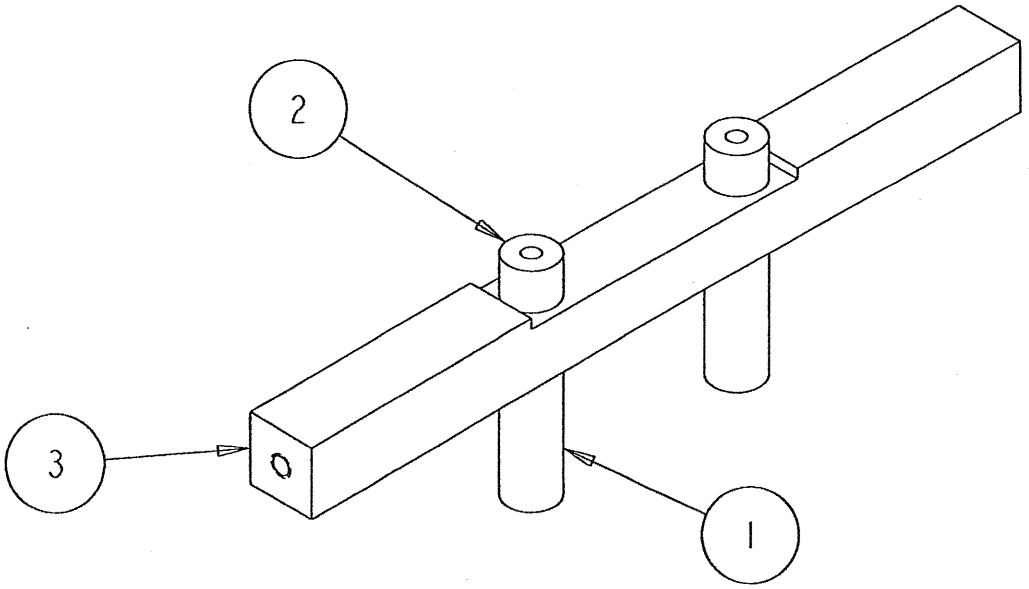
DRAWN BY: JLG	SCALE: 0.156	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.01, .XXX ±.005, ANG ±1; REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED; ALL DIMENSIONS ARE FINISHED DIMENSIONS; DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A; HEAT TREAT: N/A; FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED OR USED FOR ANY PURPOSE WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 29-JUN-99			MODEL: 512	TITLE: ASSY, CHNL FRAMES MODULAR STATION	
ISSUED BY:	MASTER: M			SHEET NO: 1OF1	DRAWING #: 536709-01	

DRAWING #

5354

ITEM	QTY	PART #	DESCRIPTION
1	2	102380	SPACER, .257X.750X1.937
2	2	102381	SPACER, .257X.750X.600
3	1	SP6302-1	BAR, CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



4	535510-01
REQ'D	WHERE USED

DRAWN BY: TJG

SCALE: 0.500

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: XXX

HEAT TREAT: XXX

FINISH: XXX

THIRD ANGLE PROJECTION

KIRK - RUDY, INC.
KENNESAW, GEORGIA

CHECKED BY:

DATE: 25-Jan-99

TRACED BY:

MASTER

MODEL: 512

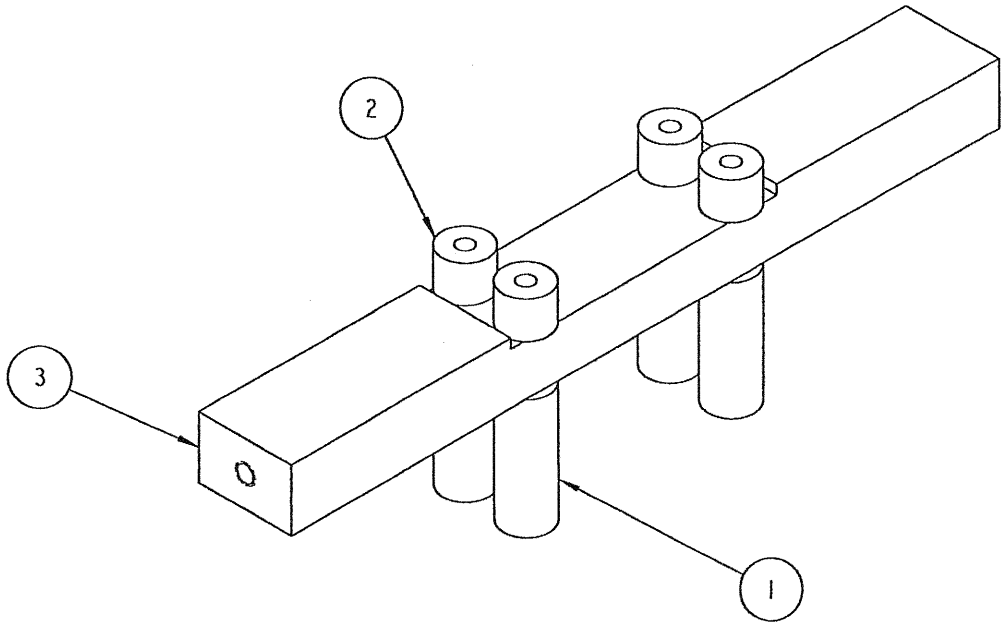
SHEET NO.: 1OF1

TITLE: ASSY, FRAME SPACER

DRAWING #: 535446-01

ITEM	QTY	PART #	DESCRIPTION
1	4	102380	SPACER, .257X.750X1.937
2	4	102381	SPACER, .257X.750X.600
3	1	SP6913-1	BAR, WIDE CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	535510-01
REQ'D	WHERE USED

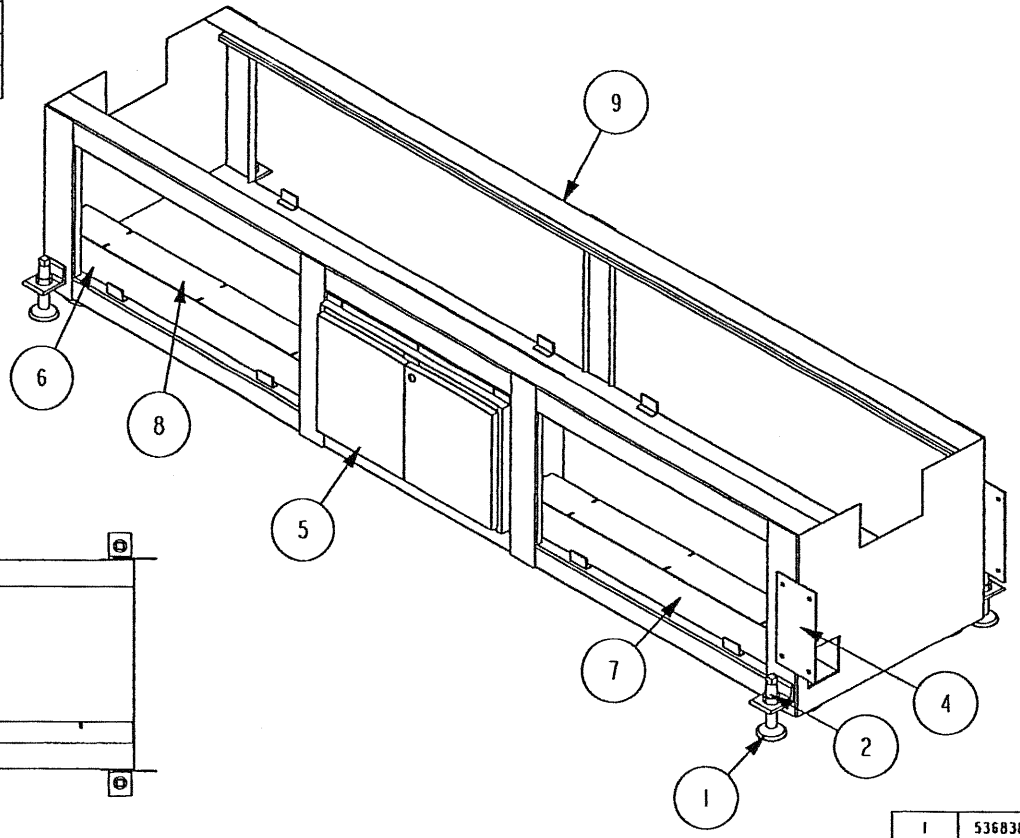
DRAWN BY: TJG	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED (.XX .01; .XXX .005; ANG. .5)	MATERIAL: XXX	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 29-Jan-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: XXX	MODEL: 512	TITLE: ASSY, FRAME SPACER	
TRACED BY:	MASTER m	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY.	FINISH: XXX	SHEET NO.: 1OF1	DRAWING # 535447-01	

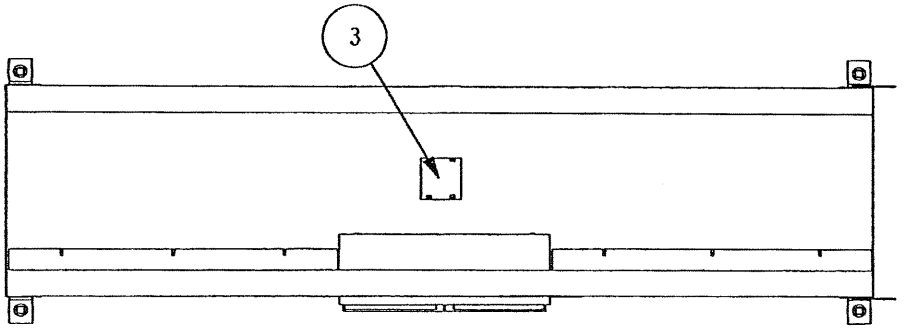
DRAWING #

5368? 1

ITEM	QTY	PART #	DESCRIPTION
1	4	190634	FOOT, MOUNTING
2	4	191010	LEVELING BOLT, CABINET
3	1	200257	BOX, ELECTRICAL 4.5 X 4.5
4	2	536665-01	PLATE, SPLICE
5	1	536667-01	WLDMNT, ELECTRICAL BOX
6	1	536695-01	CHANNEL, WIRING 37 IN
7	1	536696-01	CHANNEL, WIRING 37 IN
8	2	536699-01	COVER, WIRING CHANNEL 37 IN
9	1	SP34401-2	WDLMNT, 99IN INSERTER SECTION

REV NO	DATE	DESCRIPTION	ECN NO	BY





SCALE 0.050

1	536838-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.062	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION		KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 19-Aug-99			MODEL: 512	TITLE: ASSY, 3 STATION CABINET	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536836-01	

KR512 OUTFEED SECTION

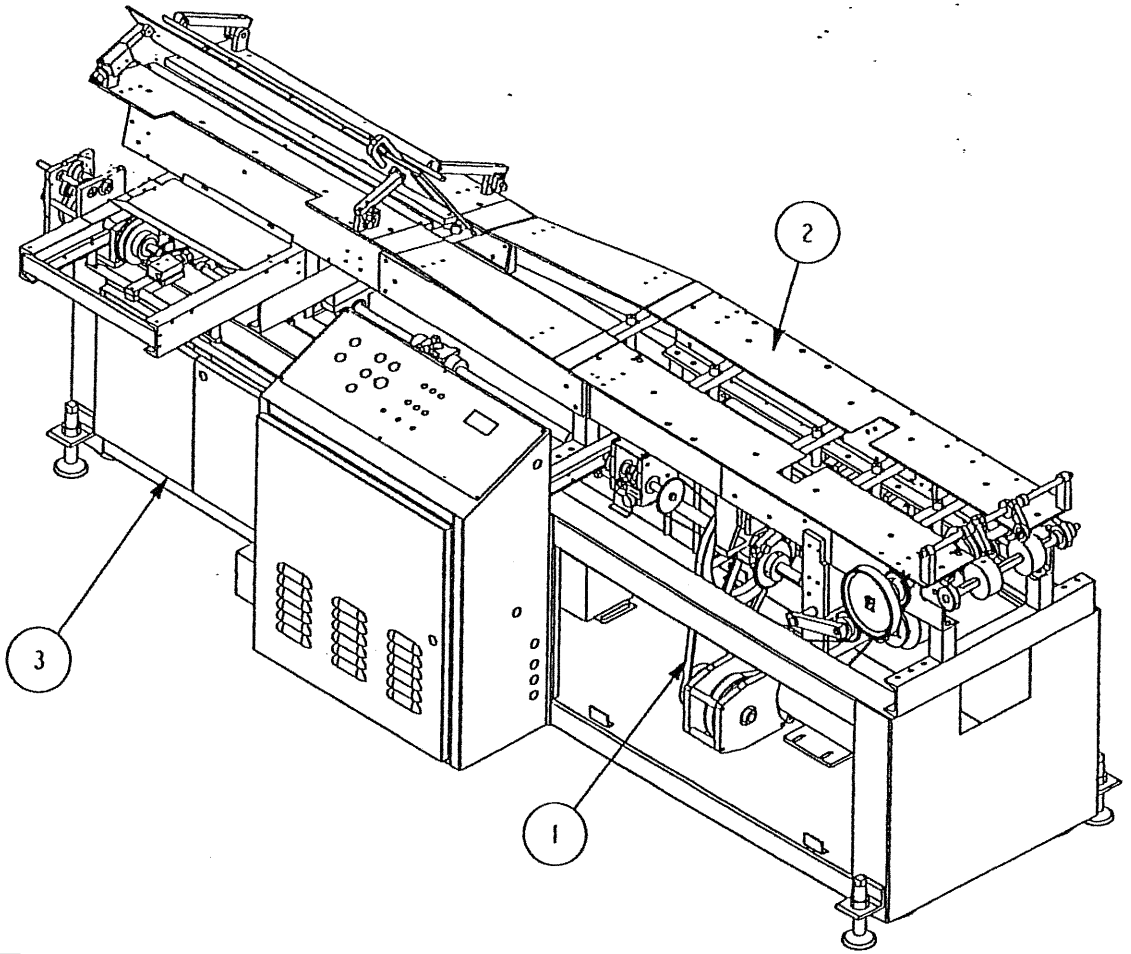
ASSEMBLY NUMBER	DESCRIPTION
536837-01	ASSY, KR 512 OUTFEED SECTION
534734-01	ASSY, 324-1 FEEDER (SEE KR324-1 MANUAL)
536717-01	ASSY, OUTFEED SECTION
532810-01	ASSY, OUTFD ROLLER
108882-A	ASSY, 10L050 SPROCKET
532808-01	ASSY, OUTFEED DRIVE SHAFT
532809-01	ASSY, BEARING PLATE
532879-02	ASSY, FLIGHT CHAIN CLUTCH
532807-01	ASSY, CLUTCH & SPROCKET
532877-01	ASSY, PLATE BEARING SUPPORT
532878-01	ASSY, TAKE-UP ARM
533749-01	ASSY, GEARBOX RH
535201-02	ASSY, SIDE GUIDES
535462-02	ASSY, GEARBOX MOUNT
535514-01	ASSY, OUTFD PINCH ROLLERS
535700-01	EG, DRIVE SHAFT ASSY
535816-01	ASSY, BEARING MOUNT
535817-01	ASSY, 40 CHAIN TAKEUP
536659-01	ASSY, JACKET GUIDE
536663-01	ASSY, TAKE UP
536703-01	ASSY, MICROSWITCH
536718-01	ASSY, CHANNEL FRAMES OUTFD
535446-01	ASSY, FRAME SPACER
535447-01	ASSY, FRAME SPACER
536719-01	ASSY, FRAME SPACER
536835-01	ASSY, OUTFEED CABINET

DRAWING #

5368 01

ITEM	QTY	PART #	DESCRIPTION
1	1	106023-1	BELT, V 5L460
2	1	536717-01	ASSY, OUTFEED SECTION
3	1	536835-01	ASSY, OUTFEED CABINET

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	512
REQ'D	WHERE USED

DRAWN BY: MY

CHECKED BY:

TRACED BY:

SCALE: 0.070

DATE: 19-Aug-99

MASTER

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: N/A

HEAT TREAT: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

MODEL: 512

SHEET NO.: 1OF1

KIRK - RUDY, INC.
KENNESAW, GEORGIA

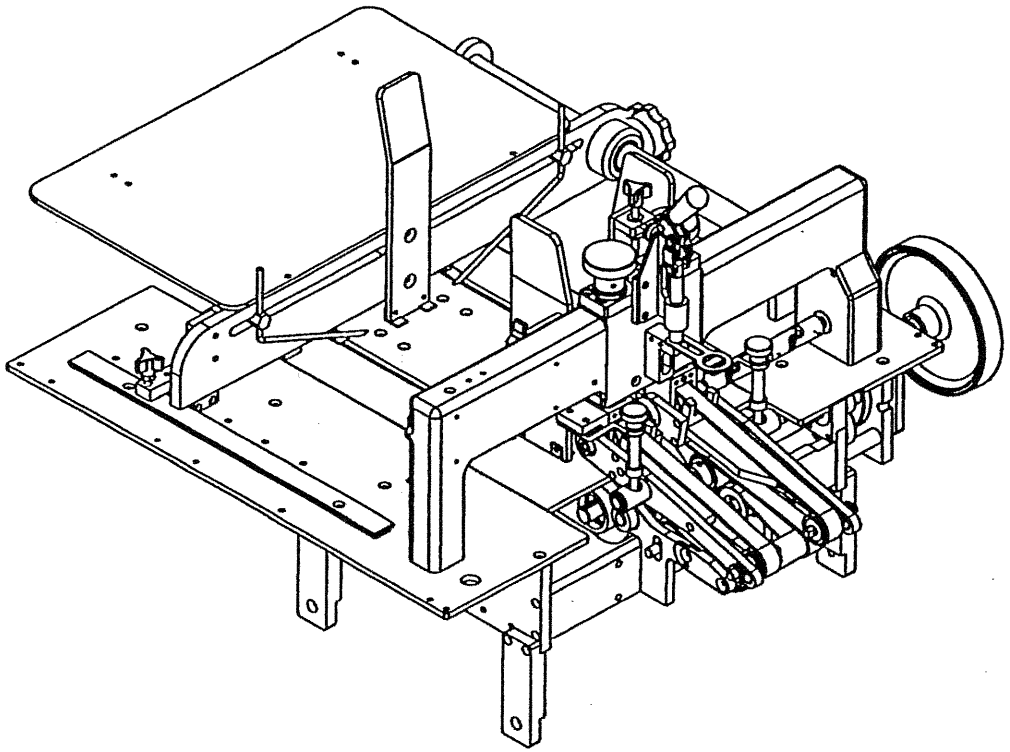
TITLE: ASSY, KR512 OUTFEED SECTION

DRAWING #: 536837-01

DRAWING #

534734-01

REV NO	DATE	DESCRIPTION	ECN NO	BY



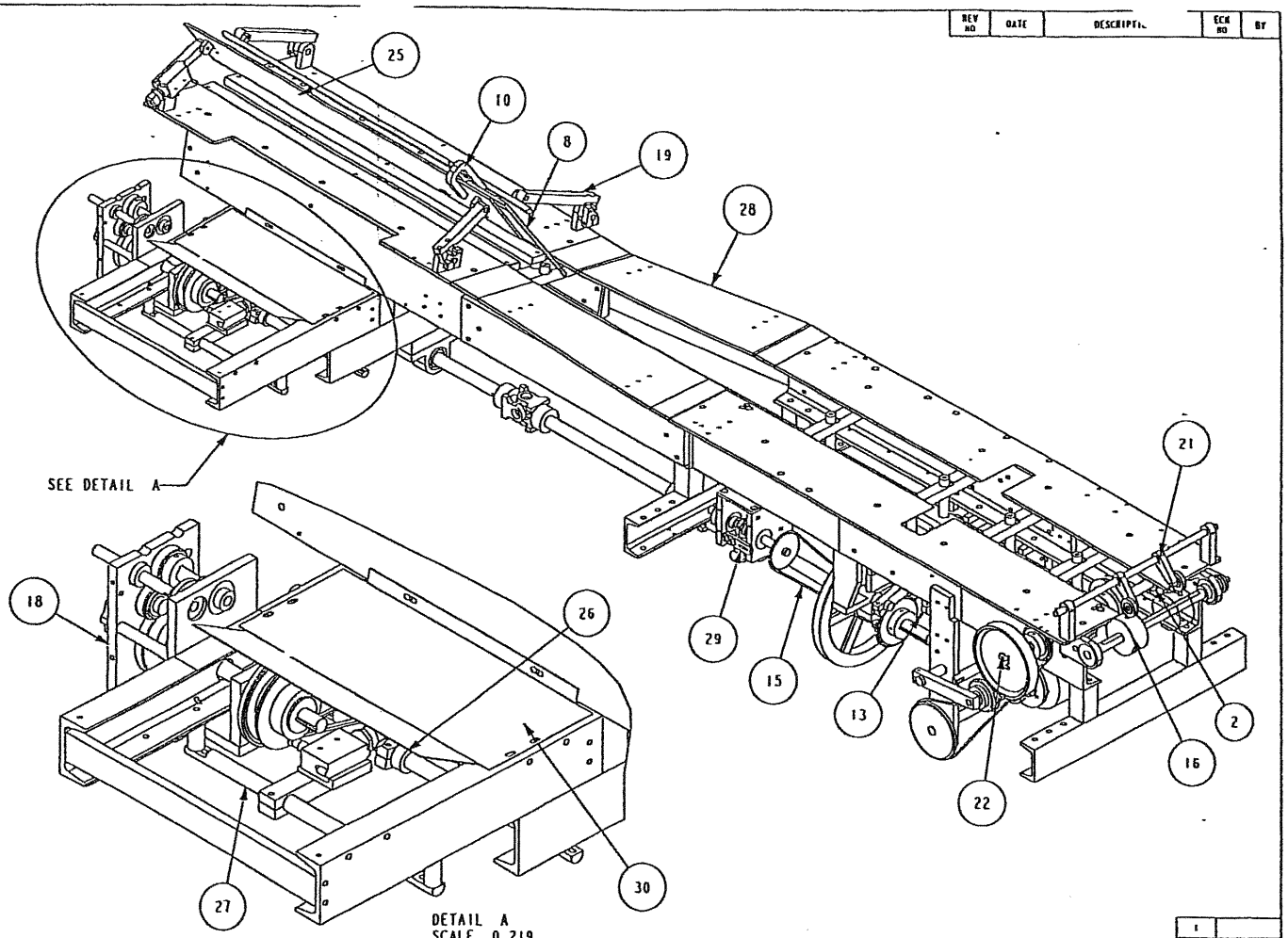
1	324-1
REQ'D	WHERE USED

DRAWN BY: TJG	SCALE 0.156	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 08-Nov-99			MODEL: 324-1	TITLE: ASSY, 324-1 FEEDER	
TRACED BY:	MASTER M			SHEET NO.: 2OF2	DRAWING #: 534734-01	

ITEM	QTY	#	DESCRIPTION
1	2	100817	UNIVERSAL JOINT, 1INCH BORE
2	2	103612	FLANGE BEARING, 0.750 2-BOLT
3	3	103706	BEARING, PILLOW BLOCK 1.00 SHAFT
4	1	105005	PULLEY, V-BELT BK105 1.00 BORE
5	1	110112	SPRKT, 25B24 1.000B .250K
6	1	110431	SPRKT, 40B16 1.000B .250K
7	1	110491	SPRKT, 40B24 1.000B .250K
8	1	508829	ARM, CLOSING
9	1	508852	SHAFT, DRIVE
10	1	508915	HOLDER, CLOSING ARM
11	1	108916-6	BELT, TIMING 150L050
12	1	110019-9	CHAIN, #40
13	1	110019-10	CHAIN, #40
14	1	110019-11	CHAIN, #40
15	1	110021-15	CHAIN, #25
16	1	532810-01	ASSY, OUTFD ROLLER
17	1	532879-02	ASSY, FLIGHT CHAIN CLUTCH
18	1	533749-01	ASSY, GEAR BOX RH
19	1	535201-02	ASSY, SIDE GUIDES
20	1	535462-02	ASSY, GEARBOX MOUNT
21	1	535514-01	ASSY, OUTFD PINCH ROLLERS
22	1	535700-01	EG, DRIVE SHAFT ASSY
23	1	535816-01	ASSY, BEARING MOUNT
24	1	535817-01	ASSY, 40 CHAIN TAKEUP
25	1	536659-01	ASSY, JACKET GUIDE
26	1	536663-01	ASSY, TAKE UP
27	1	536703-01	ASSY, MICROSWITCH
28	1	536718-01	ASSY, CHANNEL FRAMES OUTFD
29	1	536720-01	ASSY, ENCODER BOX
30	1	536726-02	COVER, FEEDER CLUTCH
31	1	SP6339	SHAFT, OUTFEED SECTION
32	1	SP6340	SHAFT, TRANSITION
33	1	SP29101	MOUNT, MOTOR
34	1	SP29102	COVER, FAN INSERT
35	3	SP29108	SPACER, BEARING

'7-01

REV NO	DATE	DESCRIPTI..	ECR NO	BY



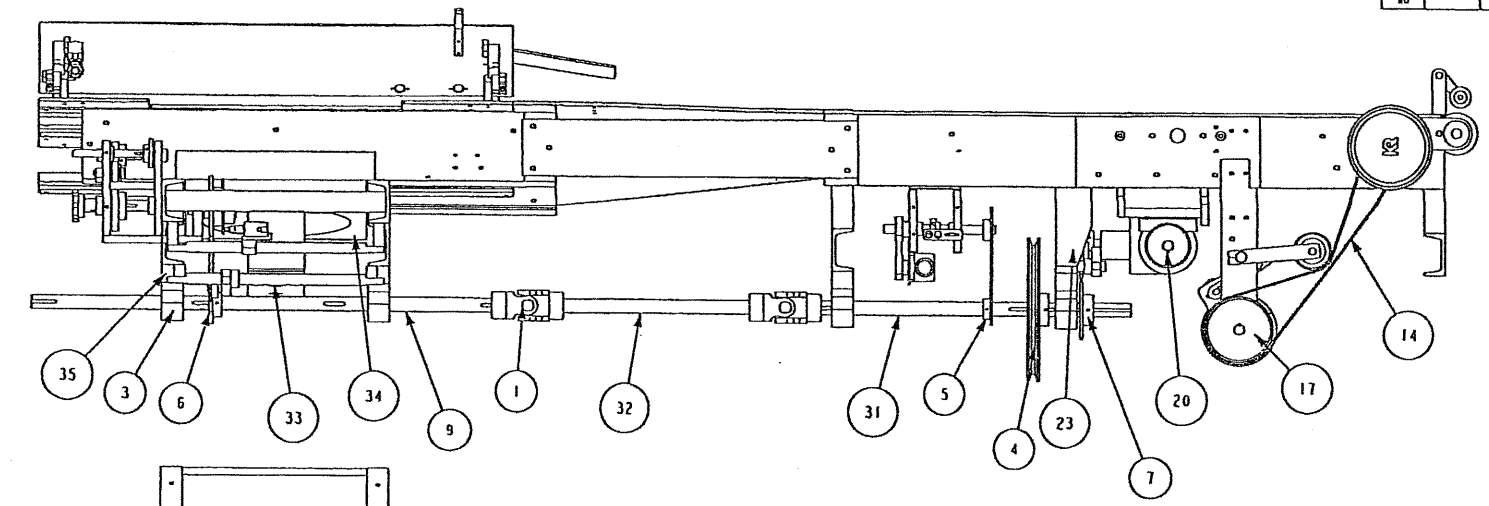
DETAIL A
SCALE 0.219

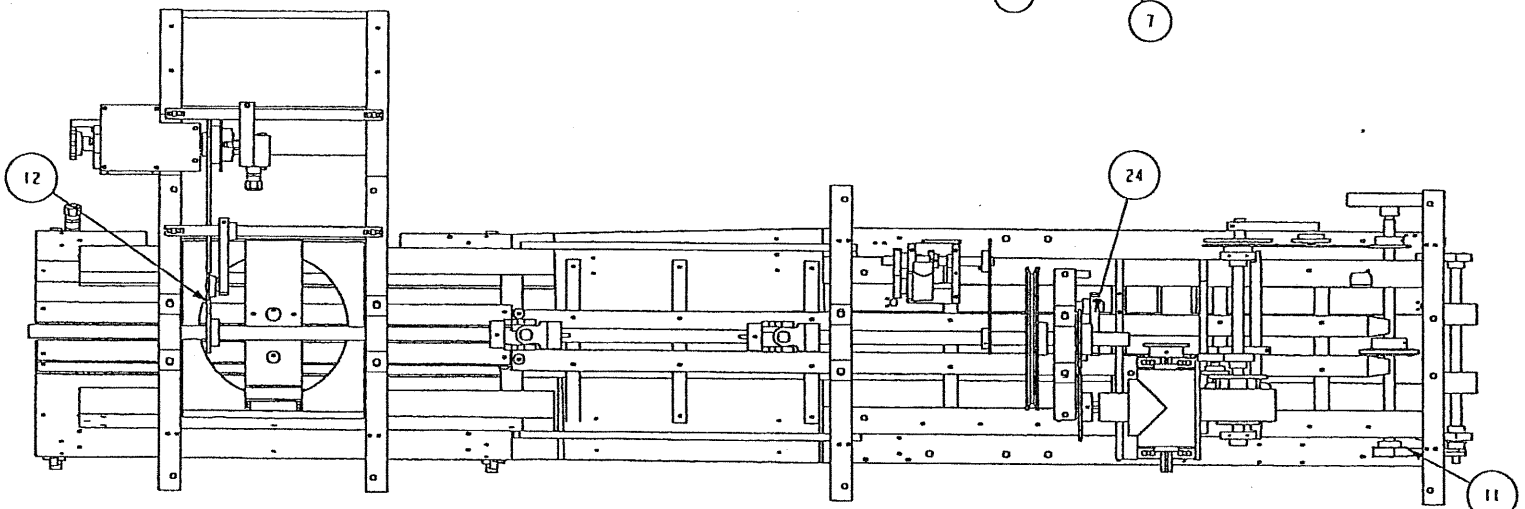
I	
REQ'D	WHERE USED

DRAWN BY: MY	SCALE: 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.01, .XXX ±.005, ANG. ±.5; REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED; ALL DIMENSIONS ARE FINISHED DIMENSIONS; DO NOT SCALE - WORK TO DIMENSIONS ONLY	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 16-Jun-99		HEAT TREAT: N/A	MODEL: 512	FINISH: ASSY, OUTFEED SECTION	
TRACED BY:	MASTER		FINISH: N/A	SHEET NO.: 1OF2	DRAWING #: 536717-01	

536717-01

REV NO	DATE	DESCRIPTION	ECN NO	BY





REQ'D	WHERE USED
1	

DRAWN BY: MY	SCALE: 0.125	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX ±.01 .XXX ±.005 ANG. ±.5	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: 22-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, OUTFEED SECTION
TRACED BY:	MASTER	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO.: 20F2	DRAWING #: 536717-01

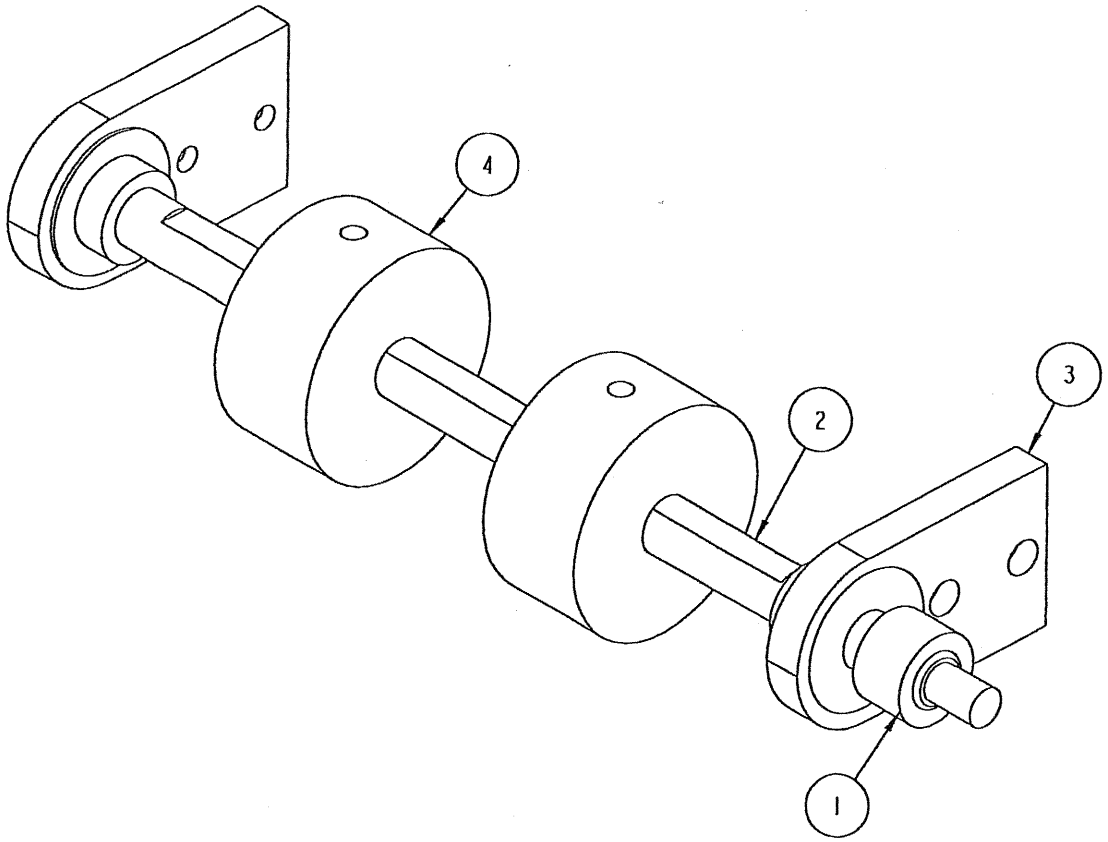
KIRK - RUDY, INC.
KENNESAW, GEORGIA

DRAWING #

532810-0.

ITEM	QTY	PART #	DESCRIPTION
1	1	108882-A	ASSY, 10L050 SPROCKET
2	1	532808-01	ASSY, OUTFEED DRIVE SHAFT
3	2	532809-01	ASSY, BEARING PLATE
4	2	SP6368	ROLLER, OUTFEED

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

DRAWN BY: NJG

SCALE: 0.500

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: N/A

HEAT TREAT: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

KIRK - RUDY, INC.
KENNESAW, GEORGIA

CHECKED BY:

DATE: 6-Feb-98

TRACED BY:

MASTER: [redacted]

MODEL: 515

SHEET NO.: 1OF1

TITLE: ASSY, OUTFD ROLLER

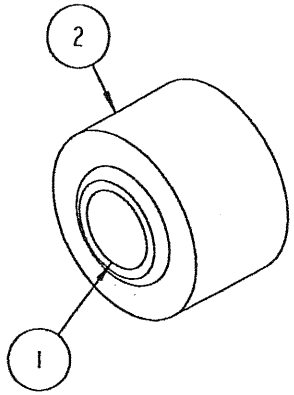
DRAWING #: 532810-01

DRAWING #

108882-A

ITEM	QTY	PART #	DESCRIPTION
1	1	101102	BEARING, ONEWAY .500
2	1	108882	PULLEY, TIMING 10L505 .750B NK

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

DRAWN BY: NJG	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 6-Feb-98	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: GENERAL	TITLE: ASSY, 10L050 SPROCKET	
TRACED BY:	MASTER [redacted]	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 108882-A	

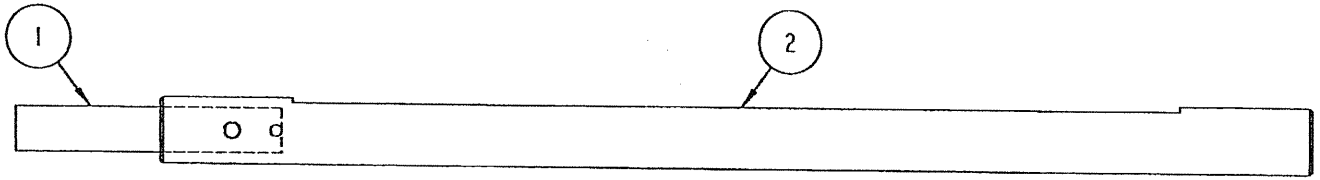
DO NOT SCALE - WORK TO DIMENSIONS ONLY

DRAWING #

532808-

ITEM	QTY	PART #	DESCRIPTION
1	1	105459	DOWEL, PIN .500X3.000
2	1	SP32504	SHAFT, OUTFD ROLLER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

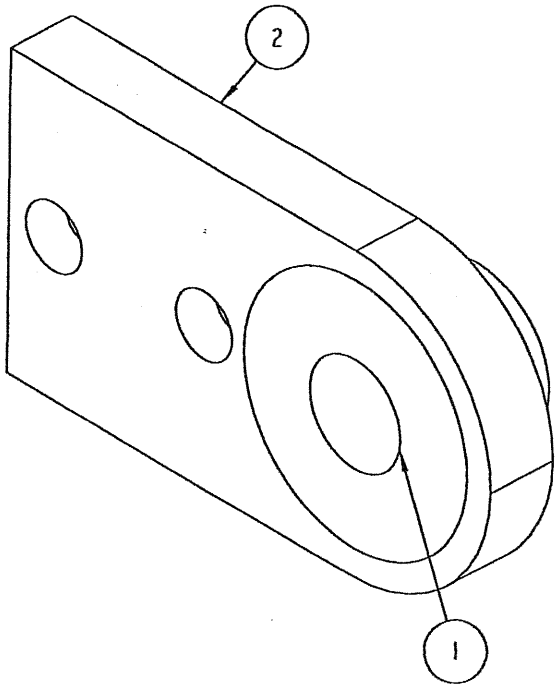
DRAWN BY: NJG	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01; .XXX .005; ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 6-Feb-98	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 515	TITLE: ASSY, OUTFEED DRIVE SHAFT	
TRACED BY:	MASTER [redacted]	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 532808-01	

DRAWING #

532809-01

ITEM	QTY	PART #	DESCRIPTION
1	1	103805	BEARING, HUB .750
2	1	SP32502	PLATE, OUTFD ROLLER BRG

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

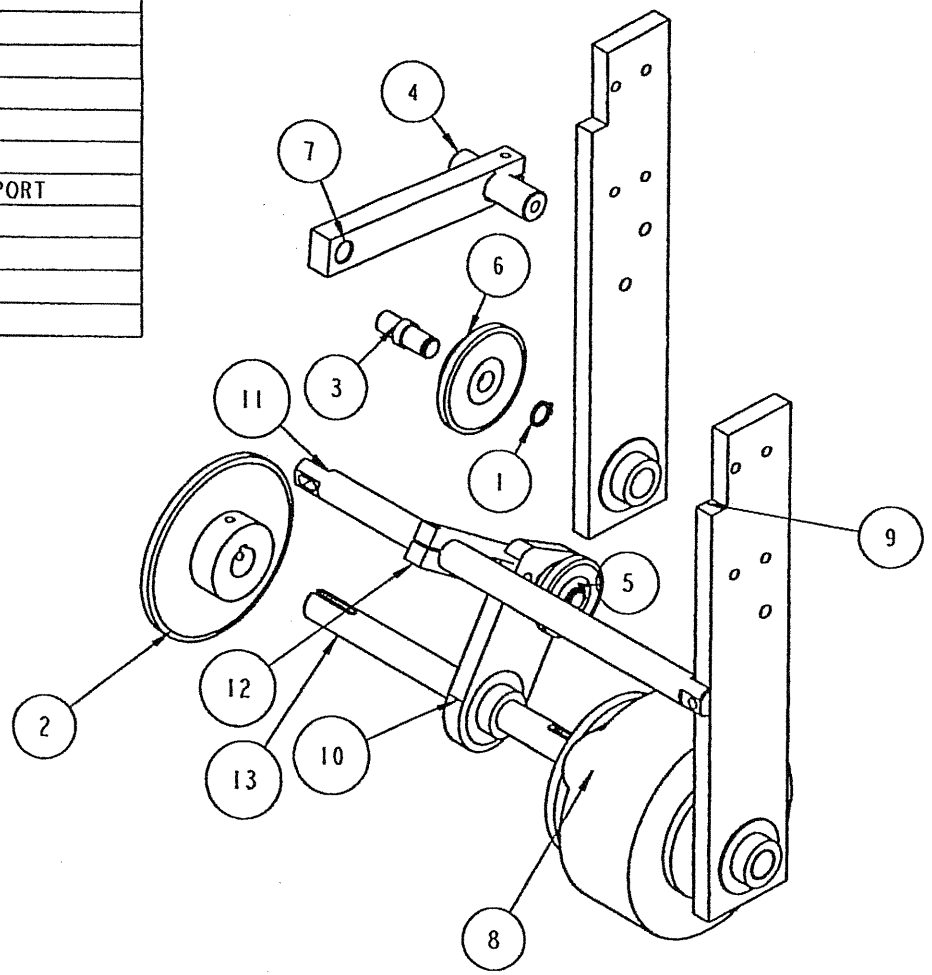
DRAWN BY: NJG	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .XXX ANG. .01 .005 .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 6-Feb-98			MODEL: 515	TITLE: ASSY, OUTFD BRG PLATE	
TRACED BY:	MASTER [redacted]			SHEET NO.: 1OF1	DRAWING # 532809-01	

DRAWING #

532879 -2

ITEM	QTY	PART #	DESCRIPTION
1	2	104106	SNAPRING, .500
2	1	110509	SPRKT, 40B28 .750B .188K
3	2	508540	STUD
4	1	525408	STUD, TAKEUP ARM
5	1	110449A	SPROCKET ASY
6	1	110469A	SPROCKET, IDLER
7	1	508684-1	ARM, TAKE UP
8	1	532807-01	ASSY, CLUTCH & SPROCKET
9	2	532877-01	ASSY, PLATE BEARING SUPPORT
10	1	532878-01	ASSY, TAKE-UP ARM
11	1	SP6350	SHAFT, OUTFD IDLER
12	1	SP6393	ARM, ADJUSTMENT
13	1	SP6351-1	SHAFT, OUTFD IDLER DR

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

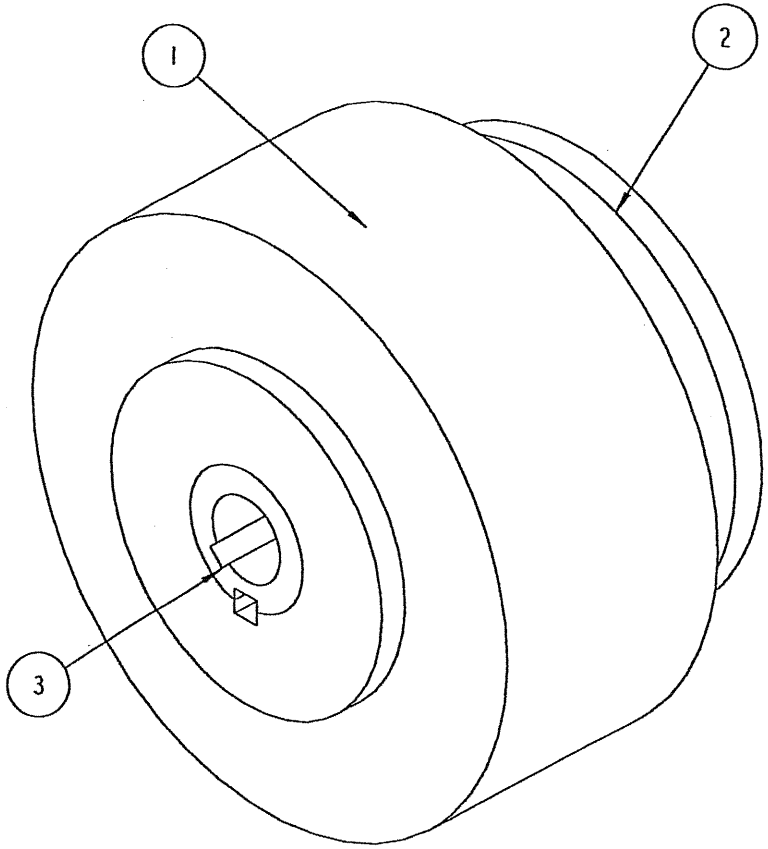
DRAWN BY: TJG	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Jun-99		HEAT TREAT: N/A	MODEL: SP75700	TITLE: ASSY, FLIGHT CHAIN CLUTCH	
TRACED BY:	MASTER m		FINISH: N/A	SHEET NO.: 1 OF 1	DRAWING # 532879-02	

DRAWING #

532807-01

ITEM	QTY	PART #	DESCRIPTION
1	1	104003	CLUTCH
2	1	110593	SPROCKET, 40A24
3	1	104003-2	BUSHING, 60BU012

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	515
REQ'D	WHERE USED

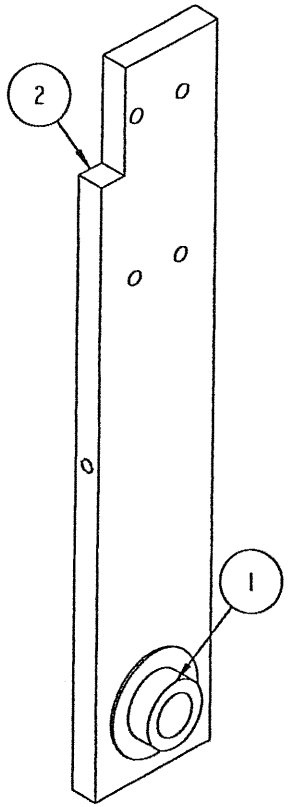
DRAWN BY: SLB	SCALE 0.750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION MODEL: 515 SHEET NO.: 1OF1	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
CHECKED BY:	DATE 05-Feb-98				TITLE: ASSY, CLUTCH & SPROCKET	
TRACED BY:	MASTER [redacted]				DRAWING # 532807-01	

DRAWING #

532877-01

ITEM	QTY	PART #	DESCRIPTION
1	1	103805	BEARING, HUB .750
2	1	SP6343	SUPPORT-CHAIN RETURN

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	515
REQ'D	WHERE USED

DRAWN BY: NJG

CHECKED BY:

TRACED BY:

SCALE: 0.375

DATE: 16-Feb-98

MASTER: [redacted]

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: N/A

HEAT TREAT: NONE

FINISH: NONE

THIRD ANGLE PROJECTION

MODEL: 515

SHEET NO.: 1OF1

KIRK - RUDY, INC.
KENNESAW, GEORGIA

TITLE: ASSY, PLATE BEARING SUPPORT

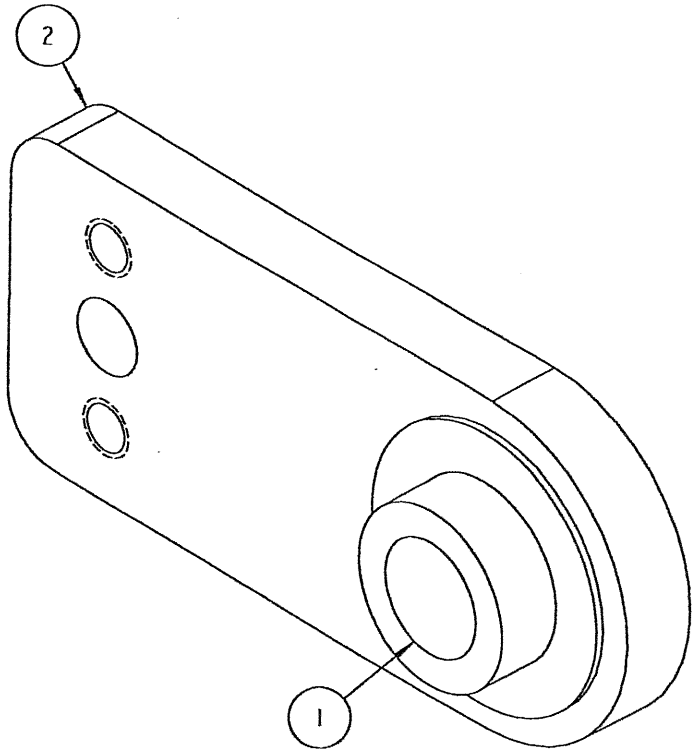
DRAWING #: 532877-01

DRAWING #

532878-01

ITEM	QTY	PART #	DESCRIPTION
1	1	103805	BEARING, HUB .750
2	1	SP6394	ARM, TAKE-UP

REV NO	DATE	DESCRIPTION	ECN NO	BY

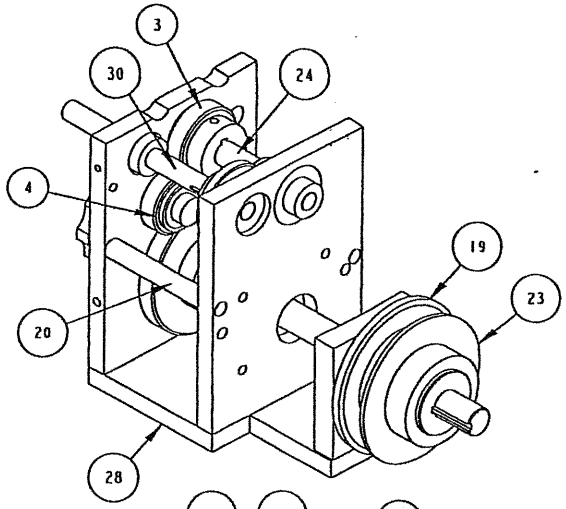


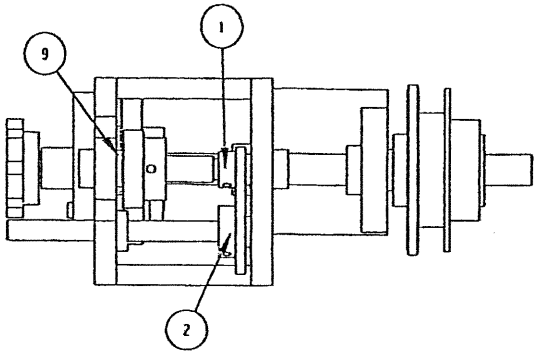
1	515
REQ'D	WHERE USED

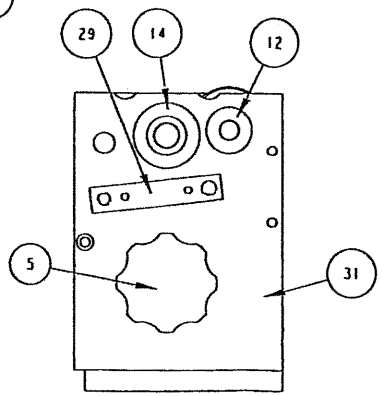
DRAWN BY: NJG	SCALE 1.000	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: NONE FINISH: NONE	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 16-Feb-98			MODEL: 515	TITLE: ASSY, TAKE-UP ARM	
TRACED BY:	MASTER			SHEET NO.: 1OF1	DRAWING # 532878-01	

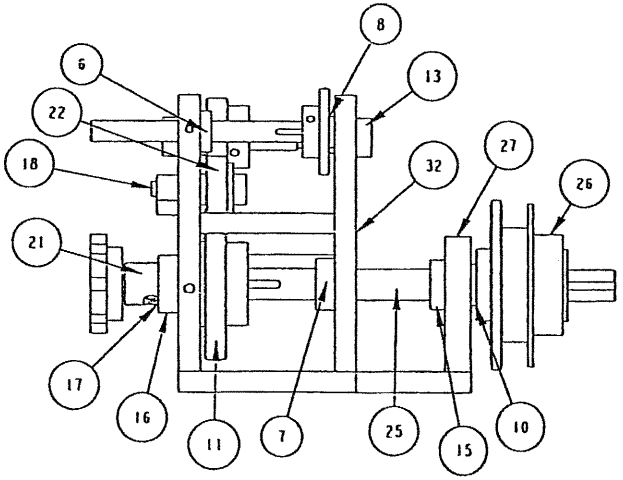
533749-01

ITEM	QTY	PART #	DESCRIPTION
1	1	101610	GEAR, 2424 .500B .125K
2	1	101611	GEAR, 2448 .500B .125K
3	1	101964	GEAR, 1628 .625B .188K
4	1	101965	GEAR, 1624 1.124B NK
5	1	102112	KNOB, PURCHASED
6	1	102205	COLLAR .500
7	1	102215	COLLAR .750
8	3	102301	SHIM, .500X.750X.125
9	1	102309	SHIM, .625X.875X.125
10	1	102334	SHIM, .750X1.000X.125
11	1	102497	GEAR, 1656 .750B NK
12	4	103108	BEARING, FLAT .500
13	1	103803	BEARING, HUB .500
14	1	103804	BEARING, HUB .625
15	1	103805	BEARING, HUB .750
16	1	103808	BEARING, HUB 1.000
17	1	105413	DOWEL, PIN .250X.750
18	1	107251	BOLT, SHOULDER 1/2X1-1/4
19	1	111111	SPRKT, 40A24 1.7328B
20	2	508785	SPACER, PLATE
21	1	508943	SLEEVE, DISCONNECT
22	1	101965-A	ASSY, IDLER GEAR
23	1	104040-2	CLUTCH, WAYR SIZE 1
24	1	508770-1	SHAFT, FEEDER DRIVE
25	1	508772-1	SHAFT, FEEDER DRIVE
26	1	535748-01	ASSY, CLUTCH & SPROCKET
27	1	SP25232	PLATE, BEARING
28	1	SP25233	PLATE, BOTTOM
29	1	SP25234	PLATE, STUD MOUNTING
30	1	SP25236	SHAFT, CAM
31	1	SP25230-1	PLATE-DISCONNECT
32	1	SP25231-1	PLATE, SUPPORT









REV NO	DATE	DESCRIPTION	ECN NO	BY

ITEM	SIZ
REQ'D	WHERE USED

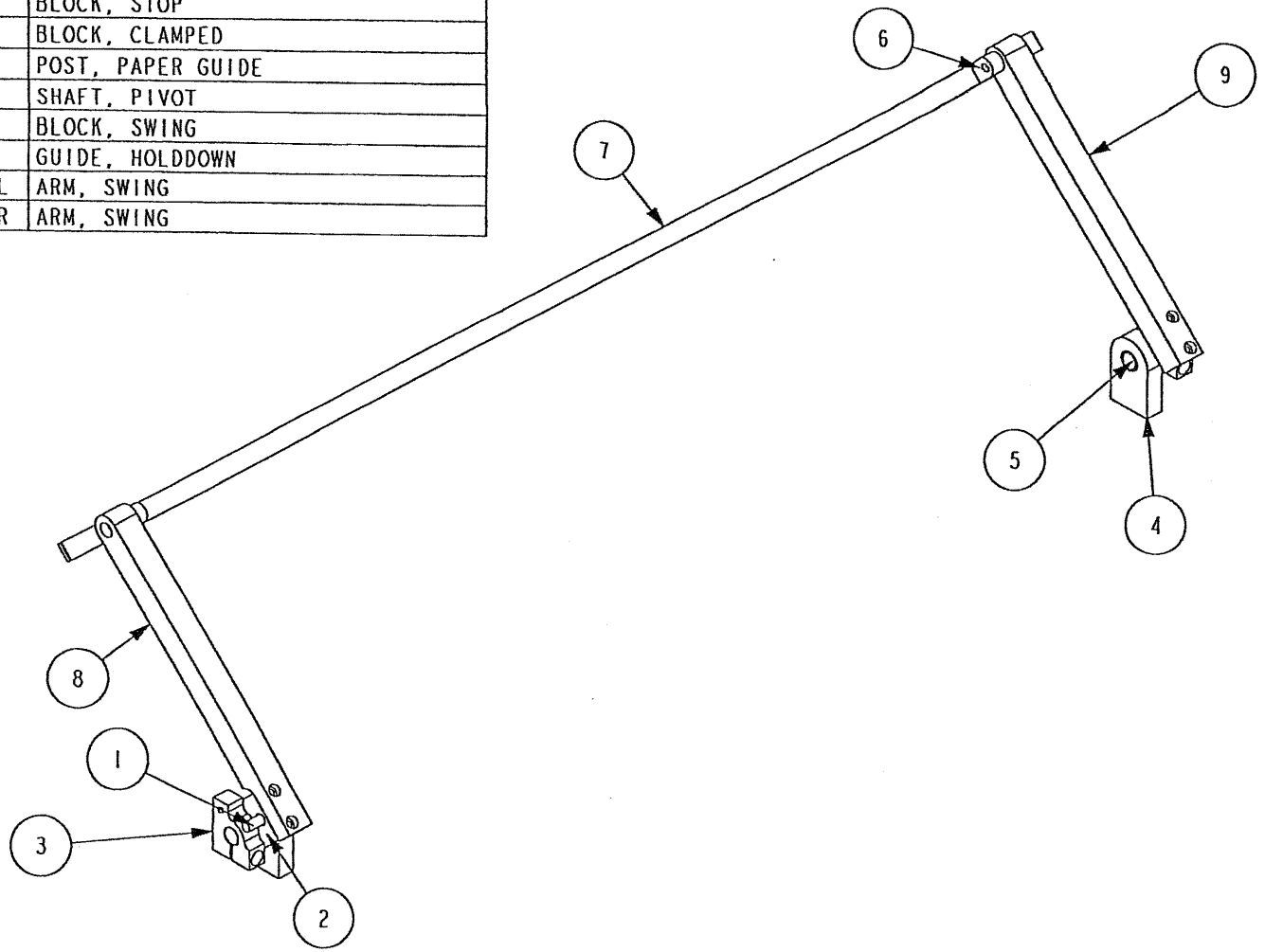
DRAWN BY: RHM	SCALE: 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.010, .XXX ±.005, ANG ±.5; REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED; ALL DIMENSIONS ARE FINISHED DIMENSIONS; DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: NOTED	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE: 23-Jun-99		HEAT TREAT: NONE	MODEL: 512	TITLE: ASSY, GEAR BOX RH	
TRACED BY:	MASTER: M		FINISH: NOTED	SHEET NO.: 1OF1	DRAWING #: 533749-01	

DRAWING #

535201-02

ITEM	QTY	PART #	DESCRIPTION
1	1	105223	PIN, ROLL 1/4 X 1.000
2	2	508536	BLOCK, STOP
3	2	508537	BLOCK, CLAMPED
4	2	508538	POST, PAPER GUIDE
5	2	508791	SHAFT, PIVOT
6	2	SP12135	BLOCK, SWING
7	1	SP12136	GUIDE, HOLDDOWN
8	1	SP12132-L	ARM, SWING
9	1	SP12132-R	ARM, SWING

REV NO	DATE	DESCRIPTION	ECN NO	BY



REQ'D	WHERE USED
1	536653-01

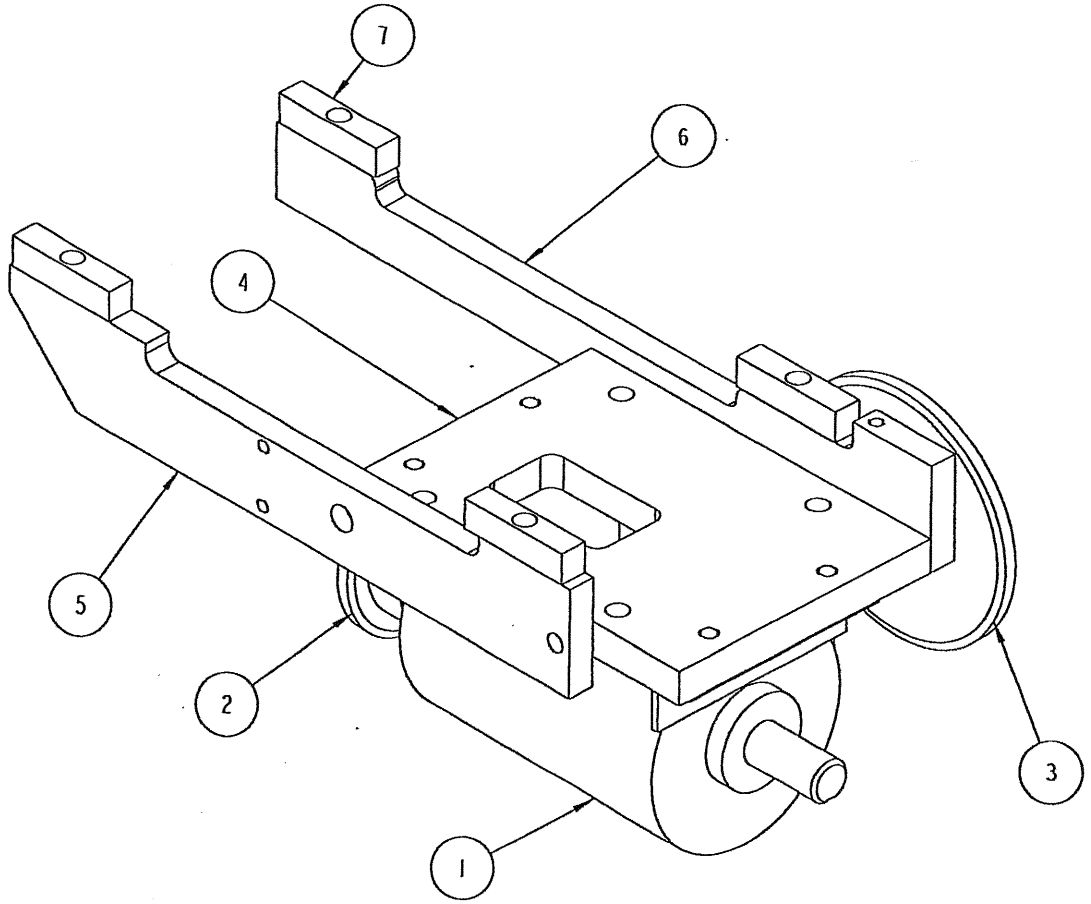
DRAWN BY: MY	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 18-Jun-99			MODEL: 512	TITLE: ASSY, SIDE GUIDES	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 535201-02	

DRAWING #

5354C J2

ITEM	QTY	PART #	DESCRIPTION
1	1	101304	GEARBOX
2	1	110470	SPRKT, 40B18 .750B .188K
3	1	110547	SPRKT, 40B27 .750B .188K
4	1	508526	PLATE, GEARBOX
5	1	508527-1	BAR, GEARBOX SUPPORT
6	1	508814-3	BRACE, CROSS
7	4	SP6902	SPACER, GEARBOX SUPPORT

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	535513-01
REQ'D	WHERE USED

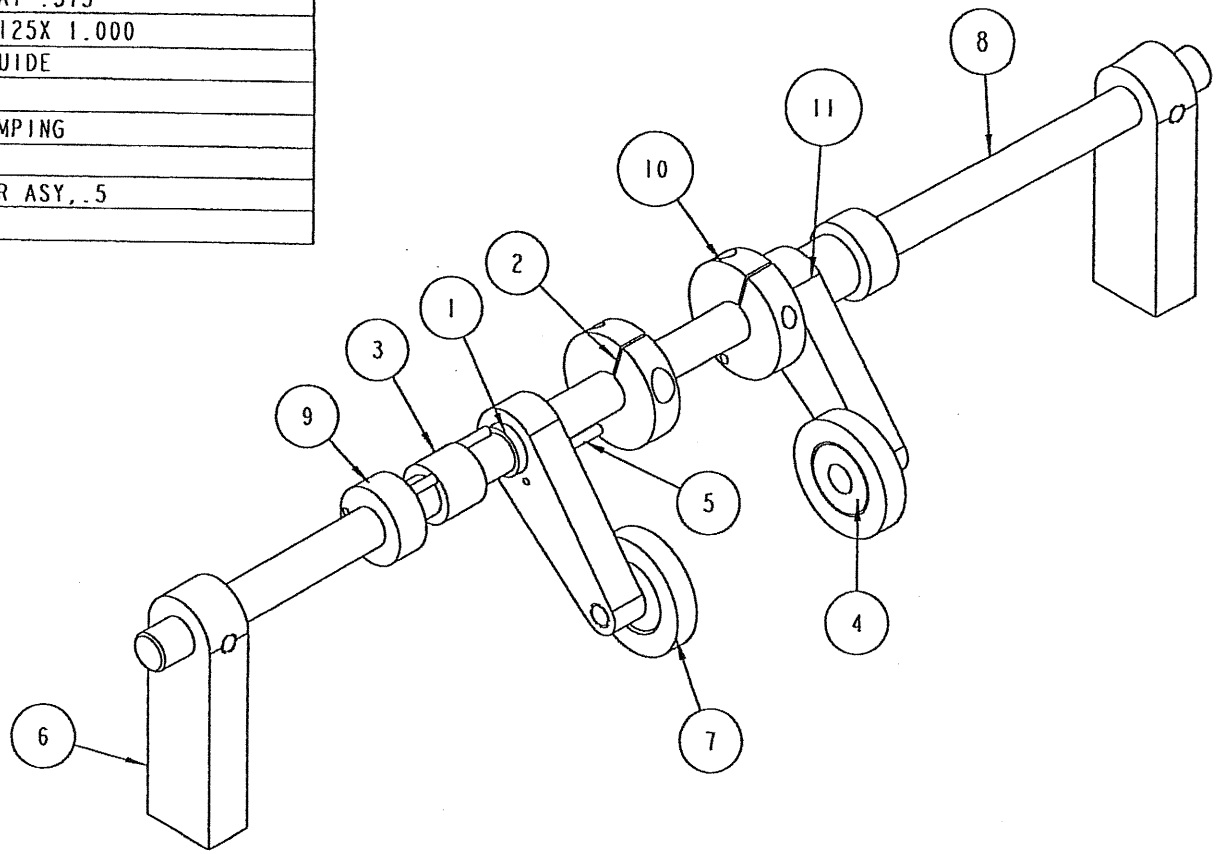
DRAWN BY: MY	SCALE 0.375	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX ±.01, .XXX ±.005, ANG. ±.5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 9-Aug-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, GEARBOX MOUNT	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 535462-02	

DRAWING #

535514-01

ITEM	QTY	PART #	DESCRIPTION
1	2	100162	BUSHING, SL.500ID.625OD.625LG
2	2	102233	CLAMP COLLAR, .5
3	2	102785	SPRING,TORSION
4	2	103106	BEARING, FLAT .375
5	2	105201	PIN, ROLL .125X 1.000
6	2	500791	POST, SIDEGUIDE
7	2	503555	ROLLER
8	1	508950	SHAFT, CLAMPING
9	2	102205-2	COLLAR
10	2	102233A	CLAMP COLLAR ASY,.5
11	2	500801-5	LINK

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	535435-01
REQ'D	WHERE USED

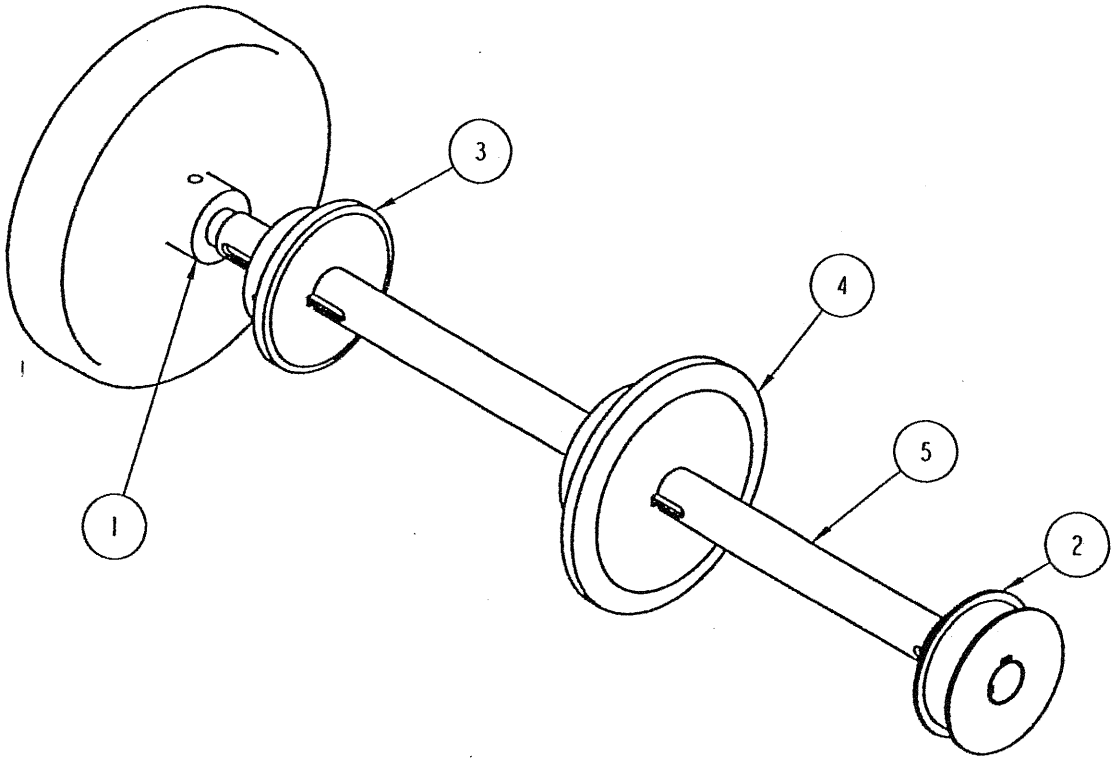
DRAWN BY: TJG	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: XXX HEAT TREAT: XXX FINISH: XXX	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 28-Jan-99			MODEL: SP72200	TITLE: ASSY, OUTFD PINCH ROLLERS	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 535514-01	

DRAWING #

535700-01

ITEM	QTY	PART #	DESCRIPTION
1	1	102108	HANDWHEEL
2	1	108883	PULLEY, TIMING 18L050 .750B .188K
3	1	110432	SPRKT, 40B16 .750B .188K
4	1	110603	SPRKT, 60B16 .750B .188K
5	1	SP32503	SHAFT, HANDWHEEL/CHAIN DRIVE

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	512
REQ'D	WHERE USED

DRAWN BY: A KEY

CHECKED BY:

TRACED BY:

SCALE: 0.375

DATE: 09-Feb-99

MASTER

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: N/A

HEAT TREAT: N/A

FINISH: N/A

THIRD ANGLE PROJECTION

MODEL: 515

SHEET NO.: 1OF1

KIRK - RUDY, INC.
KENNESAW, GEORGIA

TITLE: EG, DRIVE SHAFT ASSY

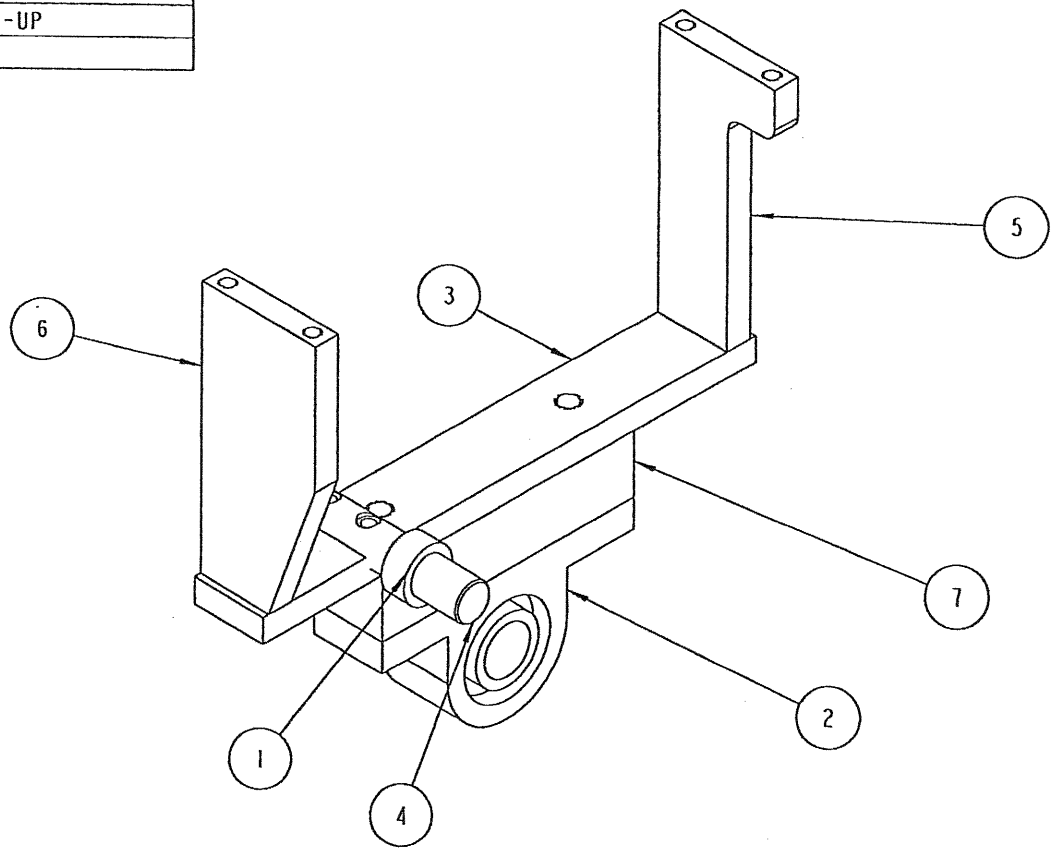
DRAWING #: 535700-01

DRAWING #

535816-01

ITEM	QTY	PART #	DESCRIPTION
1	1	102207	COLLAR .750
2	1	103706	BEARING, PILLOW BLOCK 1.00 SHAFT
3	1	508611	BAR - DRIVE SUPPORT
4	1	510690-1	SHAFT-TAKE UP ARM
5	1	SP6329	SUPPORT-OUTFEED TAKE-UP
6	1	SP6330	SUPPORT-OUTFEED TAKE-UP
7	1	SP29108	SPACER, BEARING

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	535513-01
REQ'D	WHERE USED

DRAWN BY: TJG

SCALE: 0.375

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: XXX

HEAT TREAT: XXX

FINISH: XXX

THIRD ANGLE PROJECTION

KIRK - RUDY, INC.
KENNESAW, GEORGIA

CHECKED BY:

DATE: 29-Jan-99

TRACED BY:

MASTER: m

MODEL: 512

SHEET NO.: 1OF1

TITLE: ASSY, BEARING MOUNT

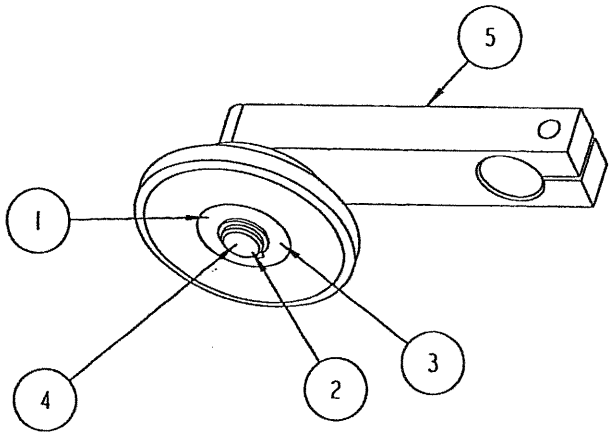
DRAWING #: 535816-01

DRAWING #

535817

ITEM	QTY	PART #	DESCRIPTION
1	2	103108	BEARING, FLAT .500
2	1	104106	SNAPRING, .500
3	1	110469	SPRKT, 40B15 1.125B NK
4	1	508540	STUD
5	1	508684-2	ARM, TAKE UP

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	535513-01
REQ'D	WHERE USED

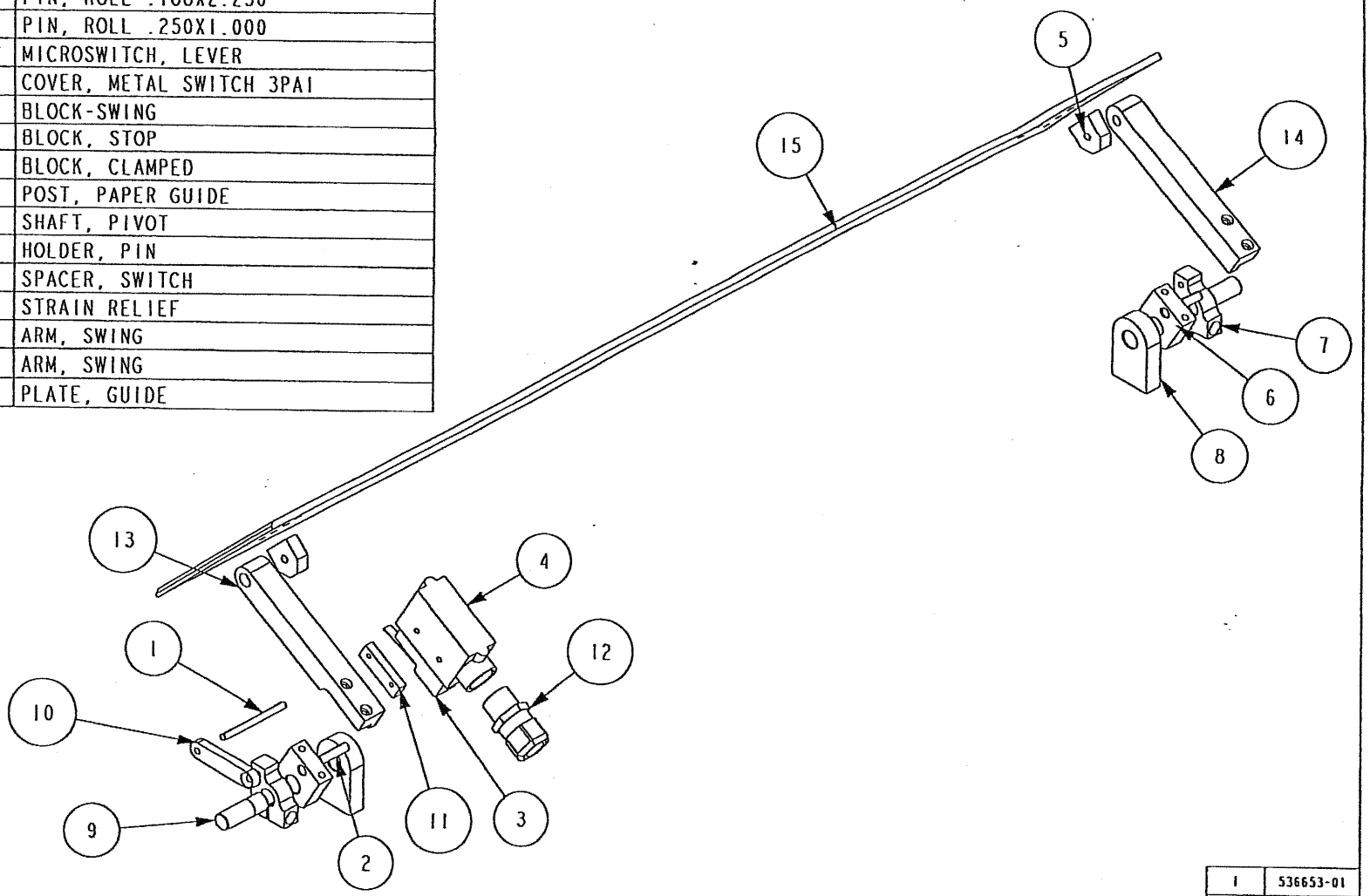
DRAWN BY: TJG	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: XXX HEAT TREAT: XXX FINISH: XXX	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 29-Jan-99			MODEL: 512	TITLE: ASSY, 40 CHAIN TAKEUP	
TRACED BY:	MASTER m			SHEET NO.: 1OF1	DRAWING # 535817-01	

DRAWING #

536659-01

ITEM	QTY	PART #	DESCRIPTION
1	1	105212	PIN, ROLL .188X2.250
2	2	105213	PIN, ROLL .250X1.000
3	1	190101	MICROSWITCH, LEVER
4	1	201134	COVER, METAL SWITCH 3PAI
5	2	508535	BLOCK-SWING
6	2	508536	BLOCK, STOP
7	2	508537	BLOCK, CLAMPED
8	2	508538	POST, PAPER GUIDE
9	2	508791	SHAFT, PIVOT
10	1	508884	HOLDER, PIN
11	1	508888	SPACER, SWITCH
12	1	200323-1	STRAIN RELIEF
13	1	508518-L	ARM, SWING
14	1	508518-R	ARM, SWING
15	1	508608-3	PLATE, GUIDE

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

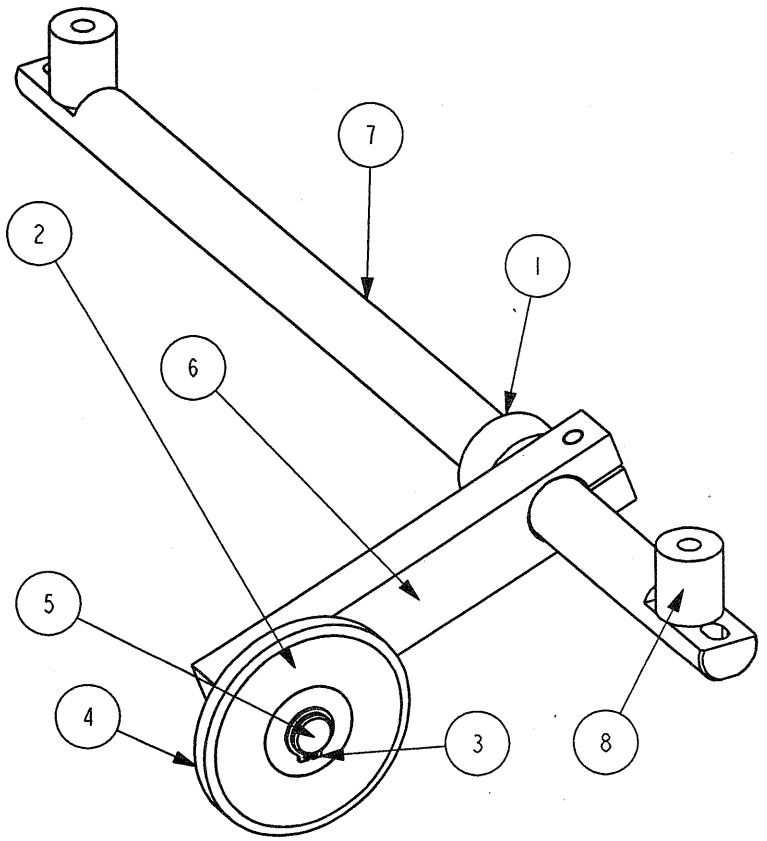
DRAWN BY: MY	SCALE 0.250	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 15-Jun-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, JACKET GUIDE	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536659-01	

DRAWING #

536663-01

ITEM	QTY	PART #	DESCRIPTION
1	1	102215	COLLAR .750
2	2	103108	BEARING, FLAT .500
3	1	104106	SNAPRING, .500
4	1	110469	SPRKT, 40B15 1.125B NK
5	1	508540	STUD
6	1	508684	ARM, TAKE UP
7	1	508781	SHAFT, TAKE UP
8	2	530712-01	SPACER

REV NO	DATE	DESCRIPTION	ECN NO	BY



1	536653-01
REQ'D	WHERE USED

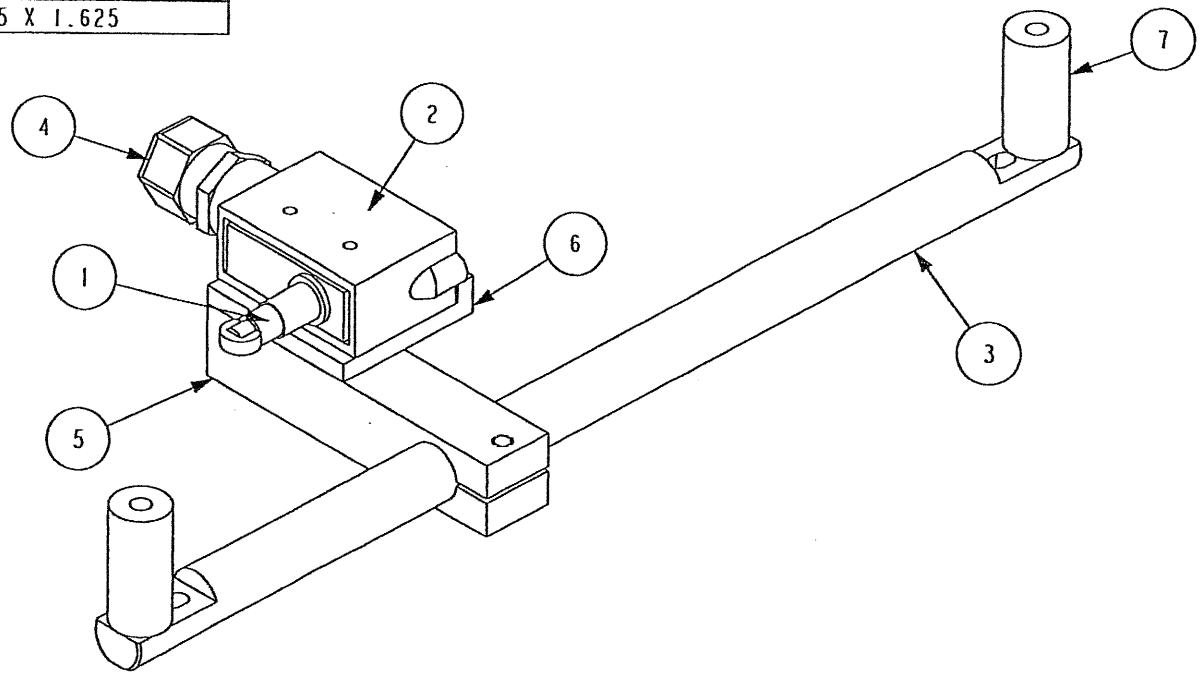
DRAWN BY: MY	SCALE 0:500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. WOODSTOCK, GA 30188 USA	KIRK - RUDY, INC. WOODSTOCK, GEORGIA
CHECKED BY:	DATE 17-Jun-99			MODEL: 512	TITLE: ASSY, TAKE UP	
TRACED BY:	MASTER: M			SHEET NO.: 1OF1	DRAWING # 536663-01	

DRAWING #

536703-01

ITEM	QTY	PART #	DESCRIPTION
1	1	201049	SWITCH, MICRO BZ-2RQ181-A2
2	1	201134	COVER, METAL SWITCH 3PA1
3	1	508781	SHAFT, TAKE UP
4	1	200323-1	STRAIN RELIEF
5	1	536701-01	BAR, MOUTNING
6	1	536702-01	PLATE, MICROSWITCH MOUTNING
7	2	536704-01	SPACER, .257 X .75 X 1.625

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	536653-01
REQ'D	WHERE USED

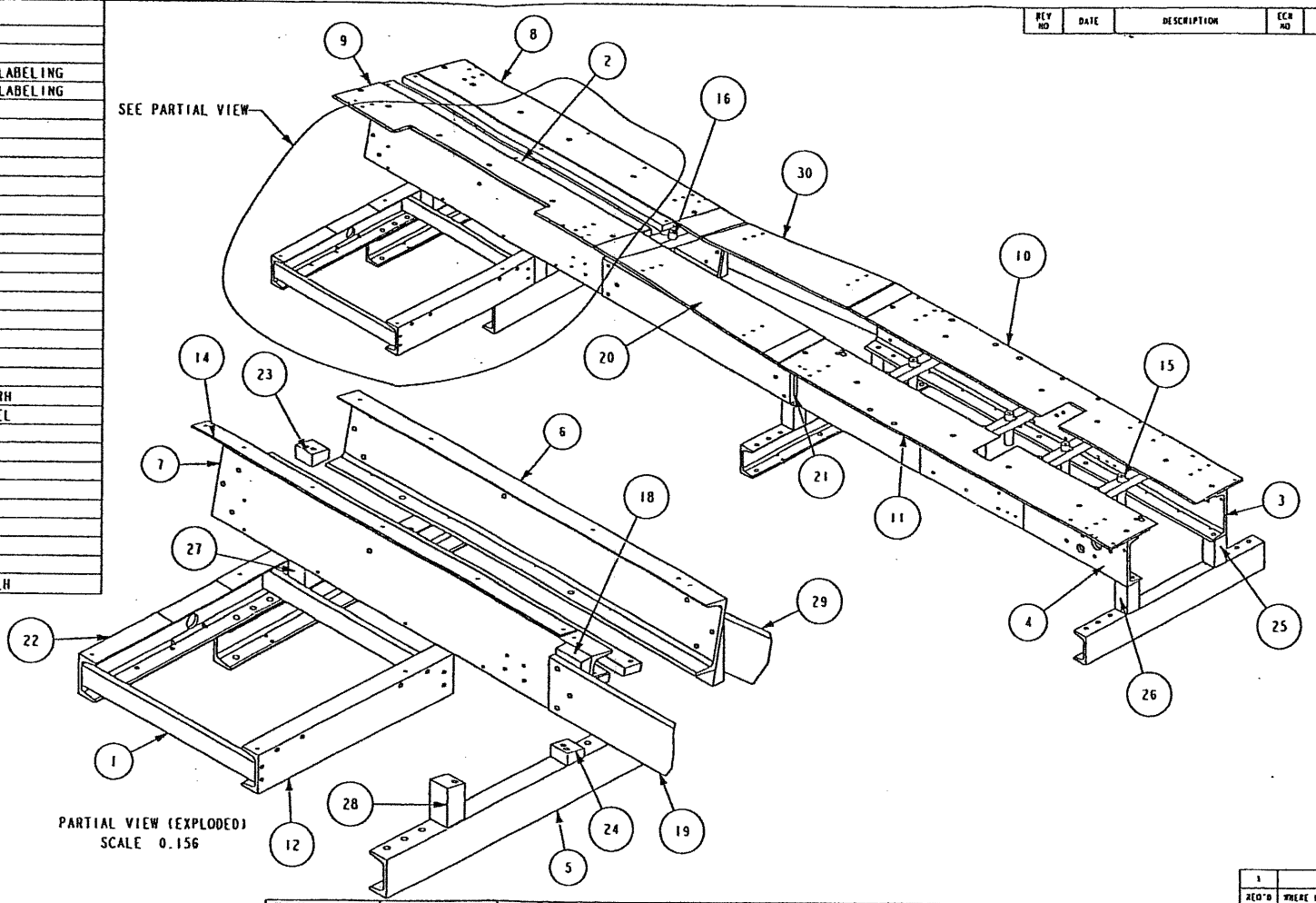
DRAWN BY: MY	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED (.XX .01 / .XXX .005 / ANG. .5) REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED. ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL 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 23-Jun-99		HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, MICROSWITCH
TRACED BY:	MASTER M		FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536703-01

KIRK - RUDY, INC.
KENNESAW, GEORGIA

536718-01

ITEM	QTY	PART #	DESCRIPTION
1	2	508788	BAR-CROSS
2	4	530457	TRACK, FLIGHT 331N
3	1	508600-1L	CHANNEL, REAR SIDE W/LABELING
4	1	508600-1R	CHANNEL, REAR SIDE W/LABELING
5	4	508603-1	CHANNEL
6	1	508701-L	CHANNEL, LH
7	1	508701-R	CHANNEL, RH
8	1	508711-4L	TOP, TABLE LH
9	1	508711-4R	TOP, TABLE
10	1	508803-1L	TOP, REAR TABLE LH
11	1	508803-1R	TOP, REAR TABLE RH
12	1	508903-3	CHANNEL, UPPER CROSS
13	4	530458-01	TRACK, FLIGHT OUTFEED
14	1	530701-01	SPACER, TABLETOP
15	5	535446-01	ASSY, FRAME SPACER
16	1	535447-01	ASSY, FRAME SPACER
17	3	536719-01	ASSY, FRAME SPACER
18	2	SP6318	WEDGE
19	2	SP6321	PLATE, CONNECTING
20	1	SP6322	TABLETOP, TRANSITION RH
21	1	SP6358	SPACER, OUTFEED CHANNEL
22	1	SP25201	CHANNEL, UPPER CROSS
23	1	SP6301-1L	SUPPORT, CHANNEL LH
24	1	SP6301-1R	SUPPORT, CHANNEL RH
25	2	SP6301-2L	SUPPORT, CHANNEL LH
26	2	SP6301-2R	SUPPORT, CHANNEL RH
27	1	SP6301-L	SUPPORT, CHANNEL LH
28	1	SP6301-R	SUPPORT, CHANNEL RH
29	1	SP6321-1	PLATE, CONNECTING
30	1	SP6322-1	TABLETOP, TRANSITION LH

REV NO	DATE	DESCRIPTION	ECN NO	BY



PARTIAL VIEW (EXPLODED)
SCALE 0.156

NOTE:
THE FOLLOWING PARTS ARE NOT SHOWN FOR CLARITY:
530458-01 TRACK, FLIGHT OUTFEED
536719-01 ASSY, FRAME SPACER

DRAWN BY: MY	SCALE 0.110	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED	MATERIAL: N/A	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 6-Aug-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, CHANNEL FRAMES OUTFD	
ISSUED BY:	MASTER	ALL DIMENSIONS ARE FINISHED DIMENSIONS	FINISH: N/A	SHEET NO: 1OF1	DRAWING # 536718-01	

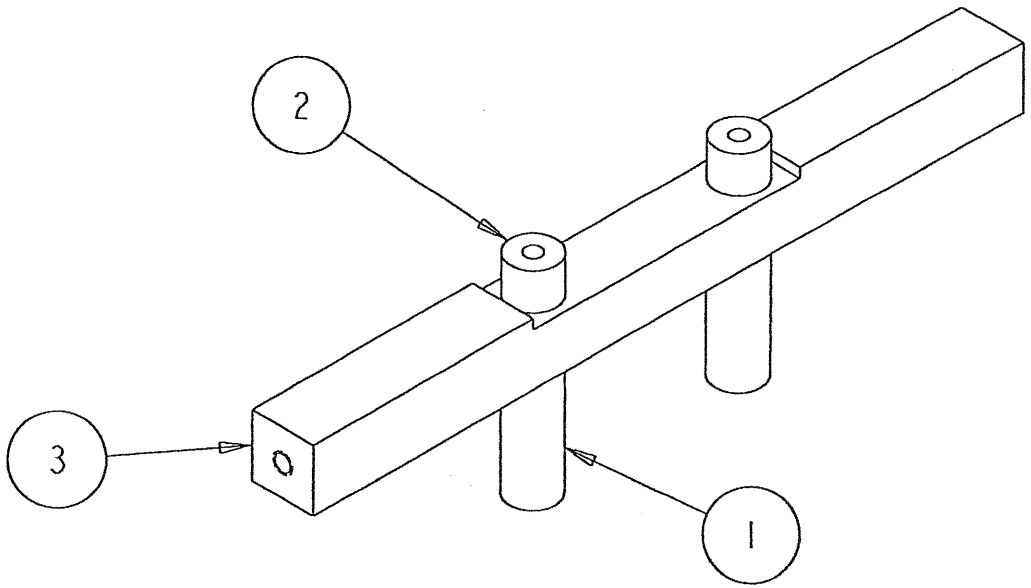
ZONE	WHERE USED
1	

DRAWING #

535446-01

ITEM	QTY	PART #	DESCRIPTION
1	2	102380	SPACER, .257X.750X1.937
2	2	102381	SPACER, .257X.750X.600
3	1	SP6302-1	BAR, CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



4	535510-01
REQ'D	WHERE USED

DRAWN BY: TJG

SCALE: 0.500

DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED

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

REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED

ALL DIMENSIONS ARE FINISHED DIMENSIONS

DO NOT SCALE - WORK TO DIMENSIONS ONLY

MATERIAL: XXX

HEAT TREAT: XXX

FINISH: XXX

THIRD ANGLE PROJECTION

KIRK - RUDY, INC.
KENNESAW, GEORGIA

CHECKED BY:

DATE: 25-Jan-99

TRACED BY:

MASTER

MODEL: 512

SHEET NO.: 1OF1

TITLE: ASSY, FRAME SPACER

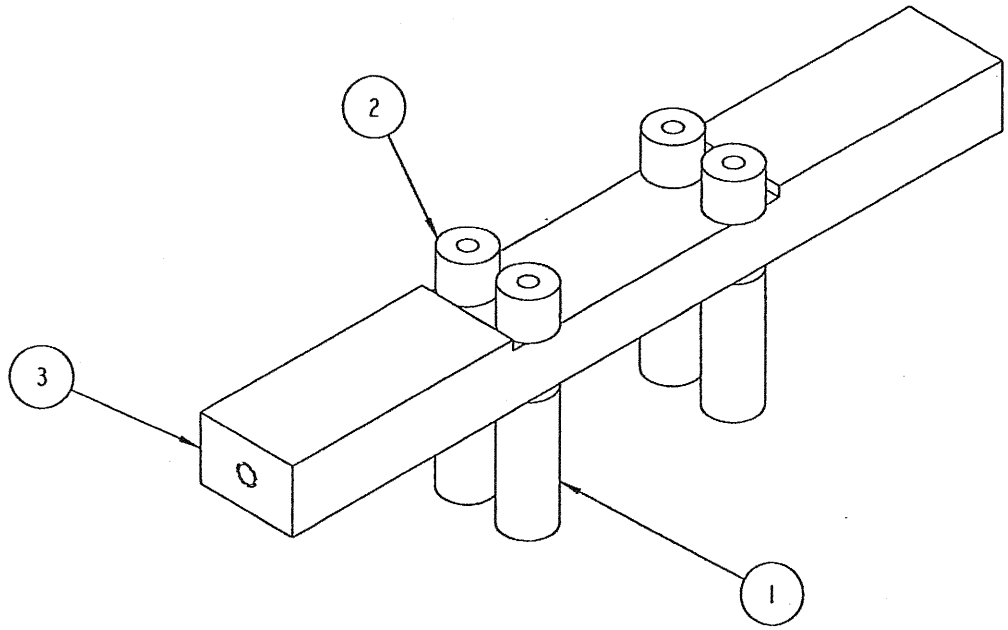
DRAWING #: 535446-01

DRAWING #

5354

ITEM	QTY	PART #	DESCRIPTION
1	4	102380	SPACER, .257X.750X1.937
2	4	102381	SPACER, .257X.750X.600
3	1	SP6913-1	BAR, WIDE CROSS

REV NO	DATE	DESCRIPTION	ECN NO	BY



2	535510-01
REQ'D	WHERE USED

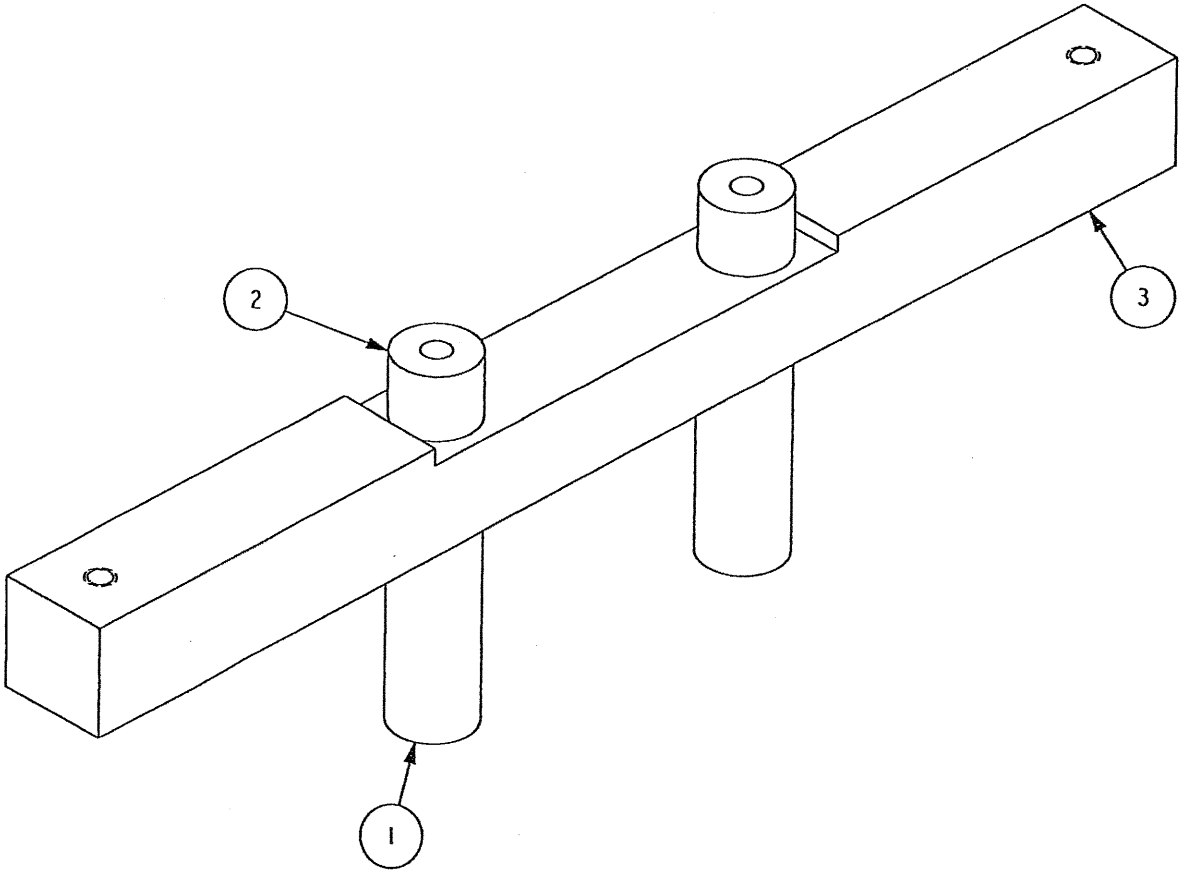
DRAWN BY: TJG	SCALE 0.500	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: XXX HEAT TREAT: XXX FINISH: XXX	THIRD ANGLE PROJECTION	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 29-Jan-99			MODEL: 512	TITLE: ASSY, FRAME SPACER	
TRACED BY:	MASTER m			SHEET NO.: 1OF1	DRAWING # 535447-01	

DRAWING #

536719-01

ITEM	QTY	PART #	DESCRIPTION
1	2	102380	SPACER, GUIDE BOTTOM
2	2	102381	SPACER, GUIDE BOTTOM
3	1	SP6302-4	BAR, CROSS OUTFEED

REV NO	DATE	DESCRIPTION	ECN NO	BY



3	536718-01
REQ'D	WHERE USED

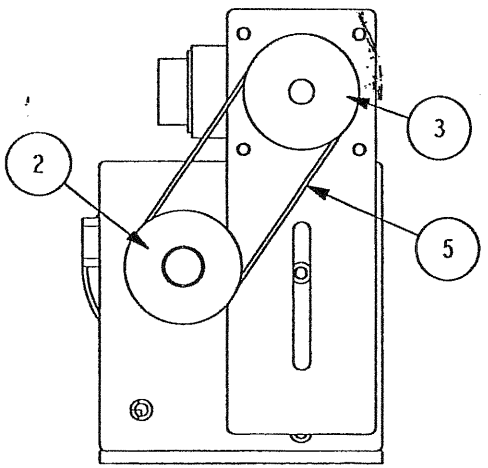
DRAWN BY: MY	SCALE 0.750	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .XXX ANG. .01 .005 .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION	PROPRIETARY 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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 06-Aug-99			MODEL: 512	TITLE: ASSY, FRAME SPACER	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536719-01	

DRAWING #

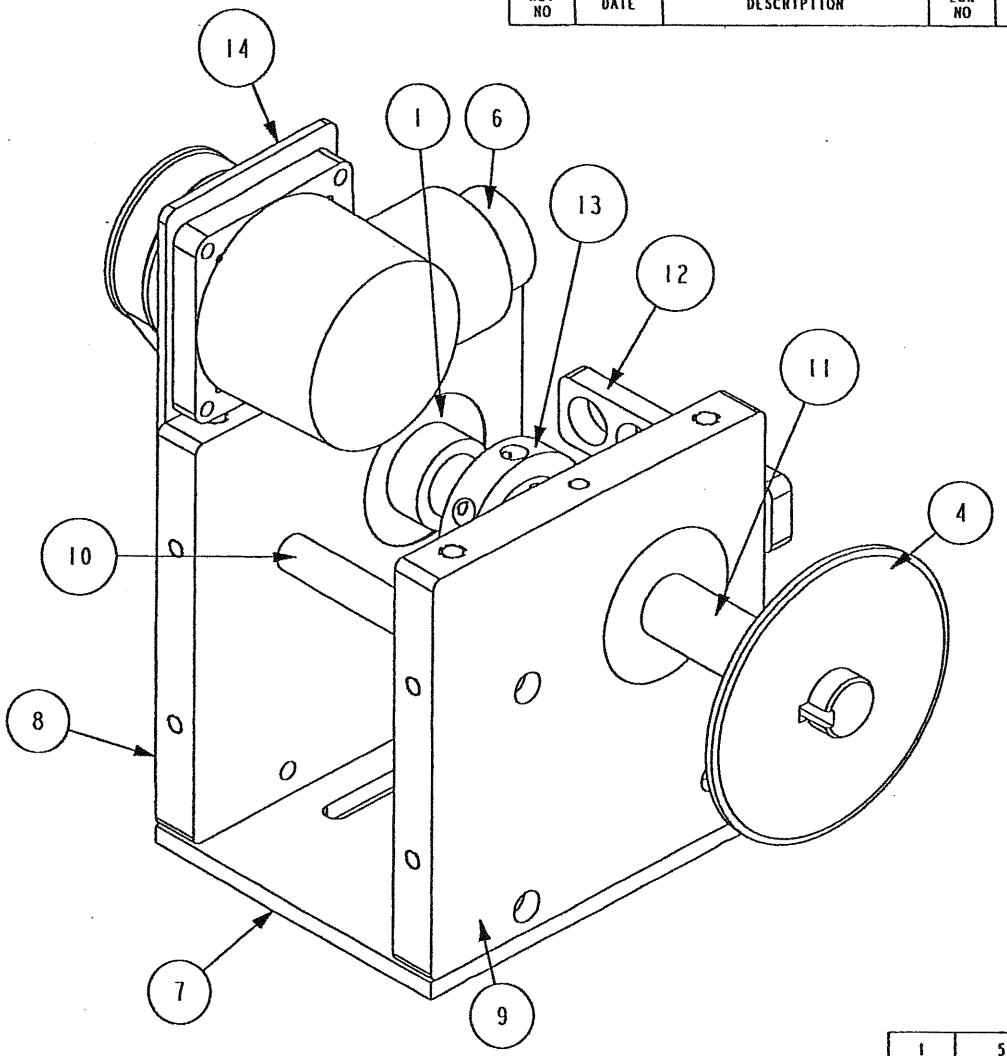
536 -01

ITEM	QTY	PART #	DESCRIPTION
1	2	103804	BEARING - HUB
2	1	108707	PULLEY, 25XL037 .625B NK
3	1	108711	PULLEY, 25XL037 .375B NK
4	1	110125	SPRKT, 25B36 .625B .188K
5	1	109003-1	BELT, TIMING 140XL037
6	1	202388-1	ENCODER, DYNAPAR .375 DIA SHAFT
7	1	526624-2	PLATE, FDN
8	1	526625-L	PLATE, SIDE
9	1	526625-R	PLATE, SIDE
10	1	526628-2	SHAFT - SPACER
11	1	526629-6	SHAFT, CAM
12	1	530521-01	BRACKET-PROXYSWITCH
13	1	531097-01	WHEEL, MAGNET
14	1	536721-01	PLATE, ENCODER MOUNTING

REV NO	DATE	DESCRIPTION	ECN NO	BY



SCALE 0.375



1	512
REQ'D	WHERE USED

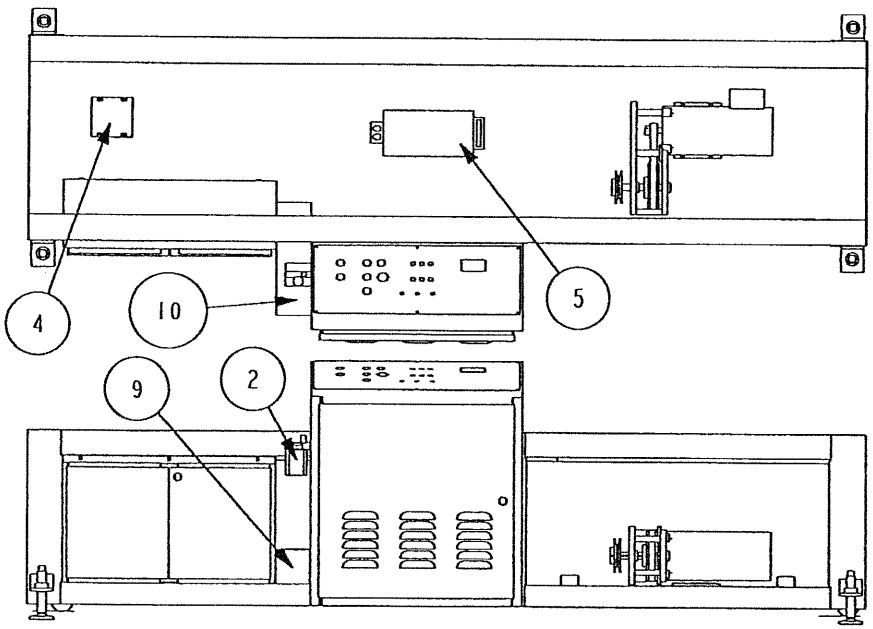
DRAWN BY: MY	SCALE 0.625	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01 / .XXX .005 / ANG. .5	MATERIAL: N/A	THIRD ANGLE PROJECTION	PROPRIETARY AND CONFIDENTIAL NO PORTION OF THIS DRAWING MAY BE QUOTED OR REPRODUCED IN ANY FORM WITHOUT THE EXPRESS WRITTEN PERMISSION OF KIRK-RUDY, INC. KENNESAW, GA 30144 USA	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 11-Aug-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: ASSY, ENCODER BOX	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: N/A	SHEET NO.: 1OF1	DRAWING # 536720-01	

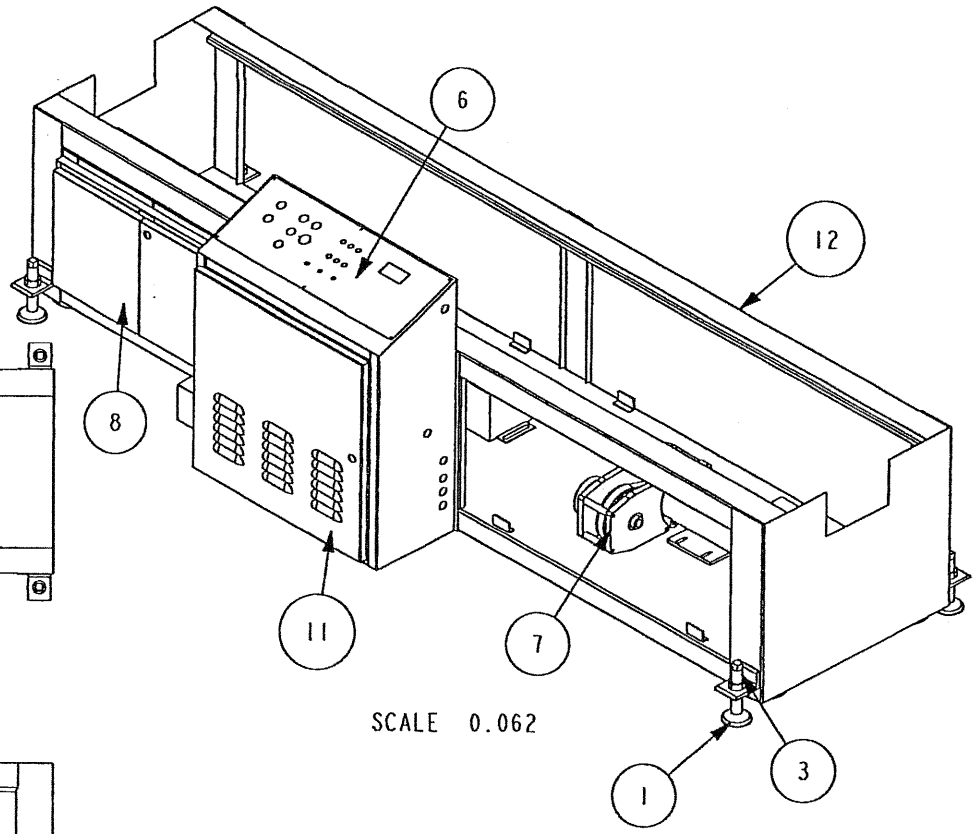
DRAWING #

536835-01

ITEM	QTY	PART #	DESCRIPTION
1	4	190634	FOOT, MOUNTING
2	1	190637	OIL PUMP
3	4	191010	LEVELING BOLT, CABINET
4	1	200257	BOX, ELECTRICAL 4.5 X 4.5
5	1	203005	TRANSFORMER, 1.5KVA
6	1	300016-6	PANEL, CONTROL
7	1	508800-1	ASSY, 1.5 HP GEARBOX
8	1	536667-01	WLDMNT, ELECTRICAL BOX
9	1	536697-01	CHANNEL, WIRING 20.5 IN
10	1	536700-01	COVER, WIRING CHANNEL 13.125 IN
11	1	536834-01	WLDMNT, INSERTER CONTROL BOX
12	1	SP34404	WLDMNT, 96IN OUTFEED SECTION

REV NO	DATE	DESCRIPTION	ECN NO	BY





SCALE 0.062

1	536837-01
REQ'D	WHERE USED

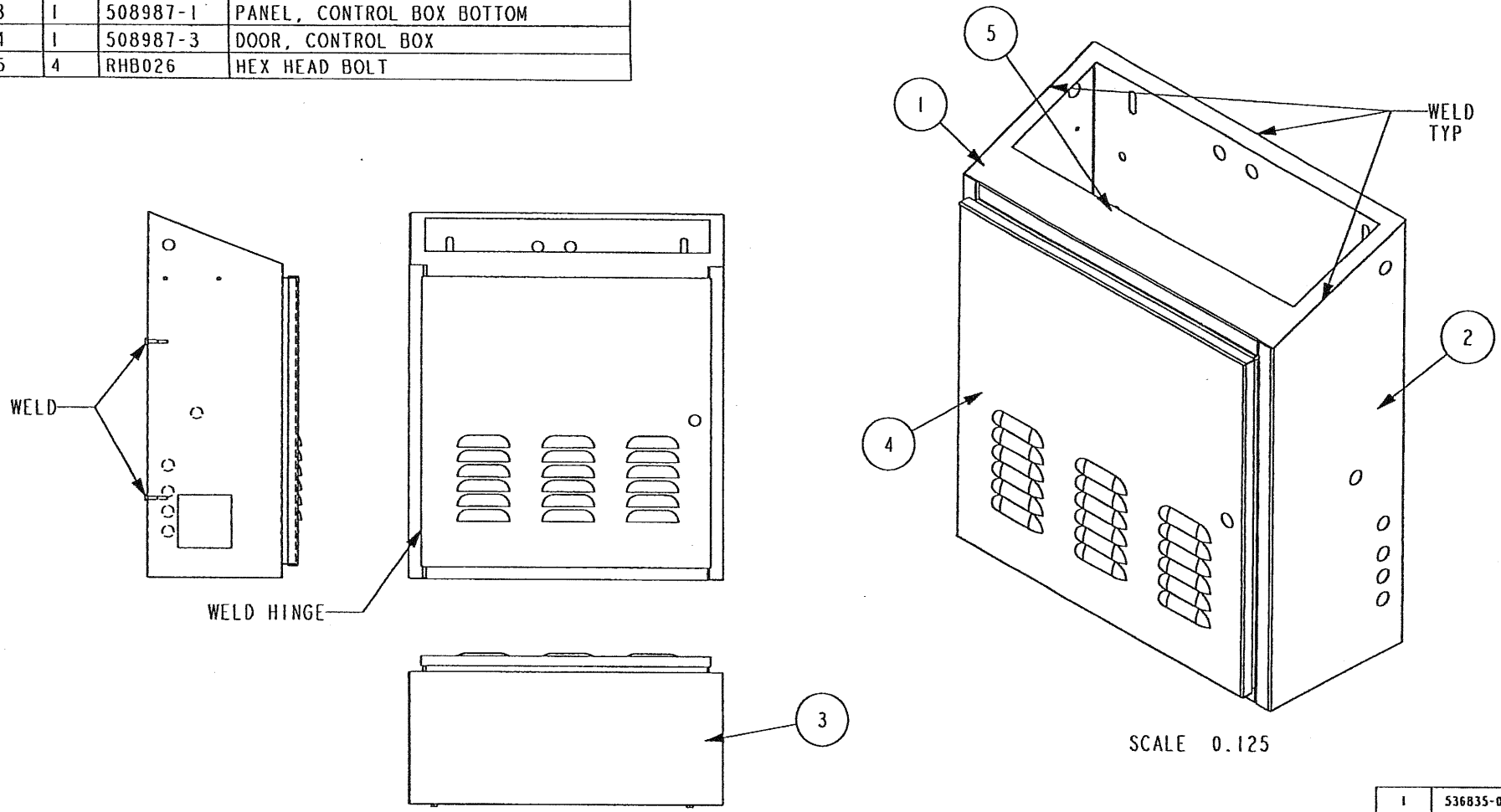
DRAWN BY: MY	SCALE 0.050	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED .XX .01 / .XXX .005 / ANG. .5 REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE FINISHED DIMENSIONS DO NOT SCALE - WORK TO DIMENSIONS ONLY	MATERIAL: N/A HEAT TREAT: N/A FINISH: N/A	THIRD ANGLE PROJECTION		KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 19-Aug-99			MODEL: 512	TITLE: ASSY, OUTFEED CABINET	
TRACED BY:	MASTER M			SHEET NO.: 1OF1	DRAWING # 536835-01	

DRAWING #

536834 01

ITEM	QTY	PART #	DESCRIPTION
1	1	300017	PANEL, CONTROL BOX TOP
2	1	508987	BOX, INSERTER CONTROL
3	1	508987-1	PANEL, CONTROL BOX BOTTOM
4	1	508987-3	DOOR, CONTROL BOX
5	4	RHB026	HEX HEAD BOLT

REV NO	DATE	DESCRIPTION	ECN NO	BY



SCALE 0.125

1	536835-01
REQ'D	WHERE USED

DRAWN BY: MY	SCALE 0.090	DIMENSIONAL TOLERANCES UNLESS OTHERWISE NOTED: .XX .01, .XXX .005, ANG. .5	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	KIRK - RUDY, INC. KENNESAW, GEORGIA
CHECKED BY:	DATE 19-Aug-99	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE NOTED	HEAT TREAT: N/A	MODEL: 512	TITLE: WLDMNT, INSERTER CONTROL BOX	
TRACED BY:	MASTER M	ALL DIMENSIONS ARE FINISHED DIMENSIONS. DO NOT SCALE - WORK TO DIMENSIONS ONLY	FINISH: PAINT	SHEET NO.: 1OF1	DRAWING # 536834-01	

7 ELECTRICAL SCHEMATICS AND PARTS

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

7.1 WIRING DIAGRAMS

210 445 0003 KR600 ELECTRICAL SCHEMATIC

7.2 PARTS LIST

8 APPENDIX

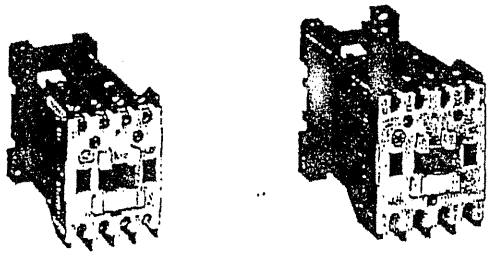
Manufacturer's Sheets

Allen-Bradley Contactor
ATC 7650 Series Photoelectric Sensor
Banner Maxi-Amp CD Series Amplifier And Control Modules
Banner Mini-Beam Quick Disconnect Cables
Banner Mini-Beam SM312D Infrared Diffuse Mode Sensor
Banner Mini-Beam SM312LV Retroreflective Mode Sensor
Bijur Automatic Oiler
Gast 23 Series Oilless Vacuum Pumps And Compressors
Gast R1102 High Capacity Blower
Gordos Digital I/O Module And Mounting Board
Honeywell Micro Switch 103SR Series Hall Effect Position Sensor
International Power DC Power Supplies
Micron GlobalTRAN Transformer
Omron Model E6F-AG5C-C Rotary Encoder
Omron Model H8PS Cam Positioner
Penta-KB Solid State DC Motor Speed Control Instructions
Red Lion Cub5 Miniature Dual Counter/Rate Indicator

Product Selection, Continued

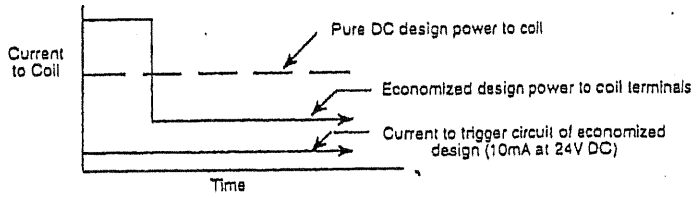
DC Operated Contactors

A-B EXPRESS Fast Shipment Program prices are printed in blue.

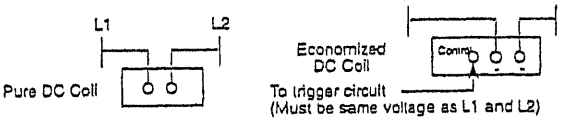


Cat. No. 100-A09NZ...A30NZ

Relative coil power comparison between pure DC coil and economized design — See table on page 1-24 for specific coil data.



Typical Wiring Diagrams
(See Applicable Codes and Laws)

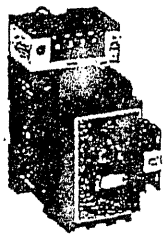


Pure DC Coil Contactors

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price	Reversing Contactors Cat. No.	Price
9 ❶	2.2	4	5.5	5.5	1/3	1	2	2	5	7-1/2	100-A09NZ⊗3	$ 115	104-A09NZ⊗3	$ 304
12 ❶	3	5.5	7.5	7.5	1/2	2	3	3	7-1/2	10	100-A12NZ⊗3	140	104-A12NZ⊗3	354
18 ❶	4	7.5	11	11	1	3	5	5	10	15	100-A18NZ⊗3	155	104-A18NZ⊗3	384
24 ❶	5.5	11	15	15	2	3	5	7-1/2	15	20	100-A24NZ⊗3	170	104-A24NZ⊗3	414
30	7.5	15	18.5	18.5	2	5	7-1/2	10	20	25	100-A30NZ⊗3	203	104-A30NZ⊗3	482
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38NZ⊗3	252	104-A38NZ⊗3	635
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45NZ⊗3	270	104-A45NZ⊗3	671
60	15	30	37	37	5	10	15	20	40	50	100-A60NZ⊗3	322	104-A60NZ⊗3	823
75	22	37	45	45	5	10	20	25	50	60	100-A75NZ⊗3	372	104-A75NZ⊗3	925
110	30	55	75	75	–	–	30	40	75	100	100-B110NZ⊗3	600	104-B110NZ⊗3	1703

❶ 4 main poles of same rating. Right hand pole is normally used as auxiliary.

DC Solid-State Economized Dual Wound Coil Contactors



Cat. No. 100-A38NE...A75NE

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38NE⊗3	$ 252
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45NE⊗3	270
60	15	30	37	37	5	10	15	20	40	50	100-A60NE⊗3	322
75	22	37	45	45	5	10	20	25	50	60	100-A75NE⊗3	372
110	30	55	75	75	-	-	30	40	75	100	100-B110NE⊗3	600
180	45	90	110	110	-	-	60	60	150	150	100-B180NE⊗3	1440

⊗ Voltage Suffix Code

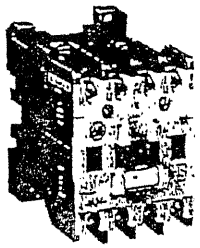
The Cat. No. as listed is incomplete. Select a voltage suffix code from the table below to complete the Cat. No. Example: Cat. No. 100-A09Z⊗3 becomes Cat. No. 100-A09NZ123. For other voltages, consult your Allen-Bradley Sales Office. See page 10-1.

DC Voltage	Type	12	24	48	64	80	115	230	250
Coil Code	Pure DC	12	24	48	64	80	01	23	25
	Economized DC	-	24	48	-	-	01	23	25

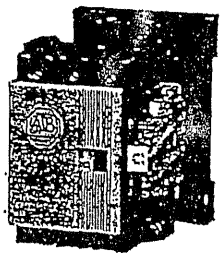
Product Selection

AC Operated Contactors

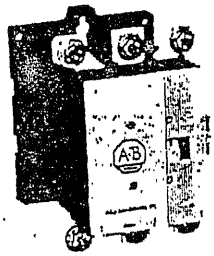
A-B EXPRESS Fast Shipment Program prices are printed in bl



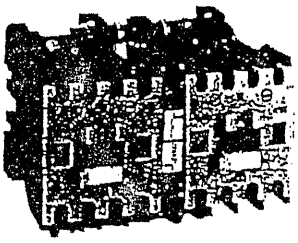
Cat. No. 100-A09...A30



Cat. No. 100-A38...A75



Cat. No. 100-B110...B600



Cat. No. 104-109...A30

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price	Reversing Contactors Cat. No.	Price
9 ❶	2.2	4	5.5	5.5	1/3	1	2	2	5	7-1/2	100-A09N⊗3	$ 90	104-A09N⊗3	$ 254
12 ❶	3	5.5	7.5	7.5	1/2	2	3	3	7-1/2	10	100-A12N⊗3	115	104-A12N⊗3	304
18 ❶	4	7.5	11	11	1	3	5	5	10	15	100-A18N⊗3	130	104-A18N⊗3	334
24 ❶	5.5	11	15	15	2	3	5	7-1/2	15	20	100-A24N⊗3	145	104-A24N⊗3	364
30	7.5	15	18.5	18.5	2	5	7-1/2	10	20	25	100-A30N⊗3	178	104-A30N⊗3	431
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38N⊗3	210	104-A38N⊗3	529
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45N⊗3	225	104-A45N⊗3	559
60	15	30	37	37	5	10	15	20	40	50	100-A60N⊗3	268	104-A60N⊗3	681
75	22	37	45	45	5	10	20	25	50	60	100-A75N⊗3	310	104-A75N⊗3	771
110	30	55	75	75	–	–	30	40	75	100	100-B110N⊗3	500	104-B110N⊗3	1419
180	45	90	110	110	–	–	60	60	150	150	100-B180N⊗3	1200	104-B180N⊗3	2881
250	75	132	160	160	–	–	75	100	200	250	100-B250N⊗3	1625	104-B250N⊗3	3919
304	90	160	200	200	–	–	100	100	250	300	100-B300N⊗3	1781	104-B300N⊗3	4231
414	120	220	280	280	–	–	125	150	350	400	100-B400N⊗3	3875	104-B400N⊗3	8958
608	180	315	445	445	–	–	200	250	500	600	100-B600N⊗3	6625	104-B600N⊗3	15220

⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a voltage suffix code from the table below to complete the Cat. No. Example: Cat. No. 100-A09N⊗3 becomes Cat. No. 100-A09NJ3. For other voltages, consult your Allen-Bradley Sales Office. See page 10-1.

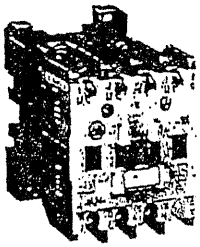
AC Voltage	24	42	48	100	100-110	110	120	200	208	220	240	277	347	380	415	440	480	500	550	600
50 Hz	K	W	Y	-	KF	D	KE	-	-	A	T	-	-	N	I	B	-	M	C	-
60 Hz	J	-	X	KF	-	-	D	-	H	L	A	F	KK	E	-	G	B	-	-	C
50/60 Hz	KD	-	KA	KF	-	S	-	KG	-	-	-	-	-	-	-	-	-	-	-	-

❶ 4 main poles of same rating. Right hand pole is normally used as auxiliary.

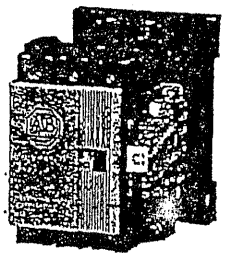
Product Selection

AC Operated Contactors

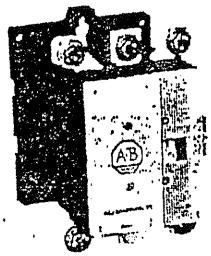
A-B EXPRESS Fast Shipment Program prices are printed in b'



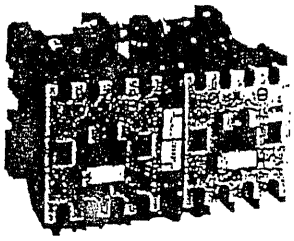
Cat. No. 100-A09...A30



Cat. No. 100-A38...A75



Cat. No. 100-B110...B600



Cat. No. 104-109...A30

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price	Reversing Contactors Cat. No.	Price
9 ❶	2.2	4	5.5	5.5	1/3	1	2	2	5	7-1/2	100-A09N⊗3	S 90	104-A09N⊗3	S 254
12 ❶	3	5.5	7.5	7.5	1/2	2	3	3	7-1/2	10	100-A12N⊗3	115	104-A12N⊗3	304
18 ❶	4	7.5	11	11	1	3	5	5	10	15	100-A18N⊗3	130	104-A18N⊗3	334
24 ❶	5.5	11	15	15	2	3	5	7-1/2	15	20	100-A24N⊗3	145	104-A24N⊗3	364
30	7.5	15	18.5	18.5	2	5	7-1/2	10	20	25	100-A30N⊗3	178	104-A30N⊗3	431
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38N⊗3	210	104-A38N⊗3	529
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45N⊗3	225	104-A45N⊗3	559
60	15	30	37	37	5	10	15	20	40	50	100-A60N⊗3	268	104-A60N⊗3	68'
75	22	37	45	45	5	10	20	25	50	60	100-A75N⊗3	310	104-A75N⊗3	77.
110	30	55	75	75	–	–	30	40	75	100	100-B110N⊗3	500	104-B110N⊗3	1419
180	45	90	110	110	–	–	60	60	150	150	100-B180N⊗3	1200	104-B180N⊗3	2881
250	75	132	160	160	–	–	75	100	200	250	100-B250N⊗3	1625	104-B250N⊗3	3919
304	90	160	200	200	–	–	100	100	250	300	100-B300N⊗3	1781	104-B300N⊗3	4231
414	120	220	280	280	–	–	125	150	350	400	100-B400N⊗3	3875	104-B400N⊗3	8958
608	180	315	445	445	–	–	200	250	500	600	100-B600N⊗3	6625	104-B600N⊗3	15220

⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a voltage suffix code from the table below to complete the Cat. No. Example: Cat. No. 100-A09N⊗3 becomes Cat. No. 100-A09NJ3. For other voltages, consult your Allen-Bradley Sales Office. See page 10-1.

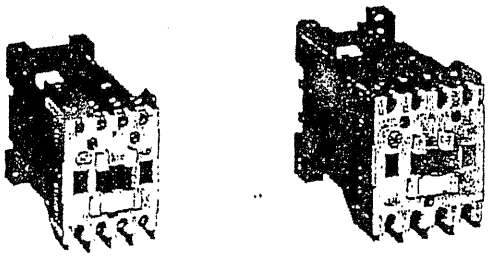
AC Voltage	24	42	48	100	100-110	110	120	200	208	220	240	277	347	380	415	440	480	500	550	600
50 Hz	K	W	Y	-	KF	D	KE	-	-	A	T	-	-	N	I	B	-	M	C	-
60 Hz	J	-	X	KF	-	-	D	-	H	L	A	F	KK	E	-	G	B	-	-	C
50/60 Hz	KD	-	KA	KF	-	S	-	KG	-	-	-	-	-	-	-	-	-	-	-	-

❶ 4 main poles of same rating. Right hand pole is normally used as auxiliary.

Product Selection, Continued

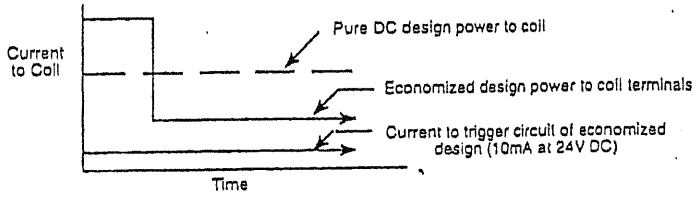
DC Operated Contactors

A-B EXPRESS Fast Shipment Program prices are printed in blue.

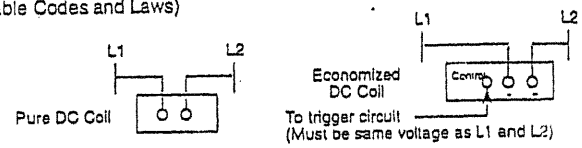


Cat. No. 100-A09NZ...A30NZ

Relative coil power comparison between pure DC coil and economized design — See table on page 1-24 for specific coil data.



Typical Wiring Diagrams
(See Applicable Codes and Laws)

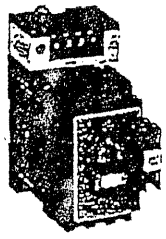


Pure DC Coil Contactors

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price	Reversing Contactors Cat. No.	Price
9 ❶	2.2	4	5.5	5.5	1/3	1	2	2	5	7-1/2	100-A09NZ⊗3	S 115	104-A09NZ⊗3	S 304
12 ❶	3	5.5	7.5	7.5	1/2	2	3	3	7-1/2	10	100-A12NZ⊗3	140	104-A12NZ⊗3	354
18 ❶	4	7.5	11	11	1	3	5	5	10	15	100-A18NZ⊗3	155	104-A18NZ⊗3	384
24 ❶	5.5	11	15	15	2	3	5	7-1/2	15	20	100-A24NZ⊗3	170	104-A24NZ⊗3	414
30	7.5	15	18.5	18.5	2	5	7-1/2	10	20	25	100-A30NZ⊗3	203	104-A30NZ⊗3	482
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38NZ⊗3	252	104-A38NZ⊗3	635
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45NZ⊗3	270	104-A45NZ⊗3	671
60	15	30	37	37	5	10	15	20	40	50	100-A60NZ⊗3	322	104-A60NZ⊗3	823
75	22	37	45	45	5	10	20	25	50	60	100-A75NZ⊗3	372	104-A75NZ⊗3	925
110	30	55	75	75	–	–	30	40	75	100	100-B110NZ⊗3	600	104-B110NZ⊗3	1703

❶ 4 main poles of same rating. Right hand pole is normally used as auxiliary.

DC Solid-State Economized Dual Wound Coil Contactors



Cat. No. 100-A38NE...A75NE

Max. I_e (A)	Ratings (AC3, AC4) kW (50 Hz) 3Ø 220V	380V 415V	500V	660V	HP (60 Hz) 1Ø 115V	230V	3Ø 200V	230V	460V	575V	Non-Reversing Contactors Cat. No.	Price
38	10	18.5	22	18.5	3	5	10	10	25	30	100-A38NE⊗3	S 252
45	11	22	30	22	3	7-1/2	10	15	30	40	100-A45NE⊗3	270
60	15	30	37	37	5	10	15	20	40	50	100-A60NE⊗3	322
75	22	37	45	45	5	10	20	25	50	60	100-A75NE⊗3	372
110	30	55	75	75	-	-	30	40	75	100	100-B110NE⊗3	600
180	45	90	110	110	-	-	60	60	150	150	100-B180NE⊗3	1440

⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a voltage suffix code from the table below to complete the Cat. No. Example: Cat. No. 100-A09Z⊗3 becomes Cat. No. 100-A09NZ123. For other voltages, consult your Allen-Bradley Sales Office. See page 10-1.

DC Voltage	Type	12	24	48	64	80	115	230	250
Coil Code	Pure DC	12	24	48	64	80	01	23	25
	Economized DC	-	24	48	-	-	01	23	25

7650 SERIES PHOTOELECTRIC SENSOR

INSTALLATION INSTRUCTIONS
MARCH, 1995
7650 000 0100

DESCRIPTION

The ATC 7650 Series sensors are compact, self contained photoelectric sensors contained in an encapsulated cylindrical 18mm threaded housing. These sensors can be powered by both AC and DC and are available with either a Relay or Solid State (FET) output. The output is SPDT, which allows the 7650 series to operate as both a "Light On" and "Dark On" sensor.

7652A/7654A

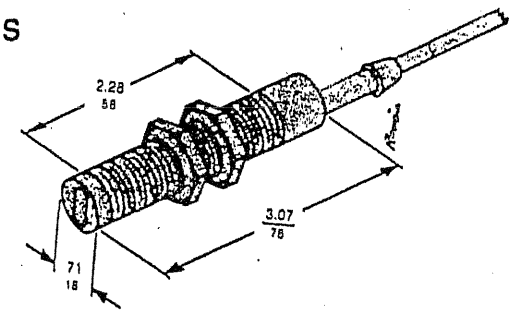
The 7652A and 7654A are diffuse photoelectric sensors. Each unit detects and object in its path by detecting the reflection of transmitted light from the surface of an object. The 7652A detects at a maximum range of 4 inches (100 mm), and the 7654A detects at a maximum range of 18 inches (500 mm).

7653A/7655A

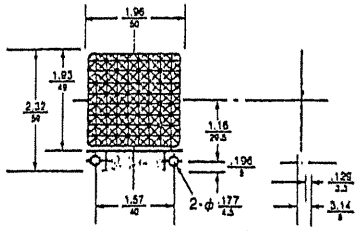
The 7653A is a retroreflective photoelectric sensor which has an infrared, modulated LED light source. The 7655A is a polarized retroreflective sensor which has a visible red, modulated LED light source. These units sense an object by detecting the presence or absence of the transmitted beam of light after it reflects from the reflector provided with each unit. The 7655A polarized unit incorporates filters so the sensor will not detect shiny surfaces other than the reflector supplied with the unit. Both the 7653A and the 7655A detect at a maximum range of 12 feet (3.5 M).

DIMENSIONS

INCHES
MILLIMETERS

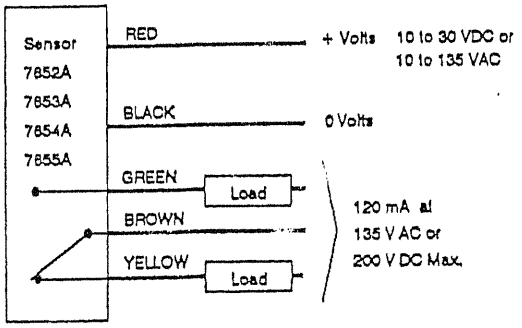


REFLECTOR (7653A/7655A only)



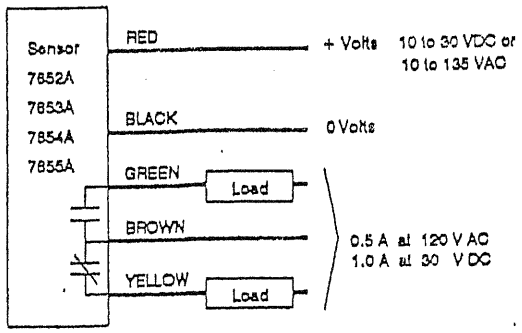
WIRING

SOLID STATE



DUAL FET OUTPUT (SPDT)

RELAY



RELAY OUTPUT (SPDT)

MOUNTING

Two (2) flat plastic nuts are supplied with each unit. After mounting in an appropriate bracket, these nuts are used to lock the sensor in place once the range adjustment is made. Lock washers are not necessary unless the sensor is installed where vibration is severe.

7652A/7654A

If the background is shiny, such as a metal surface, position the unit so that the light beam strikes the surface at an angle to improve reliability.

7653A/7655A

Mount the reflector across the path of the object opposite the sensor. If the object to be sensed has a shiny surface, positioning the unit so that the light beam strikes the object at an angle to improve reliability.

ALIGNMENT

7652A/7654A

Select a mounting position giving a clear view of the object and avoiding reflections from background surfaces, as much as possible. If some background reflection is still present, attempt to darken it. Align the sensor so that the object is within the sensing range and the LED is on. Shift the sensor away from the object until the LED turns off. Then, move the sensor toward the object until the LED just turns on. Measure the distance between the sensor and object surface and decrease this distance by 20% to give a safety factor for reliable operation through varying environmental conditions. Tighten the sensor in place using the two mounting nuts.

7653A/7655A

With power applied to the unit and no object in the beam, shift the sensor from side to side and up and down until the beam is reflected from the reflector and the LED is off. Shift the sensor in one plane to find the two extreme positions where the LED is on. Position the unit midway between the two positions. Then repeat shifting and positioning the sensor in the other plane. Pass the object between the unit and its reflector to insure operation. Tighten the sensor in place using the two mounting nuts.

SPECIFICATIONS

	7652A	7653A	7654A	7655A
SENSING				
Max. Distance	4" (10cm)	12' (3.5m)	18" (0.5m)	12' (3.5m)
Min. Target Size	0.2" (5mm)	2.0" (5.1cm)	0.5" (1.25cm)	2.0" (5.1cm)
INPUT				
Voltage	10 to 30 VDC /10 to 135 VAC			
Current (nominal)	45 mA Max.			
OUTPUT				
Type	SPDT FET Short Circuit Protected			
Capacity	Using 10 to 30 VDC			
Response Time	120 mA			
Max. Switching Rate	< 3 ms			
	166 Hz			
Type	SPDT Relay			
Capacity	1.0A @ 30 VDC;0.5A @ 120 VAC			
Response Time	< 5 ms			
Max. Switching Rate	3 Hz			
FEATURES				
Operating Mode	Light-On / Dark-On			
Status Indicator	Red LED			
ENVIRONMENT				
Ambient Temp.	-13° to 122° F (-25° to 50° C)			
Humidity	Max. Relative Humidity 85%			
PHYSICAL				
Housing	Nonmetallic, NEMA 4, Potted			
Light Emitting Element	Infared			Visible Red
Weight (shipping)	6.0	6.5	6.0	6.5
Weight (unit)	4.0	4.0	4.0	4.0

ORDERING CODE

765 2AD 04 F 2 2 R X

BASIC MODEL TYPE
- ✓2AD Short Range Diffuse
- 3AR Retroreflective (IR)
- 4AD Long Range Diffuse
- 5AR Retro Polarized (red)

OPERATION
- 04 On / Off

POWER REQUIREMENT
- F 10-30 VDC, 10-135 VAC

BEAM TYPE
- 1 Visible Red Polarized
- 2 Infrared

VIEW
- 2 End View

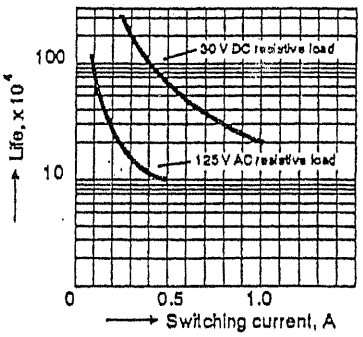
OUTPUT
- R Relay (SPDT)
- S Solid State

FEATURES
- X Standard
- K Special

REPLACEMENT PARTS

00007156900	Mtg. nuts 18mm
00001815200	2 in. square reflector

SPDT Relay LIFE CURVE



A WORD ABOUT SAFETY

Most of ATC's products are designed for general and not for specific applications. Because of this, we usually are not aware of how they eventually will be used. However, they are frequently employed in controlling automatic machinery or processes.

Although ATC makes products of high reliability, every product, given enough time, can be expected to fail. Statistically, devices can fail after a short period of time or a long period of time or anything in between. In essentially all cases, failure means (1) failure to provide a logic signal or power to an electrical load when it should or (2) the providing of such a signal or power when it should be absent. Less often, failure means failure to meet some other specification. But, in all cases, it means to do something unwanted or unexpected.

No ATC product is fail-safe in and of itself.

The photoelectric controls that we manufacture and/or market are for general industrial application and are not designed as a primary optical safety device and are not failsafe in and of themselves.

Since the failure of automatic machinery or processes can create hazardous conditions for personnel or property, whatever the definition of failure might be, it is necessary to consider the consequences of failure and design of the application in which the ATC product is used so that failure will not create a hazard to personnel or property. The design must insure that any failure will result in a fail-safe condition and there will be no danger to personnel and/or property involved in the use of the product.

Designs incorporating controls of any kind should be carefully considered to provide for their eventual failure.

IMPORTANT NOTICE

Our recommendations, if any, for the use of this product are based on tests believed to be reliable. The greatest care is exercised in the selection of our raw materials and in our manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, expressed or implied, is made as to such use or effects incidential to such use, handling or possession or the results to be obtained, whether in accordance with the directions of the claimed so to be. The manufacturer expressly disclaims responsibility therefore. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use.

Warranties of Sale, disclaimer thereof and limitations of liability are covered exclusively by Automatic Timing and Controls' printed warranty statement for the controls. These instructions do not expand, reduce, modify or alter Automatic Timing and Controls' warranty statement and no warranty or remedy in favor of a customer or any other person arises out of these instructions.

AUTOMATIC TIMING & CONTROLS
114 Earland Drive
New Holland, PA 17557
Phone: (717) 354-8430 • Fax: (717) 354-5463

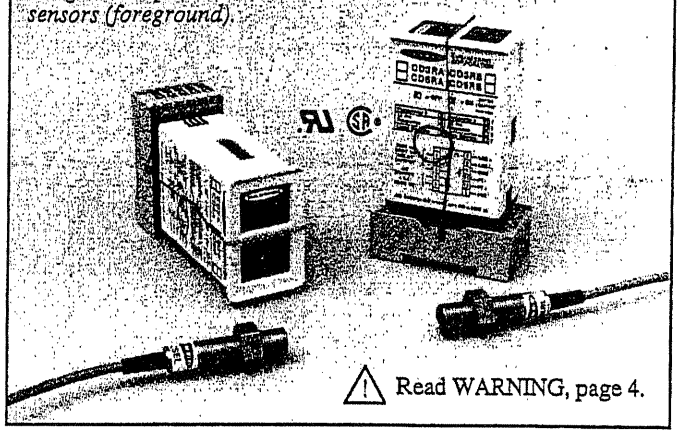
MAXI-AMP™ CD Series

Programmable Modulated Amplifier and Control Modules for use with SP12 Series Preamplified Remote Photoelectric Barrel Sensors

BANNER
the photoelectric specialist

- **Modulated photoelectric amplifier, power supply, output relay, and versatile timing logic (CD5 models) in one compact, stand-alone package**
- **120 or 240V ac or 12-28V dc operation; requires only the addition of a Banner SP12 preamplified opposed mode sensor pair to create a powerful sensing system**
- **CD5 models are easily programmed for any of *twelve* delay, one-shot, and latch functions (either single or dual timing); interrogation schemes are possible using auxiliary input**
- **Exceptionally high immunity to ambient light and electrical noise; no false pulse on power-up**
- **Rugged, 15-turn potentiometers for precise timing and sensitivity adjustment; tough Noryl® housing**
- **Includes Banner's *exclusive* AID™ alignment system**

MAXI-AMP™ CD Series amplifier and control modules are designed to operate with SP12 Series sensors (foreground).



⚠ Read WARNING, page 4.

CD Series MAXI-AMP modules combine power supply, modulated photoelectric amplifier, timing logic (in CD5 models) and output switch in a single compact, cost-saving module. CD Series modules work together with Banner SP12 Series preamplified remote sensors. These sensors offer small size and high power, and are built to operate in highly demanding sensing environments. Their preamplified design gives them exceptionally high immunity to electrical noise (see Banner product data sheet P/N 34466 for further information). MAXI-AMP modules themselves are also ruggedly built for dependable industrial duty.

CD Series MAXI-AMP modules contain a state-of-the-art Banner CMOS modulator/demodulator/amplifier circuit that offers high immunity to both ambient light and electrical interference plus reliable sensor performance. All models have Banner's *exclusive,* patented Alignment Indicating Device (AID™) system*, which lights an LED indicator whenever the receiver sees a "light" condition, and pulses the LED at a rate proportional to the received light signal strength. MAXI-AMP modules operate from a variety of voltages (see tables at right).

All CD Series modules are programmable for LIGHT or DARK operate. Module input response time may be set at either 1.5 or 15 milliseconds. The 15-millisecond response mode offers maximum sensing power (excess gain) with SP12 Series sensors. CD Series modules also feature selectable sensor modulation frequencies ("A" and "B"). This makes it possible to operate two high-powered SP12 Series sensor pairs using different modulation frequencies (at the same response time setting) in close proximity to each other without optical crosstalk.

CD5 models include a versatile multi-function timing logic circuit that is programmable for 12 popular and useful delay, one-shot, and latch functions. Each timing function has a choice of three time ranges. Timing and sensitivity adjustments use rugged 15-turn potentiometers for very accurate settings. CD Series module circuit design prevents false outputs on system power-up.

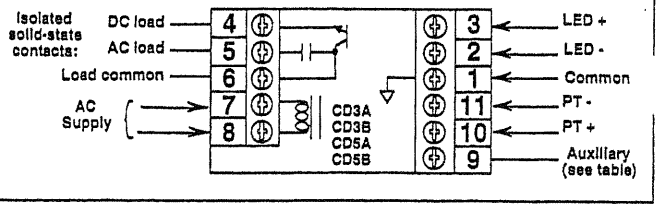
The output circuit for CD3A, 3B, 5A, and 5B modules consists of two SPST solid-state switches: one for ac loads of up to 250V ac (3/4 amp), and a second for dc loads of up to 30V dc (50 mA). Models CD5RA and CD5RB have a 5-amp SPDT electromechanical relay. CD3RA and CD3RB modules have a 5-amp SPDT electromechanical relay *plus* an NPN transistor solid-state switch. For more information on output circuit load capability, refer to the tables (right) and the Specifications section on the next page.

*US patent no. 4356393

MODEL	SUPPLY VOLTAGE	OUTPUT	LOGIC
CD3RA	105 to 130V ac, or 12 to 28V dc	SPDT electro-mechanical relay, plus NPN transistor solid-state switch	ON/OFF
CD3RB	210 to 250V ac, or 12 to 28V dc		
CD5RA	105 to 130V ac, or 12 to 28V dc	SPDT electro-mechanical relay (5 amp contact rating)	12 timing functions
CD5RB	210 to 250V ac, or 12 to 28V dc		

MODEL	SUPPLY VOLTAGE	OUTPUT	LOGIC
CD3A	105 to 130V ac, or 12 to 28V dc	SPST solid-state contact for switching AC loads up to 250V ac and 3/4 amp, plus solid-state contact for switching DC loads up to 30V dc and up to 50mA.	ON/OFF
CD3B	210 to 250V ac, or 12 to 28V dc		
CD5A	105 to 130V ac, or 12 to 28V dc		12 timing functions
CD5B	210 to 250V ac, or 12 to 28V dc		

Generalized Hookup: models with solid-state output



MAXI-AMP™ CD Series Modules Specifications

SUPPLY VOLTAGE: Models CD3(R)A, CD5(R)A: 105 to 130V ac, 50/60Hz (4 VA), or 12 to 28V dc* at 70mA. Models CD3(R)B, CD5(R)B: 210 to 250V ac, 50/60Hz (4 VA), or 12 to 28V dc* at 70mA. **NOTE: do not connect ac power when using external dc power.*

OUTPUT CONFIGURATION:
CD3A, CD3B, CD5A, CD5B: Two solid-state SPST switches, one for ac loads of up to 250V ac and up to 3/4 amp, the other for dc loads of up to 30V dc and up to 50mA. **CD3A and CD3B also have a logic level current sinking NPN transistor switch** at pin #9, maximum load 20mA at 12V dc max.

CD3RA and CD3RB: SPDT electromechanical relay (see specifications, below) plus an NPN transistor solid-state logic-level dc switch (at pin #9, maximum load 20mA at 12V dc max.).
CD5RA and CD5RB: SPDT electromechanical relay (specs below).

SPDT Electromechanical Relay Specifications:
CONTACT RATING: 250V ac max, 24V dc max, 5 amps max. (resistive load), 1/10 H.P. at 240V ac. Install a transient suppressor (MOV) across contacts that switch inductive loads.
CLOSURE TIME: 10 milliseconds max.
RELEASE TIME: 10 milliseconds max.
MAXIMUM SWITCHING SPEED: 20 operations/second
MECHANICAL LIFE: 20,000,000 operations

AMPLIFIER:
RESPONSE SPEED: Programmable for 1.5 or 15 milliseconds. NOTE: use 15 millisecond setting for maximum sensor excess gain.
MODULATION FREQUENCY: selectable, "A" or "B".

SENSOR LEAD LENGTH: 100 feet (30 m) maximum, each sensor. When splicing, use *separate* cable for emitter and receiver, or order sensors with extended cable length.

SENSOR HOOKUP: One SP12 Series opposed mode sensor pair per amplifier module. Additionally, one self-contained sensor may be connected at pin #9 (CD5 models) to provide a RESET or INHIBIT signal. +15V dc power for this one additional sensor is available at module pin #3 (40mA maximum load).

TIMERS (CD5 models only):

Timing ranges:	LOW range - 10 to 150 milliseconds MIDDLE range - 0.1 to 1.5 seconds HIGH range - 1 to 15 seconds
Repeatability:	+/-2% of set time over all extremes of supply voltage and temperature

ADJUSTMENTS: Miniature switches are provided for programming of LIGHT/DARK operate, amplifier response time, modulation frequency, normally open or normally closed output and timing function (CD5 models). 15-turn clutched potentiometer for gain (sensitivity) and time settings (CD5 models).

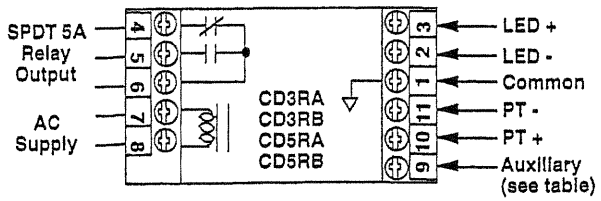
OPERATING TEMPERATURE: 0 to 50°C (+32 to 122°F).

INDICATOR LEDs: Two LEDs. A red indicator LED is "ON" when the module output is energized. Exclusive Banner Alignment Indicating Device (AID™) system lights another red LED indicator whenever the receiver "sees" its own modulated light source, and pulses it at a rate proportional to the strength of the received light signal.

CONSTRUCTION: Rugged Noryl® polyphenylene oxide (PPO®) housing, 1.6" x 2.3" x 4". Standard round-pin 11-pole plug base.

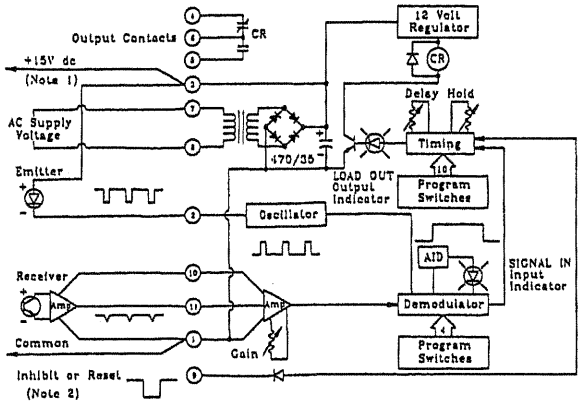
Noryl® is a registered trademark of General Electric Co.

Generalized Hookup:
models with electromechanical relay output



Functional Schematics

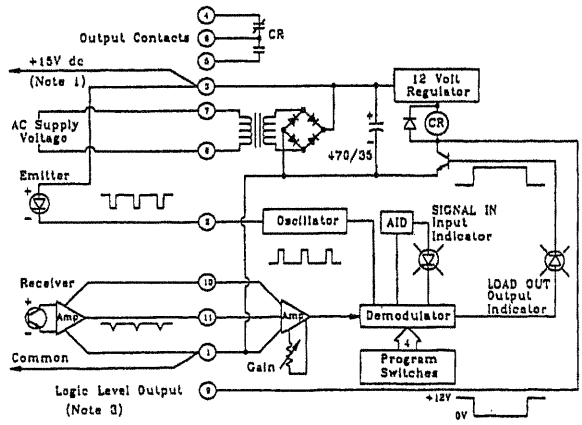
Models CD5RA, CD5RB



NOTE #1: power is available at pins #3 (+) and #1 (-) for an external 10 to 30V dc device (see hookup example, page 3). Current available is 40 mA at 120V ac (240V ac) line level; 30mA at 105V ac (210V ac) line level. Alternately, the module may be powered by 12 to 28V dc at pins #3 (+) and #1 (-). *Do not connect ac voltage when using external dc power.*

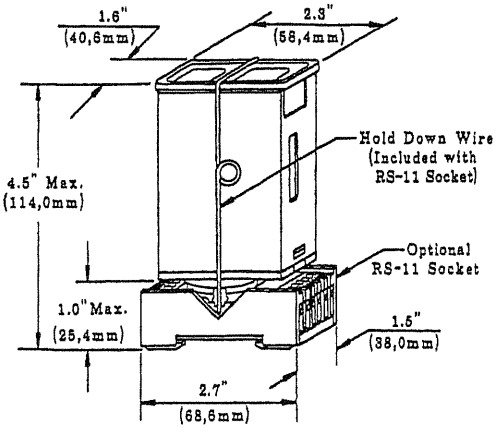
NOTE #2: pulling pin #9 low (to common) will inhibit the timing, or reset the latch of CD5 models (see "Description of Logic Functions", page 5).

Models CD3RA, CD3RB



NOTE #3: pin #9 of CD3 models may be connected directly as the input to Banner CL Series MAXI-AMPs or to Banner MICRO-AMP™ or Plug Logic modules (see hookup example, page 3).

Dimension Drawing



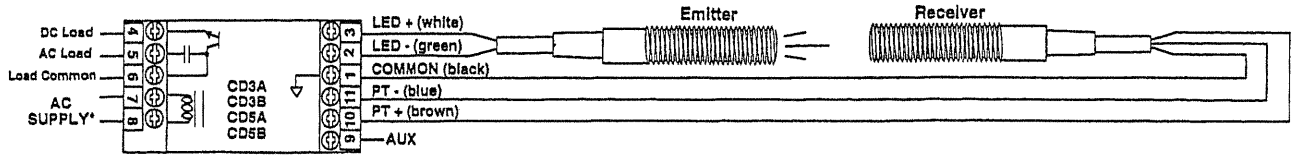
MAXI-AMP CD Series

SP12 Sensor Hookup to CD Series MAXI-AMP™ Modules

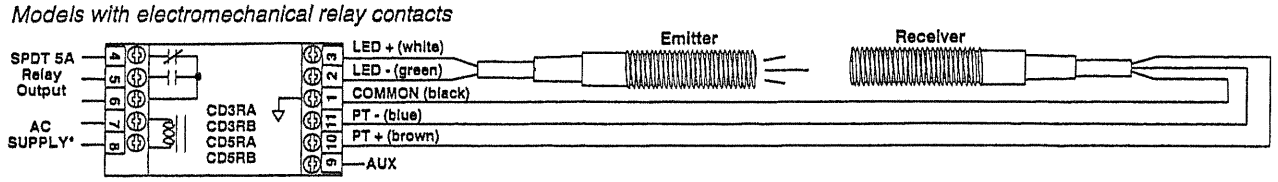
1) Hookup of SP12 Series Sensors (all models)

SP12 Series sensors are especially designed for use with CD Series modules. The basic hookup is given here. Each MAXI-AMP™ CD Series module supports use of one pair of SP12 Series sensors. CD5 Series module models also support use of a GATE or INHIBIT sensor at pin #9 (below, this page).

Models with isolated solid-state contacts



Models with electromechanical relay contacts

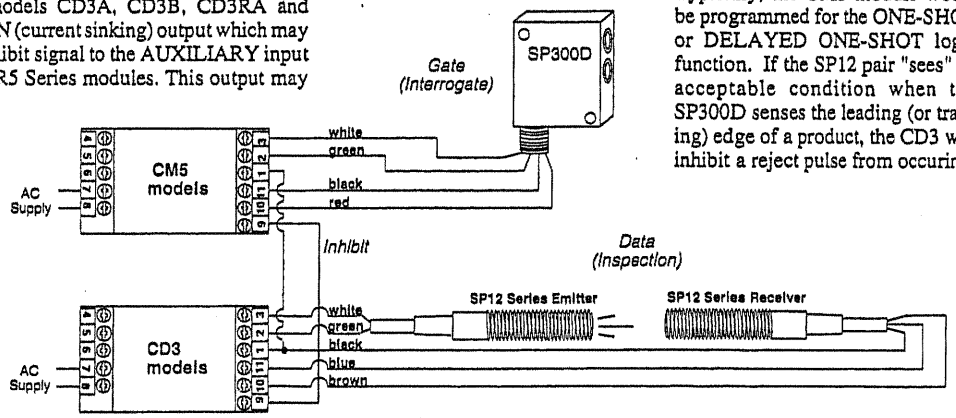


*105 to 130V ac or 210 to 250V ac, 50/60Hz, depending on model. To power the MAXI-AMP™ module from a dc supply, connect +12 to 28V dc at ≥70mA to terminal #3 and dc common to terminal #1. Make no connection to terminal #7 or #8.

2) Logic Level NPN Output (CD3 models)

The AUXILIARY terminal (#9) of models CD3A, CD3B, CD3RA and CD3RB modules offers a logic-level NPN (current sinking) output which may be used as a fast-response solid-state inhibit signal to the AUXILIARY input of MAXI-AMP CD5, CL5, CM5, or CR5 Series modules. This output may also serve as an input to any MICRO-AMP™, Plug Logic, or CL Series logic module. In addition, this output may interface to other dc devices or circuits like counters, rate meters, or programmable logic controllers. Switching capacity is 20mA at 12V dc.

The example here shows the use of SP12 Series sensors and a CD3 module to provide inspection information, with the SP300D functioning as a product (GATE) sensor.



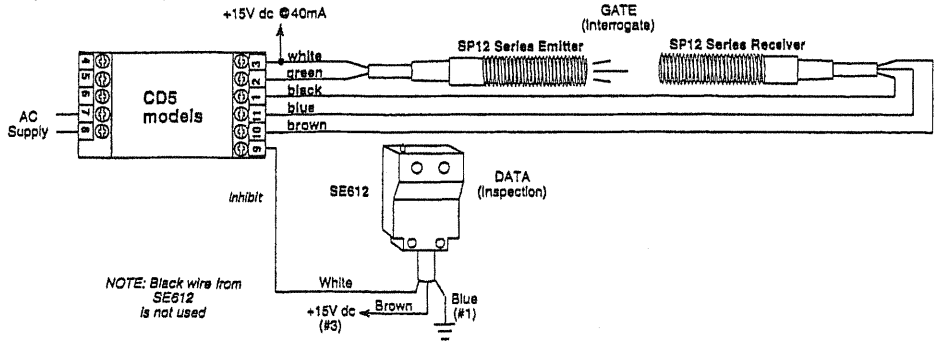
Typically, the CM5 module would be programmed for the ONE-SHOT or DELAYED ONE-SHOT logic function. If the SP12 pair "sees" an acceptable condition when the SP300D senses the leading (or trailing) edge of a product, the CD3 will inhibit a reject pulse from occuring.

See Hookup Diagram #1 (above) for load and power connection information.

3) Power for External Devices (all models)

External 10 to 30V dc devices such as self-contained sensors may be connected between terminals #3 (+) and #1 (-) of any CD series MAXI-AMP module. Terminal #3 offers 40mA maximum. This is sufficient to power most Banner self-contained dc sensors.

As the example at the right illustrates, the *current sinking* output of a self-contained sensor powered by the MAXI-AMP may be used as the input to the AUXILIARY terminal of a CD5 module.

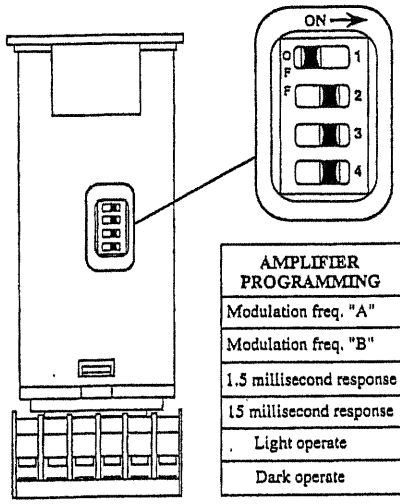


MAXI-AMP CD Series

Amplifier Programming (all CD Series modules)

Amplifier response conditions may be programmed via the group of four switches located on one of the narrow sides of the MAXI-AMP™ module.

Switch #1 selects the modulation frequency of the amplifier and the emitter light source. When two pairs of SP12 Series sensors are being used in close proximity to each other, the modulation frequency switch of their respective CD Series modules should be set to *different* modulation frequencies. This makes it possible to use the two sensor pairs in close proximity without optical crosstalk. *Both amplifiers must be set for the same response time (either 1.5 or 15 milliseconds) to ensure freedom from crosstalk.*



Factory settings are shown at left. The "underlined" settings in table below are factory settings.

AMPLIFIER PROGRAMMING	SWITCH #1	SWITCH #2	SWITCH #3	SWITCH #4
Modulation freq. "A"	OFF	—	—	—
Modulation freq. "B"	ON	—	—	—
1.5 millisecond response	—	OFF	OFF	—
15 millisecond response	—	ON	ON	—
Light operate	—	—	—	ON
Dark operate	—	—	—	OFF

Switches #2 and #3 are used to program the amplifier response time. The 15 millisecond setting allows SP12 Series sensors to operate at their maximum excess gain.

Switch #4 is used to select LIGHT OPERATE or DARK OPERATE. In the LIGHT OPERATE mode, the output will energize (in ON/OFF or LATCH operation) or the timing function will initiate (in DELAY, ONE-SHOT, or LIMIT operation) when the receiver "sees" sufficient light (excess gain greater than 1X). In DARK OPERATE, the output will energize or timing will begin when the receiver is sufficiently dark (excess gain less than 1X).

The diagram at the left shows the location of switches 1-4, and the table summarizes the settings required for each response condition.

NOTE: An adhesive-backed mylar label is supplied. It may be marked to indicate switch programming and then applied to the MAXI-AMP housing as a switch cover.

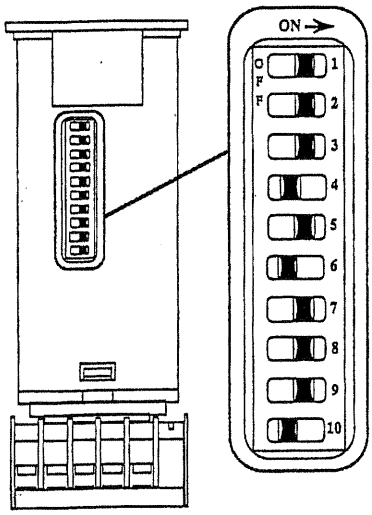
WARNING These photoelectric sensing devices do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

Timing Logic Programming (CD5 models)

Settings illustrated below are factory settings, and are "underlined" in the table.



TIMING LOGIC PROGRAMMING	SWITCH #1	SWITCH #2	SWITCH #3	SWITCH #4	SWITCH #5	SWITCH #6	SWITCH #7	SWITCH #8	SWITCH #9	SWITCH #10
On/Off	ON	ON	ON	OFF	ON	OFF	ON	—	—	—
On Delay	ON	ON	OFF	OFF	ON	OFF	ON	—	—	—
Off Delay	ON	OFF	ON	OFF	ON	OFF	ON	—	—	—
On and Off Delay	ON	OFF	OFF	OFF	ON	OFF	ON	—	—	—
One-shot	OFF	OFF	ON	OFF	ON	OFF	ON	—	—	—
Delayed One-shot	OFF	OFF	OFF	OFF	ON	OFF	OFF	—	—	—
Limit	ON	ON	OFF	OFF	OFF	OFF	ON	—	—	—
Repeat Cycle	ON	OFF	OFF	ON	ON	OFF	ON	—	—	—
AC Latch	OFF	ON	ON	OFF	ON	ON	ON	—	—	—
DC Latch	ON	ON	ON	OFF	ON	ON	ON	—	—	—
Delay and Latch	ON	ON	OFF	OFF	ON	ON	ON	—	—	—
Limit and Latch	ON	ON	OFF	OFF	OFF	ON	ON	—	—	—

N/C Output		OFF	—	—
N/O Output		ON	—	—
.15 Sec. Max. Time		—	OFF	OFF
1.5 Sec. Max. Time		—	ON	OFF
15 Sec. Max. Time		—	OFF	ON

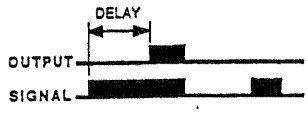
A group of ten switches, located on the side of the module opposite the amplifier program switches, is used to select the timing logic for the CD5 models.

Switches #1 through #7 are used to select the logic function. Switch #8 programs the output for either NORMALLY OPEN or NORMALLY CLOSED operation. Switches #9 and #10 program the time range(s). There are three ranges: 10 to 150 milliseconds, 0.1 to 1.5 seconds, and 1 to 15 seconds. The programmed range will be the same for *both* functions of a dual timing mode (ON & OFF DELAY, DELAYED ONE-SHOT, and REPEAT CYCLE). However, DELAY and HOLD times are independently adjustable within the selected range.

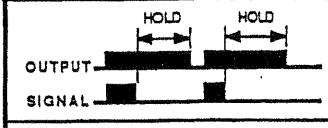
The diagram shows switch locations, and the table summarizes the program switch positions.

Description of Logic Functions, CD5 models

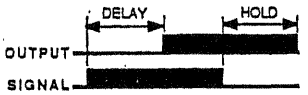
ON/OFF: ON/OFF operation does not involve timing. The output simply follows the action of the input signal. Grounding pin #9 (AUXILIARY) turns the output "off", regardless of the state of the input signal. This may be accomplished by closing a switch or relay contact between pins #9 and #1 (common), or by connecting an open collector NPN (current sinking) output of any external dc device directly to pin #9. NOTE: connect the COMMON of any external dc device to pin #1 of the MAXI-AMP to establish a voltage reference between the dc supply for the external device and the internal dc supply of the MAXI-AMP.



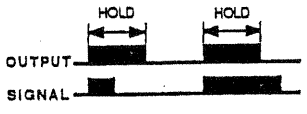
ON DELAY: The ON DELAY timer keeps the output "off" until the selected LIGHT or DARK signal has been present for the preset "DELAY" time. If the input signal is interrupted, the timing is reset and starts over with the next signal. Grounding pin #9 immediately cancels an output in progress and resets the delay timer. The delay timer is restarted when the inhibit signal is removed, if an input signal is present.



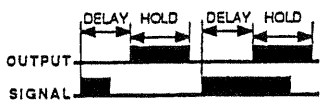
OFF DELAY: The output energizes immediately when the input signal occurs, but does not de-energize until the signal has been removed for the preset OFF-DELAY ("HOLD") time. Grounding pin #9 prevents an output from occuring. If an inhibit input occurs during an output, the output remains "on" for the remainder of the OFF-DELAY time.



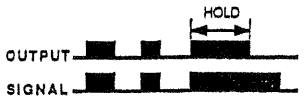
ON & OFF DELAY: ON and OFF DELAY logic combines both timing functions into a single mode. The ON-DELAY ("DELAY") time and the OFF-DELAY ("HOLD") time are independently adjustable within the selected time range. Momentary grounding of pin #9 during the ON-DELAY period resets the DELAY timer. An inhibit signal which occurs during an output will allow the output to stay energized for the remainder of the OFF-DELAY time. ON and OFF DELAY logic is often used in jam and void control, high/low level control, and edge-guiding applications.



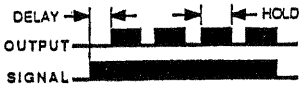
ONE-SHOT: The output of a ONE-SHOT function is a pulse of adjustable "HOLD" duration which is independent of the duration of the input signal. With the MAXI-AMP programmed for LIGHT operate, the pulse occurs when the input signal changes from dark to light. In DARK operate, the pulse occurs with a light to dark input transition. Grounding pin #9 prevents the one-shot from triggering, but does not affect a pulse already under way.



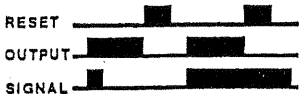
DELAYED ONE-SHOT: A DELAYED ONE-SHOT is initiated by either a momentary or maintained input signal. This input starts the adjustable "DELAY" period, after which the output pulses for an adjustable pulse ("HOLD") time. No further action occurs unless the input is removed and reapplied, beginning a new sequence. Grounding pin #9 during the delay period will cancel the sequence, and no output occurs. This feature is often used for inspection/rejection control logic. An inhibit signal will not affect a pulse under way.



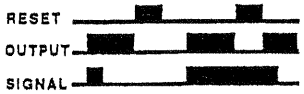
LIMIT: The output of the LIMIT function follows the action of the input, as it does with the ON/OFF function. However, an input signal which is longer than the adjustable LIMIT ("HOLD") time will turn the output "off". Removing the input signal resets the timer. This function is sometimes called "TIME LIMITED ON/OFF", and is useful for energy conservation. Grounding pin #9 cancels the output. Lifting the inhibit restarts the LIMIT timer, if an input signal is present.



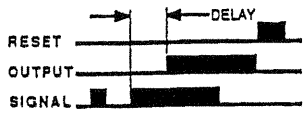
REPEAT CYCLE: The REPEAT CYCLE function provides an oscillating output when an input signal is present. Presence of an input signal triggers an adjustable "DELAY" timer. After the delay, the output energizes for an adjustable "HOLD" period. If the input remains, the output continues to cycle "on" and "off" at this rate indefinitely. When the signal is removed, any output in progress completes and then remains "off" until the next signal and DELAY period. Grounding pin #9 cancels the sequence, but will allow the completion of a "HOLD" period in progress. Lifting the inhibit signal begins the DELAY period, if an input signal is present.



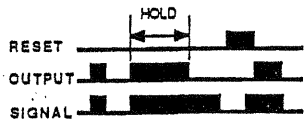
AC LATCH: An AC LATCH is the combination of a ONE-SHOT and a LATCH. A momentary or sustained input will latch the output "on". Grounding pin #9 will reset the latch, even if the input signal remains. The output will not re-latch until the input signal is removed and then reapplied.



DC LATCH: The output will latch "on" whenever the selected LIGHT or DARK input condition occurs. Grounding pin #9 of a dc latch will turn the output "off" regardless of the state of the input signal. If the signal is present when the reset is removed, the output will immediately latch "on" again.



DELAY AND LATCH: The DELAY + LATCH is a combination of the ON-DELAY and DC LATCH functions. An input must be present for at least the adjustable "DELAY" time for the output to latch "on". If the input signal is removed during the timing cycle, the timing is reset. Momentary grounding of pin #9 resets the latch and/or the DELAY timing cycle. Sustained grounding of pin #9 inhibits any output.



LIMIT AND LATCH: The LIMIT + LATCH operates exactly like the LIMIT function, except that the LIMIT ("HOLD") timer can be reset *only* by the auxiliary input. An output remains latched "off" until reset by momentarily grounding pin #9. In addition to resetting the timer, grounding pin #9 will hold the output "off", regardless of the state of the input signal.

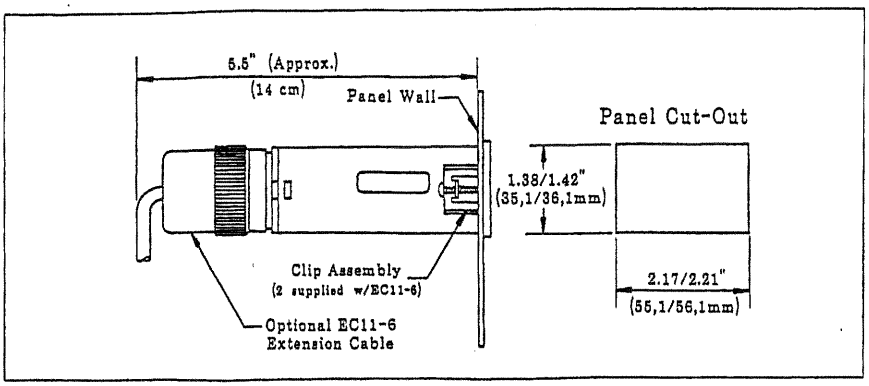
MAXI-AMP System

Mounting and Accessories

Panel Wall Mounting of MAXI-AMP Module

After the panel cutout has been completed and deburred, slide the MAXI-AMP through the cutout and place one clip assembly into the rectangular depression on each of the two narrow sides of the housing. Orient clips as shown, and alternately tighten the screws for equal pressure against the inside of the panel wall. Do not overtighten the screws. Attach the optional EC11-6 extension cable (described below) to the MAXI-AMP and route the opposite end of the cable to the RS-11 (or equivalent) socket.

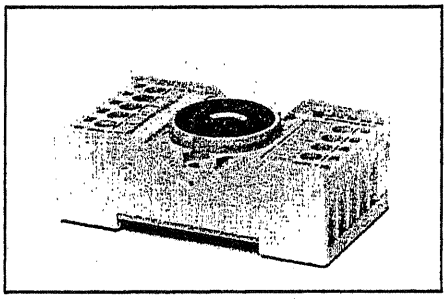
Model EC11-6 extension cable is 6 feet (2m) long. Clips for panel wall mounting of the MAXI-AMP are included with the cable.

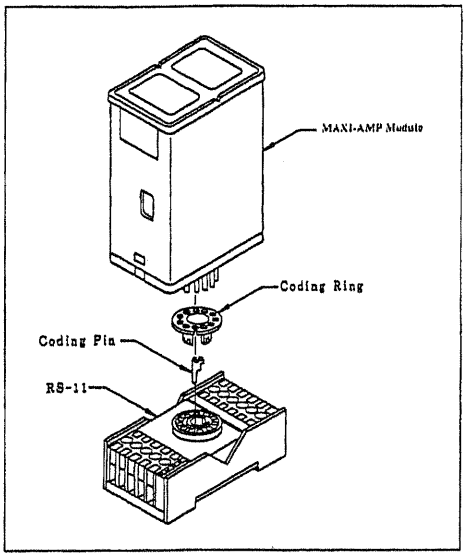


Accessories for MAXI-AMP Modules

Model RS-11 Socket

Model RS-11 is an eleven-pole round-pin screw terminal relay socket which is used to make electrical connections to any MAXI-AMP module. The socket provides in-line wire clamp screw terminals which will accept from one #24 AWG up to two #14 wires at each pin. The RS-11 is UL recognized (file #E92191) and CSA approved (file #LR38486). It may be mounted directly to a panel plate or via standard 35mm DIN-rail track (see below). A hold-down wire is supplied with each RS-11 socket (see dimension diagram on page 2).

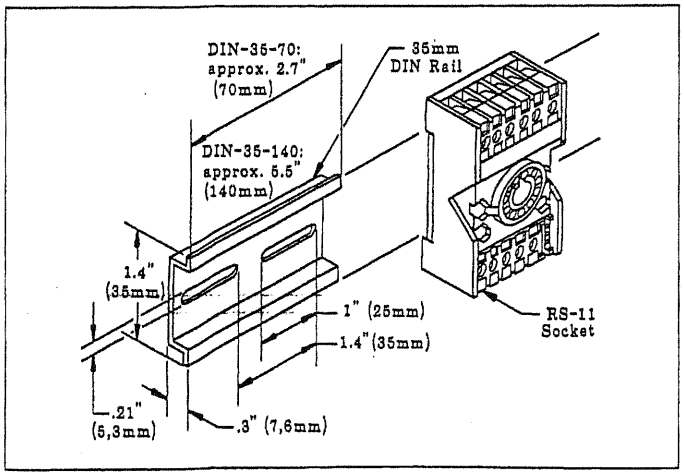




The RS-11 is supplied with a coding ring and pin (see diagram at right). This allows a MAXI-AMP to be keyed to fit only its own 11-pin socket. The pin is installed in one of the eleven slots in the RS-11, and the notch in the ring is aligned to slip over the pin. When the MAXI-AMP is removed from the RS-11, the coding ring stays with the MAXI-AMP base, while the coding pin remains in the socket.

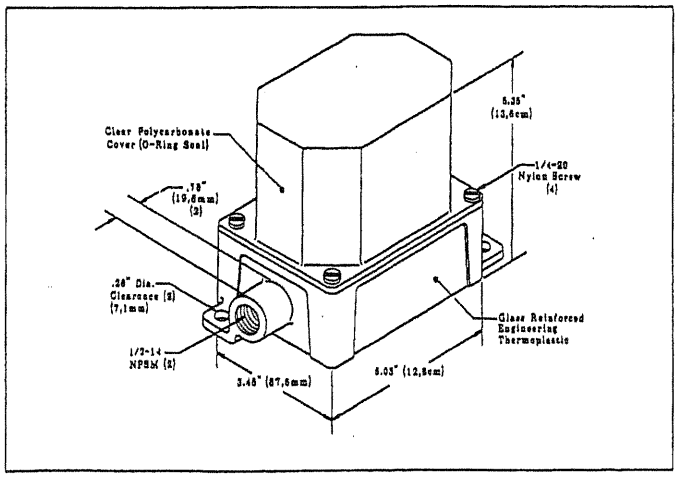
35mm DIN Rail Track

Track model DIN-35-70 accomodates one RS-11 socket. Model DIN-35-105 holds two sockets. Model DIN-35-140 holds up to three sockets. The RS-11 socket is designed to snap (or slide) directly into the 35mm DIN track.



Model BENC-4 Enclosure

Model BENC-4 is a NEMA-4 rated corrosion-resistant enclosure for a MAXI-AMP module or other control device. It is supplied with a DIN-35-70 track for easy mounting of one RS-11 socket. For mounting two sockets, use DIN-35-105.



WARRANTY: Banner Engineering Corporation warrants its products to be free from defects for 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.

Banner Engineering Corp. 9714 Tenth Ave. No. Minneapolis, MN 55441 Telephone: (612) 544-3164 FAX (applications): (612) 544-3573

MINI-BEAM® Quick-Disconnect Cables

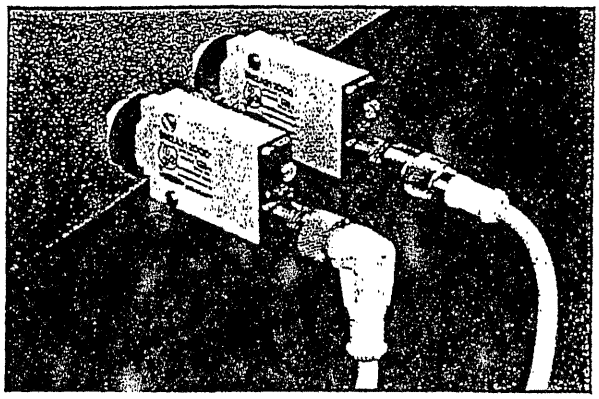
for use with SM2A312 series AC MINI-BEAM Sensors with "QD" Option

BANNER®
the photoelectric specialist

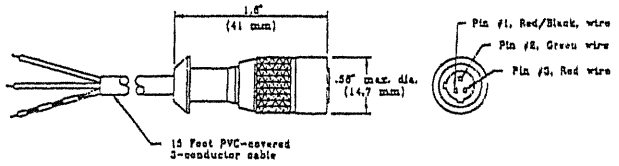
Models MQDC-315 and MQDC-315RA are 3-conductor quick-disconnect cables for use with SM2A312 series "QD"-type AC MINI-BEAM sensors. They are ideal for use with these sensors in situations where it is desireable to be able to substitute or replace the sensors and/or cabling, each independent of the other.

The 3-pin female plug of these cables mates with a 3-pin male connector on the rear of "QD"-type AC MINI-BEAM sensors. Cable model MQDC-315 has a "straight" connector; model MQDC-315RA is a right-angled version. The cable lead covering and outer jacket are of PVC. Plug contacts are gold-plated. Cables are supplied in a standard length of 15 feet (5 meters).

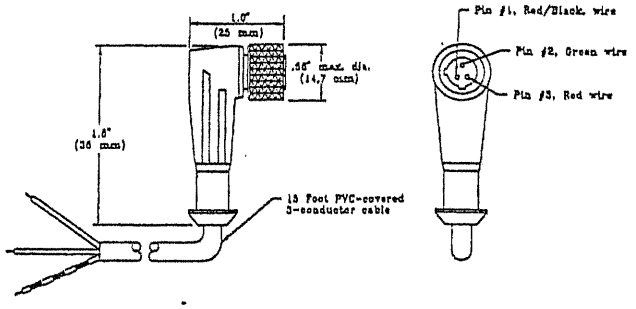
NOTE: these cables may be used *only* with *AC* MINI-BEAM sensor models having the "QD" (Quick Disconnect) option. Specify these sensors by adding the suffix "QD" to any standard AC MINI-BEAM model number. Example: the "QD" version of model SM2A312LV is "SM2A312LVQD".



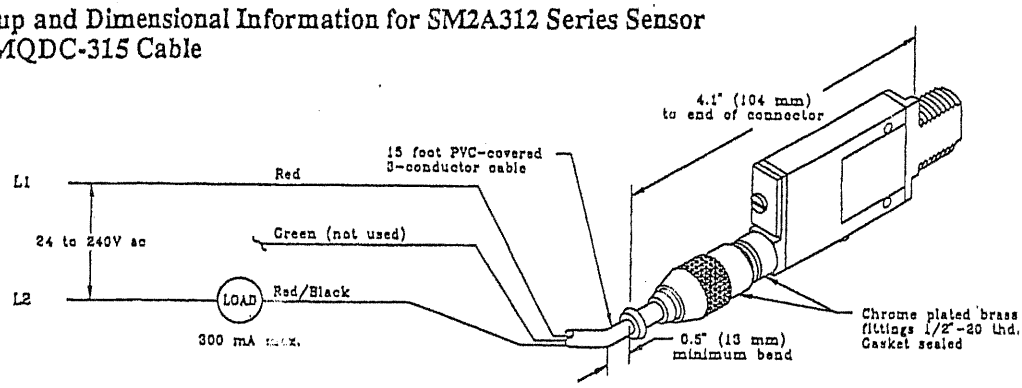
Dimensional Information for MQDC-315 Cable



Dimensional Information for MQDC-315RA Cable

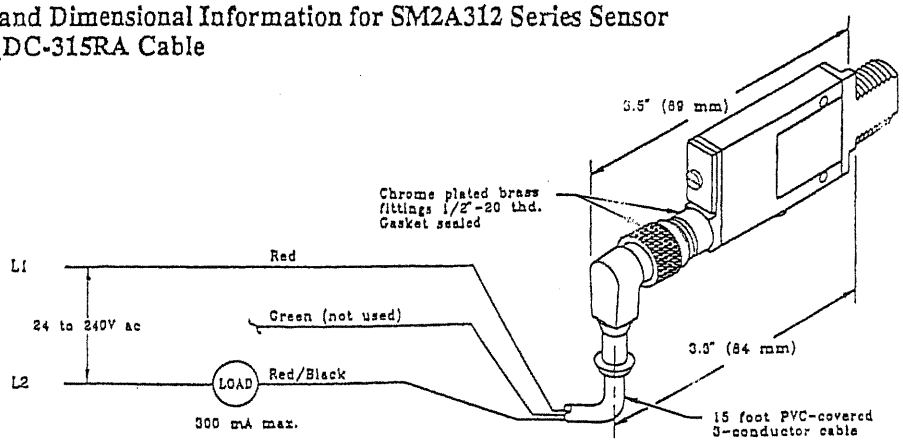


Hookup and Dimensional Information for SM2A312 Series Sensor with MQDC-315 Cable



NOTE: AC Emitters (models SMA31EQD and SMA31ELQD) connect directly across a 24-240V ac line, without regard to polarity (the green wire is not used).

Hookup and Dimensional Information for SM2A312 Series Sensor with MQDC-315RA Cable



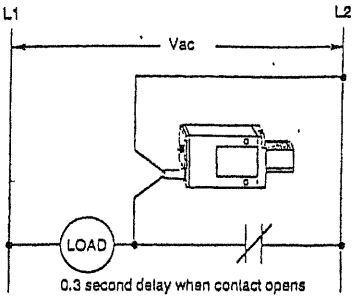
NOTE: AC Emitters (models SMA31EQD and SMA31ELQD) connect directly across a 24-240V ac line, without regard to polarity (the green wire is not used).

Banner Engineering Corporation 9714 10th Avenue No., Minneapolis, MN 55441 Telephone: (612) 544-3164 FAX (appls): (612) 544-3573 P/N 03520D0A

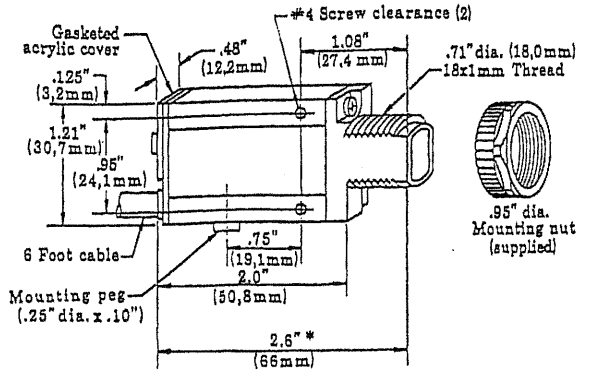
Hookup Diagrams (continued)

AC SENSORS WITH PARALLEL CONTACTS

When 2-wire ac sensors are connected in parallel with mechanical switch or relay contacts, the sensor loses the voltage it needs to operate while any contact is closed. When all of the contacts open, the sensor's 0.3 second power-up delay may cause a momentary drop-out of the load.



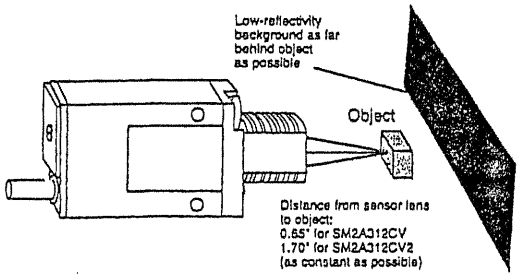
DIMENSION DRAWING, SM2A312CV & SM2A312CV2



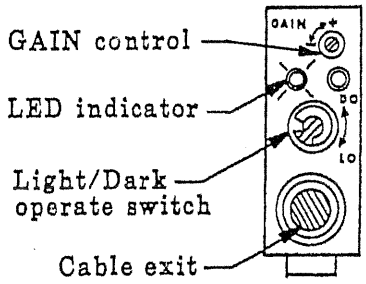
INSTALLATION and ALIGNMENT

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 to the object. For best results, mount these sensors in an 18-mm hole by their threaded barrel or use one of the available mounting brackets (see next page).

Begin with the sensor at the approximate position where it will be mounted. With power applied to the circuit and with the sensor set for "light operate", direct the sensor's visible red spot at the object approximately 0.65" (for model SM2A312CV) or 1.7" (for model SM2A312CV2) directly in front of the lens. Move the sensor very slightly toward or away from the object while observing the red LED indicator on the back of the sensor. Note the near and far points at which sensing occurs (the range of distance over which the LED remains lit). Mount the sensor at a point approximately midway in the range. This should correspond to the point at which the red sensing spot on the object appears most sharply defined. Mount the sensor at this position and distance.



SENSOR REAR VIEW



ADJUSTMENTS

GAIN control: 15-turn clutched potentiometer; turn clockwise to increase.

LED indicator: red LED lights whenever the load is energized.

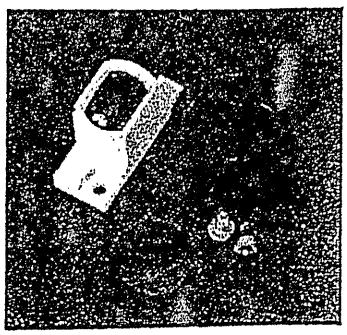
LIGHT/DARK OPERATE switch: in LIGHT operate (control fully clockwise), the sensor's output conducts when an object is present. In DARK operate (control fully counterclockwise), the sensor's output conducts when the object is absent or when the darker of the two colors is sensed.

Reliable convergent sensing requires that the sensor-to-object distance be held relatively constant. This may be a critical factor, especially when highly reflective background objects are present, or when the background is close to the object. Best results will be attained under the following conditions: constant sensing distance from one object to the next, a background of low reflectivity, and the background as far from the object as possible.

Modifications and Accessories

REPLACEMENT UPPER COVERS & MOUNTING NUTS

Replacement upper covers (right) are available. Upper cover model UC-300C.7 is the threaded "nose" of MINI-BEAM model SM2A312CV (with its attached mounting flanges) which houses the lens and comprises the "front" of the sensor. Two replacement mounting screws and a black plastic 18-mm mounting nut are included. NOTE: the SM2A312CV2 uses upper cover part number UC-300C2.



A "CV" model can be changed to a "CV2" (and vice-versa) by substituting the proper upper cover.

CABLE LENGTH MODIFICATION: 30 Ft. Cable

Sensors may be supplied with cables longer than the standard 6 feet. Thirty-foot lengths are most readily available (longer lengths may also be quoted).

EXTENSION CABLE

Model EC-312A-100 2-conductor cable (brown, blue; without connectors) is available in 100-foot lengths.

QUICK-DISCONNECT CABLE:

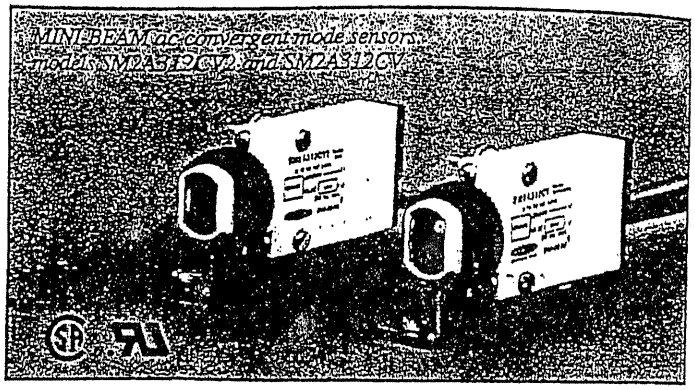
15-foot *microfast*™ 3-wire cables with straight or right-angled QD connector are available for use with dc-powered QD MINI-BEAM sensor models SM2A312CVQD and SM2A312CV2QD. Model MQDC-315 has a straight connector; MQDC-315RA has a right-angled connector. For more information, see Banner product catalog or product data sheet P/N 03520.

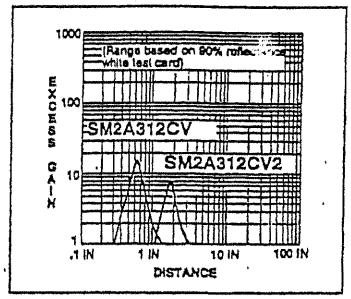
MINI-BEAM® SM2A312CV & SM2A312CV2

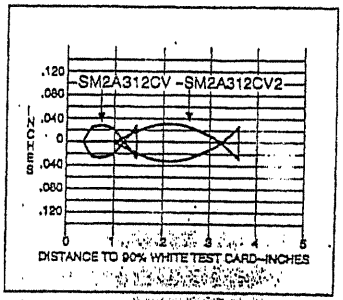
Self-contained 2-wire AC Convergent Mode Sensors

BANNER
the photoelectric specialist

- Produce a precise 0.05" diameter sensing spot at a focus point 0.65" from the lens surface (SM2A312CV) or a 0.12"sensing spot at a 1.7" focus (SM2A312CV2)
- Modulated visible light beam for ease of alignment and immunity to ambient light
- Switch-selectable for light or dark operate; highly repeatable, 4 millisecond response
- SPST solid state SCR output switches up to 300mA; convenient 2-wire hookup
- LED indicator lights when load is energized
- 24 to 240V ac operation (50-60Hz), 250V ac maximum
- Rugged, epoxy-encapsulated construction: meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13







These are small, rugged, visible-red convergent beam sensors with fast response that produce a well-defined sensing spot at a fixed focal distance in front of the lens. Model SM2A312CV produces a .05" diameter spot at a .65" focal distance. Model SM2A312CV2 produces a 0.12" diameter spot at a focal distance of 1.7". This small, visible red sensing spot greatly simplifies alignment and makes these sensors especially useful for sensing small objects. They may also be used for accurate positioning control and position sensing, including positioning of many transparent materials.

SM2A312CV and CV2 convergent 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 simplified by an easily-visible rear panel red LED indicator that lights whenever the load is energized (i.e. when the sensor sees light in "light operate" mode, or when the sensor sees dark in "dark operate" mode).

Both models have SPST SCR solid-state relay contacts capable of switching loads of up to 300mA at 50°C ambient (derated to 100mA at 70°C ambient). These sensors connect in series with suitable loads, exactly like a mechanical limit switch. They may also be connected either in series (for "AND" or "NOR" logic functions) or parallel (for "OR" or "NAND" logic functions) *with each other*, and then this series or parallel sensor combination connected in series with the load. Their low output leakage current and low saturation voltage also make them suitable for interfacing to programmable controllers and other solid-state circuitry.

The SM2A312CV and SM2A312CV2 operate from 24 to 240V ac (50-60Hz), and are fully protected against false pulse on power-up and inductive load transients.

A convenient control on the back of the sensor allows a choice of either light- or dark-operate sensing mode. A rugged, clutched 15-turn slotted brass screw GAIN control potentiometer enables precise adjustment of sensor sensitivity.

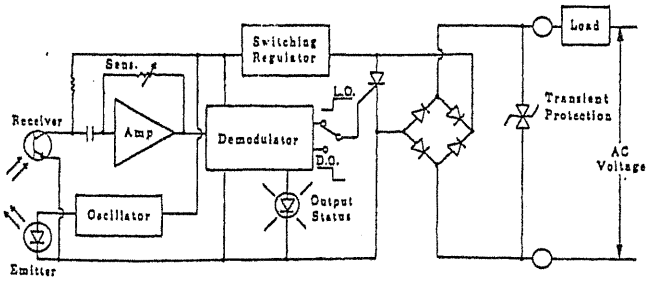
Banner MINI-BEAM sensors feature totally-encapsulated electronics in a rugged VALOX® housing, with o-ring sealing, acrylic lenses, and stainless steel screws. All models meet NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13. Replacement lenses are available (see page 3).

WARNING These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

FUNCTIONAL SCHEMATIC, SM2A312CV & SM2A312CV2



A dimension drawing appears on page 3.

Printed in USA

P/N 03402A4G

SPECIFICATIONS: SM2A312CV & SM2A312CV2

SUPPLY VOLTAGE: 24 to 240V ac (50-60Hz); 250V ac max.

OUTPUT CONFIGURATION: SPST SCR solid-state relay with er normally closed or normally open contact (light/dark operate ctable).

OUTPUT RATING: minimum load current 5mA; maximum steady-state load capability 300mA to 50 °C ambient (122 °F), 100mA to 70°C ambient (158 °F). Inrush capability 3 amps for 1 second (non-repetitive); 10 amps for 1 cycle (non-repetitive). Off-state leakage current less than 1.7mA rms. On-state voltage drop ≤5 volts at 300mA load, ≤10 volts at 15mA load.

OUTPUT PROTECTION: protected against false pulse on power-up and inductive load transients.

RESPONSE TIME: 4 milliseconds ON, 4 milliseconds OFF. "OFF" response time does not include load response of up to 1/2 AC cycle (8.3 milliseconds). Response time specification of load should be considered when important. (NOTE: 300 millisecond delay on power-up.)

REPEATABILITY of RESPONSE: 1.3 milliseconds. RESPONSE TIME and REPEATABILITY specifications are independent of signal strength.

LIGHT BEAM: visible red (650nm); convergent beam.
SM2A312CV: spot size 0.05" diameter at 0.65"(16mm) focus point;
SM2A312CV2: spot size 0.12" diameter at 1.7" (43mm) focus point.

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 2-conductor cable (6' length) standard.

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 of sensor and protected by a gasketed, clear acrylic cover.

INDICATOR LED: red LED indicator on rear of unit is "ON" when the load is energized.

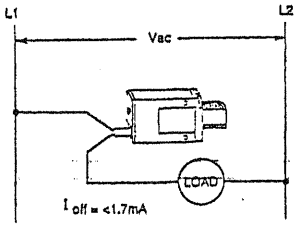
OPERATING TEMPERATURE RANGE: -20 to +70 degrees C (-4 to +158 degrees F).

HOOKUP DIAGRAMS, SM2A312CV and SM2A312CV2

NOTE: output has a maximum load capacity of 300mA. Minimum load is 5mA (see specs.).

BASIC AC HOOKUP

MINI-BEAM 2-wire ac sensors wire in series with an appropriate load. This combination, in turn, wires across the ac line.



These sensors operate in the range of 24 to 240V ac, and may be programmed for either normally open (N.O.) or normally closed (N.C.) operation by way of the light-dark operate switch on the back of the sensor. A 2-wire ac sensor may be connected exactly like a mechanical limit switch.

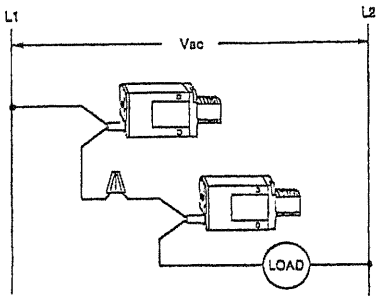
The sensor remains powered when the load is "off" by a residual current which flows through the load. The off-state leakage current (I) is always less than 1.7mA. The effect of this leakage current depends on the characteristics of the load. The voltage which appears across the load in the off-state is equal to the leakage current of the sensor multiplied by the resistance of the load: V(off) = 1.7mA x R(load).

If this resultant off-state voltage is less than the guaranteed turn-off voltage of the load, then the interface is direct. If the off-state voltage causes the load to stay "on", then an artificial load resistor must be connected in parallel with the load to lower the effective resistance. Most loads, including most programmable controller inputs, will interface to 2-wire sensors with 1.7mA leakage current without an artificial load resistor. *These sensors are not polarity sensitive: all hookups are without regard to wire color.*

WARNING: MINI-BEAM 2-wire ac sensors will be destroyed if the load becomes a short circuit.

AC SENSORS IN SERIES

Multiple 2-wire ac MINI-BEAMs may be wired together in series for "AND" or "NOR" logic functions. The maximum number of sensors which may be wired in series to a load depends upon the level of the line voltage and the switching characteristics of the load. Each sensor connected in series adds an amount of voltage drop across the load. The amount of voltage drop that each sensor adds depends upon the current demand of the load. Each sensor in series adds approximately 5 volts drop across a 300mA load. A 15mA load will see about a 10 volt drop from each sensor added in series. To determine compatibility, compare the resultant on-state voltage across the load against the load's guaranteed turn-on voltage level (from the manufacturer's specifications).



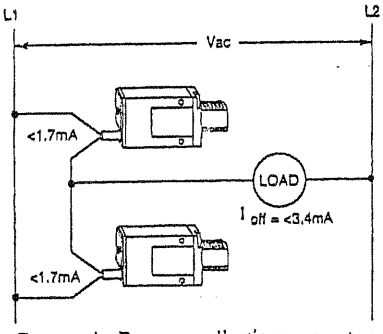
Most non-compatibility of series sensors with loads occurs in low-voltage applications (e.g. 12, 24, or 48V ac circuits) where the on-state voltage drop across the load is a significant percentage of the supply voltage.

The power-up inhibit time (up to 300 milliseconds per sensor) is also additive.

AC SENSORS IN PARALLEL

Multiple 2-wire ac MINI-BEAMs may be wired in parallel to a load for "OR" or "NAND" logic functions. With sensors wired in parallel, the off-state leakage current through the load is equal to the sum of the leakage currents required by the individual sensors. Consequently, loads with high resistance like small relays and solid state inputs may require artificial load resistors.

AC MINI-BEAMs wired together in parallel will *not* cause momentary drop-out of the load, as is experienced when wiring in parallel with contacts (see next page). However, it is likely that the power-up delay feature *will* cause a momentary drop-out of the load if an ac MINI-BEAM is wired in parallel with a different brand or model of 2-wire sensor.

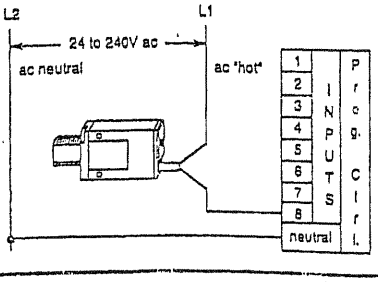


Contact the Banner applications group to verify compatibility.

CONNECTION TO PROGRAMMABLE CONTROLLERS

2-wire ac MINI-BEAMs may be connected to the inputs of programmable controllers (PLC's), as shown in this drawing.

Connect ac "neutral" to "neutral" of the PLC. The sensor connects in series with the "hot" lead of the ac line.



TECHNICAL DATA SHEET

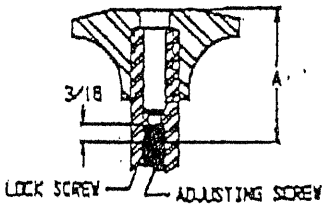
Lubricator Type TM-1

Automatic Cyclic

Operation: Lubricator is a motor-driven, spring discharge piston pump. The motor incorporates a gear reduction which determines the operating cycle of the pump piston. Available cycle times are shown in the table below.

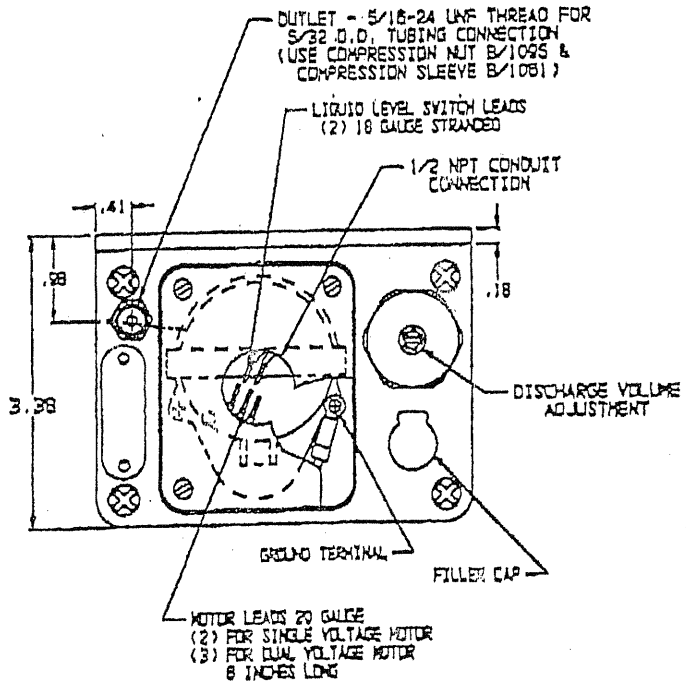
VOLTS	LUBRICATOR CYCLE TIME IN MINUTES		WITHOUT LEVEL SWITCH	WITH LEVEL SWITCH
	50 cps	60 cps	Part No.	Part No.
115V	145	120	C2731	C2889
	72	60	C2739	C2890
	18	15	C2741	C2891
	9	7.5	C2803	C2898
230V	9	7.5	C2774	C2897
	145	120	C2763	C2892
	72	60	C2764	C2893
	18	15	C2765	C2894
115/230V	2.4	2	C2798	C2895

Discharge Volume Per Cycle: Adjustable from 0.2 cu. cm. minimum to 1.0 cu. cm. maximum. Lubricator is supplied set at maximum discharge, 1.0 cu. cm. (maximum piston stroke). For less delivery, remove lock screw, measure **A**, turn adjusting screw clockwise, increasing **A** by **B** dimension.

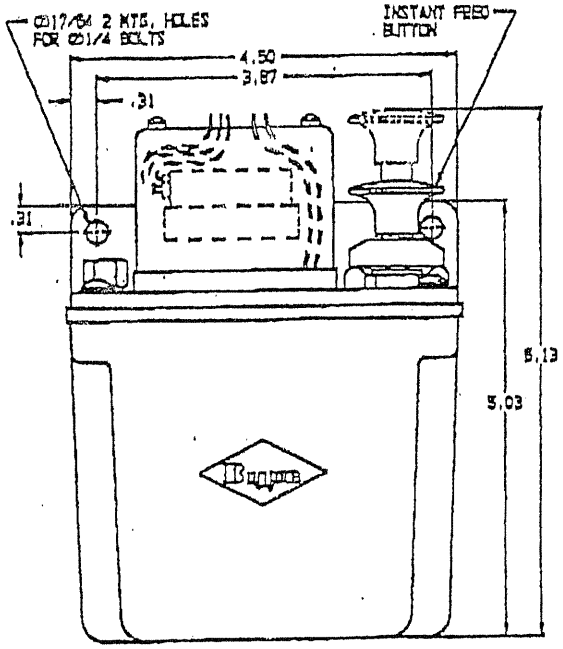


B	Discharge
.440	.2cc
.330	.4cc
.220	.6cc
.110	.8cc
0	1.0cc

Discharge Pressure Range: 20 – 50 psi. Pressure will decrease as the number of Meter Units in the system increases.



Top View



Front View

Bijur Lubricating Corporation

Oil Viscosity Range: 150 to 8000 SSU at operating temperature.

Reservoir Capacity: 1 Pint (475 cu. cm.)

Lubricator Inlet Filter: 40 micron particle separation. It should be inspected periodically and cleaned or replaced, as required.

Distribution System: Uses Type F Meter Units. Limitations – For System ϕ Limitations, see "Engineering Manual." For System Flow Value (ϕT) limitations, refer to table below.

No. of Meter Units	Oil Discharge In cc's Per Cycle		
	.25	.50	1
5	95	145	240
10	65	100	170
15	55	85	140
20	45	75	115
	Maximum Permissible System Flow Value ϕT		

Motor: Continuous duty, single phase, synchronous induction timing motor for 50/60 Hz single voltage 115 and 230V and dual voltage for 115/230V. Power consumption 3 watts.

Wiring for Dual Voltage Motor:
115V: Connect blue and white, insulate red.
230V: Connect blue and red, insulate white.

Bijur reserves the right to change motor size, mounting dimensions and/or manufacturer.

Liquid Level Switch: Models of this lubricator equipped with liquid level switch are listed in the table on front side of this sheet. They are supplied so the switch will close an electrical circuit whenever the oil in the reservoir is **above** the minimum operating level. Thus, when connected to a light or other indicating device, the liquid level can be monitored.

Customers may reverse the operation when desired, by inverting the float. When the float is reversed, the switch will close an electrical circuit whenever the oil level is **below** the minimum operating level.

Note: Switch contact rating is 10 watts maximum. (Light or indicating device is not supplied by Bijur.)

When Ordering, Specify:
Lubricator type and part number, such as:
Lubricator Type TM-1, C2731

For complete listing of available models, see table on front of sheet.

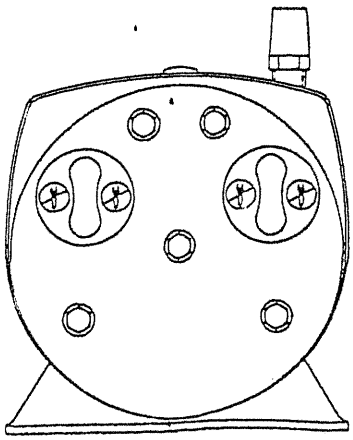
70-290
G375PL
(12/93)

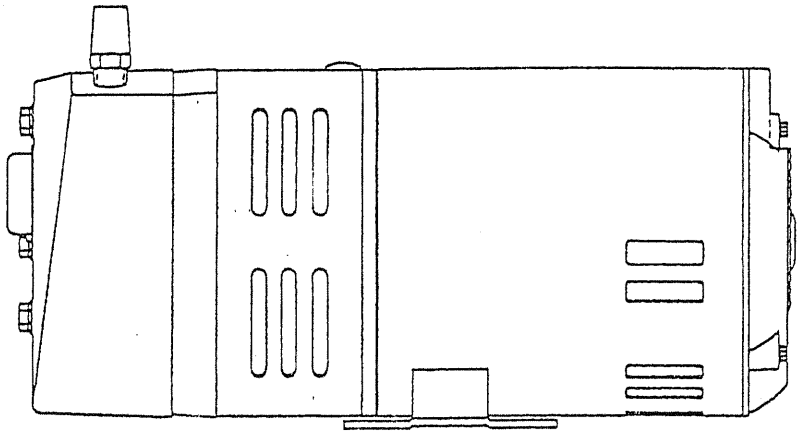
GAST MANUFACTURING CORPORATION
P. O. BOX 97, BENTON HARBOR, MICHIGAN 49023-0097
PHONE 616-926-6171

PARTS LIST and OPERATING INSTRUCTIONS

23 SERIES OILLESS VACUUM PUMPS AND COMPRESSORS

0323
0523
0823
1023
1423





⚠ WARNING: Do not pump flammable or explosive gases or operate in an atmosphere containing them.

OPERATING AND MAINTENANCE INSTRUCTIONS

CONSTRUCTION: The end plate, body, rotor and mounting bracket are all cast iron. Consequently any moisture that accumulates in the pump will tend to corrode the interior especially if it stands idle. The muffler box, on the front of the unit, is made of aluminum. The vanes are made of hard carbon and are precision ground. They should last many thousands of hours depending upon the degree of vacuum or pressure at which the pump is run.

STARTING: CAUTION: *NEVER LUBRICATE THIS OILLESS AIR PUMP.* The carbon vanes and grease packed motor bearings require no oil. If the motor fails to start or slows down when under load shut the unit off and unplug. Check that the supply voltage agrees with the motor post terminals and the motor data name plate. CAUTION: ALL DUAL VOLTAGE MOTORS ARE SHIPPED FROM THE FACTORY WIRED FOR THE HIGH VOLTAGE. If the pump is extremely cold allow it to warm to room temperature before starting. If anything appears to be wrong with the motor return the complete pump to an authorized Gast service facility.

To minimize noise and vibration the unit should be mounted on a solid surface that will not resonate. Use of shock mounts or vibration isolation material is recommended. Inlet or discharge noise can be minimized by attaching the enclosed muffler. The unit should not be allowed to operate in ambient air temperatures in excess of 40°C (104°F). If the motor fails to start or slows down when under load shut the unit off and unplug. Check that the supply voltage agrees with the motor post terminal setup and the motor data name plate.

FILTRATION: Care must be taken to insure that any particles (dirt, chips, foreign material) often found in new plumbing not be allowed to enter the unit. Liquid, moisture vapor, or oil based contaminates will affect pump performance and must be filtered from entering the pump.

Dirty filters restrict air flow and if not corrected could lead to possible motor overload, poor performance and early pump failure. Check filters periodically and clean when necessary by removing felts and washing in Gast flushing solvent (part number AH255). Dry with compressed air and replace. Filters need to be cleaned or replaced every 1500-3000 hours depending on application.

FLUSHING: Should excessive dirt, foreign particles, moisture, or oil be permitted to enter the pump the vanes will act sluggish or even break. Flushing the pump should remove these materials. There are two options for performing this operation.

Option #1 — You will need two pipe nipples at least 4" long with 3/8" NPT on one end. 1) Remove the filter elements from the front of the muffler box and screw the nipples in through the same holes. 2) With the pump running allow about 2 tbsp. of flushing solvent to be ingested into the vacuum side of the unit. CAUTION: WEAR EYE PROTECTION AND FLUSH IN A WELL VENTILATED AREA. Repeat the flushing procedure. If it does not remedy the situation remove the end plate for further examination.

Option #2 — Remove the filter elements from the front of the muffler box and carefully remove the five bolts that hold the muffler box in place (be careful not to damage the gaskets and it may be necessary to replace them). Tap the box with a small hammer to break it lose. DO NOT PRY WITH A SCREWDRIVER as the gasket will be damaged. This will allow access to the intake and exhaust ports. Follow through with steps 2 & 3 as above.

DISASSEMBLY: If flushing does not eliminate the problem remove the six bolts holding the end plate to the body. Now remove the end plate and the four vanes (do not remove the rotor or loosen any electric motor through bolts). The vanes could be worn or could require further cleaning. The top clearance (between rotor and body) may be adjusted by: 1) loosen body bolts, 2) lightly tap on the pump body and turn the rotor while setting this clearance to assure that all points on the rotor clear the body. Consult factory for proper clearances.

HAZARD PREVENTION:

WARNING: MAKE SURE THE ELECTRIC MOTOR IS PROPERLY GROUNDED AND THE WIRING IS DONE BY A QUALIFIED ELECTRICIAN FAMILIAR WITH NEMA MG2 SAFETY STANDARDS, NATIONAL ELECTRIC CODE AND ALL LOCAL SAFETY CODES.

WARNING: THE ELECTRIC MOTOR MAY BE THERMALLY PROTECTED AND WILL AUTOMATICALLY RESTART WHEN THE PROTECTOR RESETS.

WARNING: WHEN SERVICING ALL POWER TO THE MOTOR MUST BE DE-ENERGIZED AND DISCONNECTED. ALL ROTATING COMPONENTS MUST BE AT A STAND STILL.

WARNING: DO NOT USE KEROSENE OR OTHER COMBUSTIBLE SOLVENTS TO FLUSH UNIT. USE ONLY GAST AH255 FLUSHING SOLVENT OR EQUIVALENT.

All returns are F.O.B. Benton Harbor, Michigan.
Authorized service facilities are located at:

Gast Manufacturing Corp.
2300 Highway M-139
Benton Harbor, MI 49023-0097
TEL: 616-926-6171
FAX: 616-925-8288

Gast Manufacturing Co., Ltd.
Beech House, Knaves Beech
Business Centre, Loudwater
High Wycombe, Bucks HP 10 9SD
England
TEL: 44-628-532600
FAX: 44-628-532470

Gast Manufacturing Corp.
505 Washington Avenue
Carlstadt, NJ 07072
TEL: 201-933-8484
FAX: 201-933-5545

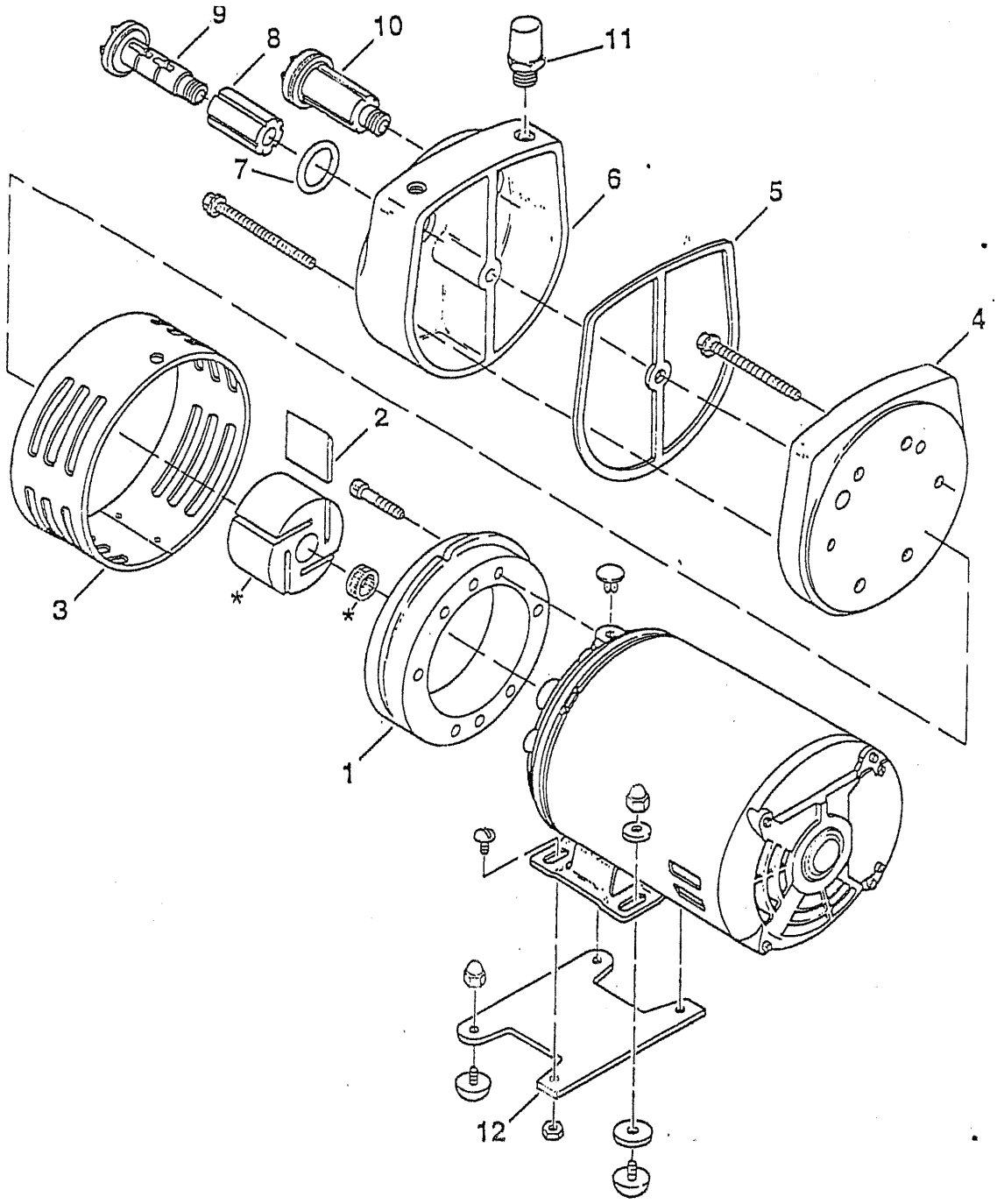
Japan Machinery Co., Ltd.
Central PO Box 1451
Tokyo, 100-91, Japan
TEL: 81-3-3573-5421
FAX: 81-3-3571-7865 or
81-3-3571-7896

Brenner-Fiedler & Assoc.
13824 Bentley Place
Cerritos, CA 90701
TEL: 310-404-2721
TEL: 800-843-5558
FAX: 310-404-7975

Wainbee Ltd.
5789 Coopers Ave.
Mississauga, Ontario, Canada L4Z 3S6
TEL: 416-213-7202
FAX: 416-213-7207

Wainbee Ltd.
215 Brunswick Blvd.
Point Claire, Quebec, Canada H9R 4R7
TEL: 514-697-8810
FAX: 514-697-3070

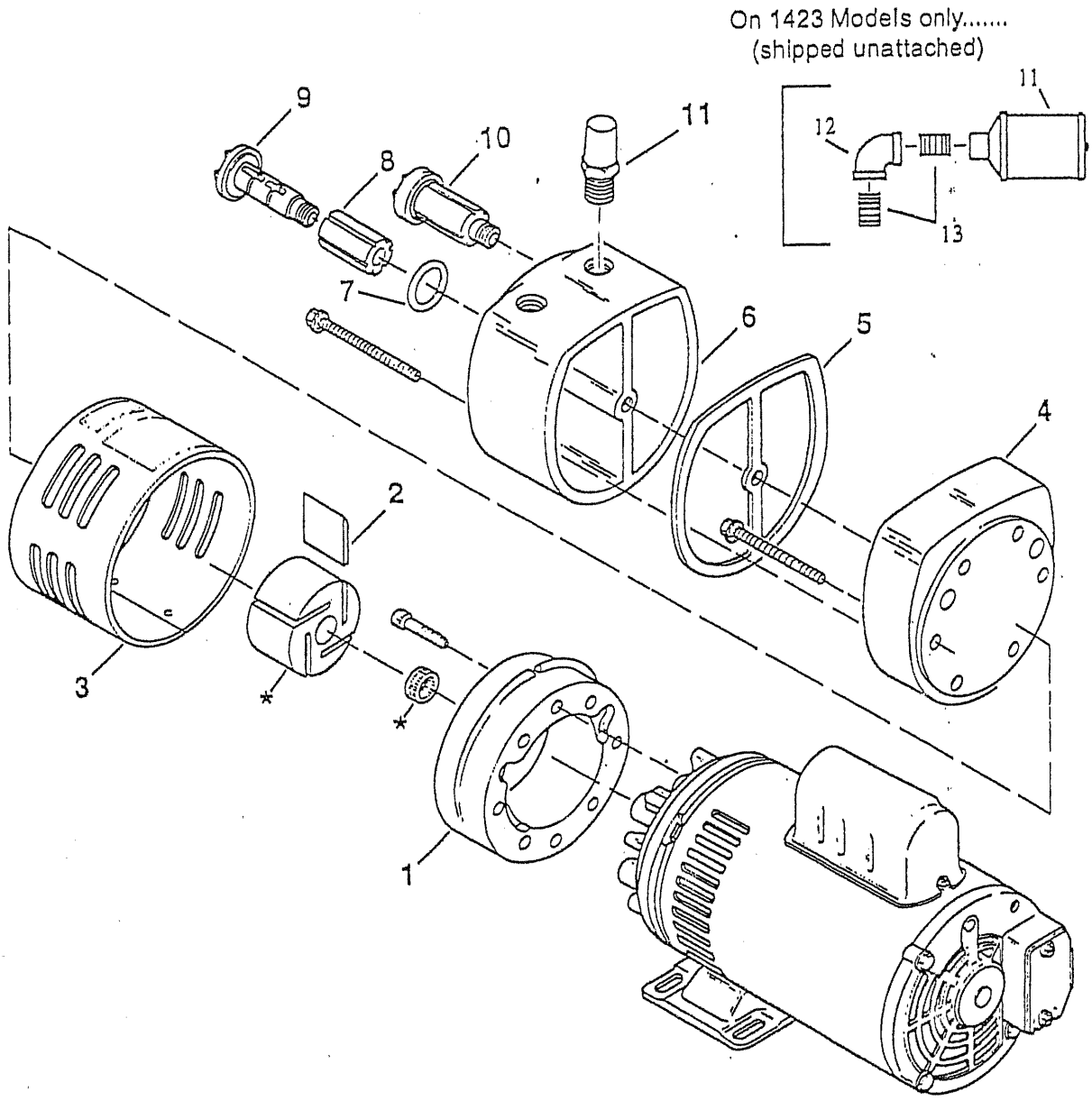
NOTE: All general correspondence should be sent to Gast Manufacturing Corporation, PO Box 97, Benton Harbor, MI 49023-0097.



0323-101Q				0323-101
Ref. No.	Description	Qty.	Part No.	Part No.
1	Body	1	AK503	AK503
• 2	Vane	4	AH850A	AH850A
3	Shroud	1	AK502	AK502
4	End Plate	1	AK501	AK516A
• 5	Gasket	1	AK521	
6	Muffler Box	1	AK519	
• 7	O-Ring	2	AK473	
• 8	Felt	2	AK524	
9	End Cap	2	AK510	
10	End Cap Asm	2	AK526	
11	Filter/Muffler	1	AK840A	
12	Foot Support	1	AC136	
	Service Kit	1	K478	K478A

0523-101Q				0523-101
Ref. No.	Description	Qty.	Part No.	Part No.
1	Body	1	AK505	AK505
• 2	Vane	4	AH850A	AH850A
3	Shroud	1	AK502	AH502
4	End Plate	1	AK501	AK516A
• 5	Gasket	1	AK521	
6	Muffler Box	1	AK519	
• 7	O-Ring	2	AK473	
• 8	Felt	2	AK524	
9	End Cap	2	AK510	
10	End Cap Asm	2	AK526	
11	Filter/Muffler	1	AK840A	
12	Foot Support	1	AC136	
	Service Kit	1	K478	K478A

• Denotes parts included in a Service Kit. When corresponding to ordering parts, please give complete model and serial number.
* Should not be replaced in the field.



Ref. No.	Description	Qty	0823-101	0823-101Q	1023-101	1023-101Q	1423-101	1423-101Q
1	Body	1	AK517	AK517	AK518	AK518	AL283	AL283
• 2	Vane	4	AK513	AK513	AK513	AK513	AL284	AL284
3	Shroud	1	AK511	AK511	AK511	AK511	AL281	AL281
4	End Plate	1	AK515A	AK514	AK515A	AK514	AK515A	AK514
• 5	Gasket	1		AK522		AK522		AK522
6	Muffler Box	1		AK520		AK520		AK520
• 7	O-Ring	2		AK473		AK473		AK473
• 8	Felt	2		AK524		AK524		AK524
9	End Cap	2		AK510		AK510		AK510
10	End Cap Asm	2		AK526		AK526		AK526
11	Filter/Muffler	1	AK840	AK840	AK840	AK840	AC432	AC432
12	Elbow	1					BA206	BA206
13	Nipple	2					BA714	BA714
	Service Kit	1	K479A	K479	K479A	K479	K575A	K575A

• Denotes parts included in a Service Kit. When corresponding or ordering parts, please give complete model and serial number.

• FOR ORIGINAL EQUIPMENT MANUFACTURERS SPECIAL MODELS CONSULT YOUR LOCAL DISTRIBUTOR.

ACCESSORIES

CHECK VALVES—vacuum

AE238	¼" NPT, male
AJ550	¼" NPT, female
AJ550A	⅜" NPT, female

CHECK VALVES—vacuum swing

AH326A	¾" NPT
AH326B	1" NPT

CORDS—ELECTRIC

AA816	⅓" ½" ¾" hp, 115V without switch, 10 ft.
AA819	½" ¾" hp, 230V without switch, 10 ft.
AA896	⅛" ¼" ⅓" hp, 115 V with switch, 10 ft.

FILTERS—no jars

AC432	⅜" female NPS, 10 m icron
AC433	½" male NPS, 10 m icron
AC435	¾" male NPS, 10 micron
AA905E	⅜" female NPS, 50 micron
AA905F	½" male NPS, 50 micron
AA905G	¾" male NPS, 50 micron
B300A	¼" male NPS, 50 micron
B343B	¼" male NPS, 50 micron
AD750	1" male NPS, 50 micron

FILTERS—glass jar

AA617G	¼" NPS, 2 oz., 50 micron
AA922H	⅛" NPS, ¾" oz., 50 micron
AD560	1" NPS, 2 qt., 50 micron
AB[illegible]89	⅜" NPS, 1 pt., 10 micron
AB599D	⅜" NPS, 1 pt., 50 micron
AB600	½" NPS, 1 pt., 50 micron
AB600F	½" NPS, 1 pt., 10 micron
AB601B	¾" NPS, 1 pt., 10 micron
AB601C	¾" NPS, 1 pt., 50 micron
AA800C	½" NPS, 1 qt., 10 micron
AA800E	½" NPS, 1 qt., 50 micron
AA900D	¾" NPS, 1 qt., 10 micron
AA900J	¾" NPS, 1 qt., 50 micron
V400G	¼" NPS, 8 oz., 50 micron
V500D	⅜" NPS, 8 oz., 50 micron
V400C	¼" NPS, 8 oz., 50 micron

FILTERS—metal jar

AB609D	¼" NPS, ½" pt., 10 micron
AB612	½" NPS, ½" pt., 10 micron
AB606B	⅜" NPS, ½" pt., 10 micron
AB609	¼" NPS, ½" pt., 50 micron
AB608	⅜" NPS, ½" pt., 50 micron
AB650C	¾" NPS, 1 qt., 10 micron
AB650G	¾" NPS, 1 qt., 50 micron
AB665	½" NPS, 1 qt., 50 micron
AB665B	½" NPS, 1 qt., 10 micron

FILTERS—plastic jar

AA922N	⅛" NPS, ¾" oz.
V400H	¼" NPS, 8 oz.
V500N	⅜" NPS, 8 oz.

FLUSHING SOLVENT

AH255	1 qt.

FOOT SUPPORT ASSEMBLIES

AC136	0211, 0322, 0522, 0323, 0523
AE240	¼-½ hp piston pumps
AE241	½-¾ piston pumps
AE245	⅛ hp piston pumps

GAUGES—pressure

AA642	⅛" NPS, 0-30 psi
AA644B	¼" NPS, 0-30 psi 0-2K/cm²
AA806	¼" NPS, 0-160 psi (back mount)
AA807	⅛" NPS, 0-160 psi (back mount)
AF583	¼" NPS, 0-100 psi, heavy duty (bottom mount)

GAUGES—vacuum

AA640	¼" NPS, 0-30" Hg, 0-760 m m Hg
AA641	⅛" NPS, 0-30" Hg

HANDLES—carrying

AC174	0211, 0322, 0522
AF555	for ½" and ¾" hp units

MUFFLERS—glass jar

AB599B	⅜" NPS, 1 pt., 10 micron, for oil-less pumps
AB600C	⅛" NPS, 1 pt., 50 micron, for oil-less pumps
AB600J	½" NPS, 1 pt., 50 micron, for oil-less pumps
AD560	1" NPS, 2 qt., 50 micron
AD560B	1" NPS, 2 qt., 50 micron, with fitting for quieter operation
AA900F	¾" NPS, 1 qt., 10 micron, for oil-less pumps
AA922B	⅛" NPS, ¾" oz., 50 micron, for oil-less pumps
AA922G	same as AA922 but iwth silencing tube
AA617F	⅛" NPS, 2 oz., 50 micron, for oil-less pumps

MUFFLERS—metal jar

AB612A	½" NPS, ½" pt., 10 micron
AB609B	¼" NPS, ½" pt., 10 micron
AB608A	⅜" NPS, ½" pt., 10 micron
AB665C	½" NPS, 1 qt., 10 micron
AB650D	¾" NPS, 1 qt., 10 micron

MUFFLERS—plastic jar

AA922P	⅛" NPS, ¾" oz.
V425M	¼" NPS, 8 oz.
V525G	⅜ NPS, 8 oz.

OVERLOADS—motor

	External thermal protector, specify motor numb and make

PAINT

AE564A	Gast blue-gray, 16 oz. aerosol can

RELIEF VALVES—pressure

AA203	⅛" NPS, flow below 2 cfm
AA205	¼" NPS, flow below 2 cfm
AA600	⅜" NPS, flow below 10 cfm
AA307	¾" NPS, flow above 10 cfm
AF570S	¼" NPS, 0-100 psi
AF720	¼" NPT, 0-100 psi
AE960	1" NPT, 0-100 psi.

RELIEF VALVES—vacuum

AA204	⅛"NPS, flow below 2 cfm
AA207	¼" NPS, flow below 2 cfm
AA640A	⅜" NPS, flow from 2-15 cfm
AA308	¾" NPS, flow above 10 cfm
AE961	1" NPS, for 4565, 5565

SWITCH—vacuum

AE265	¼" NPS

TRAPS—vacuum

AA673	⅜" NPS, 8 oz.
AA675B	⅛" NPS, 2 oz.
AA675C	¼" NPS, 2 oz.

TROUBLE SHOOTING GUIDE FOR ROTARY VANE PUMPS

REASONS FOR PROBLEM	Low		High		Pump Overheating	Motor Overload
	Vac.	Press.	Vac.	Press.		
Filter dirty	X	X	at pump		X	X
Muffler dirty		X		at pump	X	X
Vac. line collapsed	X		at pump		X	X
Relief valve set too high			X	X	X	X
Relief valve set too low	X	X				
Plugged vacuum or pressure line	X	X	at pump	at pump	X	X
Vanes sticking	X	X				
Running at too high RPM			X	X	X	X
Vanes worn (replace)	X	X				
Shaft seal worn (replace)	X	X				
Dust or offset powder in pump	X	X			X	X
Motor not wired correctly	X	X			X	

MODEL NUMBER EXPLANATION FOR ROTORY VANE OILLESS VACUUM PUMPS AND COMPRESSORS

0323 - P 101 Q - G18DX

Pump Model No.

0323 0823 Integral Motor
0523 1023 Pump Unit

Application

P as Compressor
V as Vacuum
No Letter Vacuum or Pressure

Numbers

1 - 99 Lubricated
100 - 199 Oilless
200 - 299 Lubricated
300 & up Oilless

Indicates Electric Motor is Equipped with

A Thermotector
X Internal Thermotector

Electric Motor Number

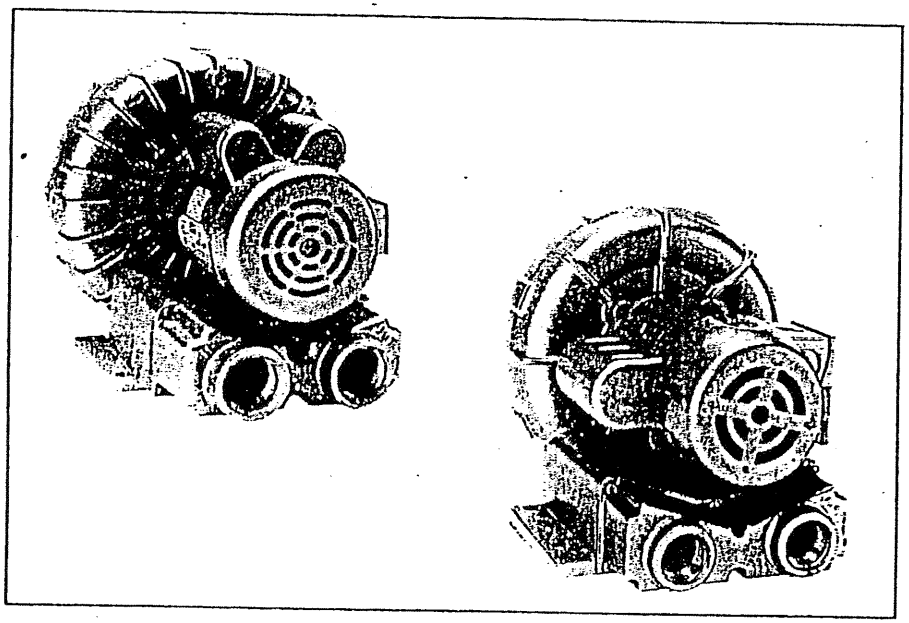
Each type & size motor has a specific number found on the specific motor list.

Engineering Design Number

Designates any modifications in dimensions, materials or grouping of accessories.

GAST

STANDARD REGENAIR BLOWER OPERATION AND MAINTENANCE TECHNICAL MANUAL



CONTENTS:

KEEP THIS DOCUMENT FOR FUTURE REFERENCE

This is the hazard alert symbol: ⚠ When you see this symbol be aware that personal injury or property damage is possible. The hazard is explained in the text following the symbol. Read the information carefully before proceeding.

The following is an explanation of the three different types of hazards:

⚠ DANGER	Severe personal injury or death will occur if hazard is ignored.
⚠ WARNING	Severe personal injury or death can occur if hazard is ignored.
⚠ CAUTION	Minor injury or property damage can occur if hazard is ignored.

GENERAL INFORMATION

These instructions do not apply to:

1) Blowers without motors, the SDR Series.
2) The M & H Series, model number with M or H as third character.
3) Blowers powered with Explosion Proof Motors.

This blower is only to be used for the purpose of pumping air and under no circumstances be used with any other gases. The blower must not be used for the pumping of fluids, particles, solids, or any substance likely to cause fire or explosion.

⚠WARNING Do not pump flammable or toxic gasses or operate the pump in an atmosphere containing them. Severe personal injury can occur if hazard is ignored.

⚠WARNING Keep hands or other body parts away from the blower suction. Failure to do so could result in personal injury.

⚠CAUTION Required ambient temperature for normal operation should not exceed 40°C (105°F). For higher ambient operation, consult the factory. Failure to do so could result in fire or property damage.

⚠CAUTION Blowers may generate heat. To prevent burns, do not touch blower during operation or until unit has cooled.

Blower performance is reduced by lower atmospheric pressure found at high altitudes, consult the factory or a Gast distributor for details.

INSTALLATION

IMPORTANT: Remove any plastic caps before starting blower. Any foreign material (burrs, chips, welding drops, slag, pipe cuttings, excess sealants, sand, lime, etc.) must be removed, or filtered out. Any such material, no matter how small, that enters the blower can damage it. Clean out new plumbing before attaching to blower inlet.

WIRING

⚠WARNING Electrical shock or fire hazard can result from incorrect wiring. Wiring must conform to all required safety codes and be installed by a qualified person. Grounding is required.

Fuses protect the wiring against short circuits. On motors without Automatic restart, thermal protection or magnetic over-current cut-outs are absolutely necessary to prevent motor overloading. This is due to the following, one phase in a three phase electric system, high starting frequency, or jammed blower. Required power will rise as differential pressure increases. For motor wiring diagram see inside of the conduit box or motor nameplate. Large motors may have two nameplates, one for 50Hz, the other for 60Hz. Be sure that all dual-voltage motors are wired for your power source.

MOUNTING THE PUMP

The single impeller blower may be installed in any orientation as long as the flow of cool, ambient air over the pump is not blocked. The dual impeller models must be mounted with the shaft horizontal.

The flow of cooling air over the blower and motor must not be blocked. It is very important to install the blower in a well ventilated area where the temperature does not exceed 40°C. Check this temperature after the blower has been running for an hour.

Strong forced ventilation is often needed for the larger blowers. In vacuum service the hot discharge air of larger blowers, must be plumbed away to avoid overheating the room or enclosure where the blower is located. Discharge excess air into atmosphere, through a relief valve.

ROTATION

The blower should only rotate clockwise as viewed from the motor side. This is marked with an arrow on most casting. Proper rotation can be confirmed by checking air flow at the IN and OUT ports. On blowers powered by a 3 phase motor, rotation can be reversed by changing any two of the power lines.

PLUMBING

Connect motor and check direction of rotation before connecting plumbing. The threaded pipe ports are designed as connection ports only and will not support the plumbing. Be sure to use the same or larger size pipe and fittings to prevent air flow restriction and overheating of the blower.

⚠CAUTION Attach blower to solid surface before starting, to prevent injury or damage from unit movement.

When installing plumbing, be sure to use a small amount of pipe thread lubricant. This protects the threads in the aluminum blower. When installing two blowers in parallel, use plumbing two whole pipe sizes larger in diameter than that of the blower.

ACCESSORIES

⚠CAUTION Blower must be installed with a proper sized inlet filter, gauge, and relief valve. Failure to do so may damage blower. Consult the factory or see a Gast distributor for recommendations.

Keep in mind filters progressively increase losses, due to clogging. Install a vacuum gauge to monitor filter restriction. Install a relief valve to avoid overloading of large blowers, caused by changes in pressure or vacuum.

Do not install check valves that close with a strong spring due to their large pressure loss. We recommend the check valves listed in the accesssory section (page 6). They have minimal pressure drop, positive sealing, and are resistant to the high discharge temperatures of large blowers.

OPERATION

⚠CAUTION Avoid running blowers larger than R4 size, with no air flow through them. Protect with Gast recommended pressure or vacuum relief valve. Failure to do so will damage the blower.

⚠WARNING Solid or liquid material exiting the blower or piping can cause eye or skin damage. Keep away from air stream.

⚠WARNING Some of these models may exceed 85 dB(A). When in close proximity to these models hearing protection is required. See Technical Data Sheet (if provided), for specific model(s).

Do not exceed maximum pressure or vacuum capabilities marked on data label of unit.

Fit correct sized pipes and choose accessories that reduce to a minimum air friction load loss. Do not throttle discharge or suction pipe to reduce capacity. Throttling increases differential pressure, which consequently increases power absorption and working temperature. When the blower is ran at duties above 125mbar (50" H_2O) metal pipe may be required for the hot exhaust air.

⚠CAUTION Air temperature increases when passing through the blower. Outlet piping can cause burns. Access to these hot temperature areas should be guarded, limited, or marked "HOT".

Once the blower is in operation, check the following:

-Working pressure and vacuum values.

-Relief valve pressure or vacuum setting, adjust if needed.

-Measure motor current and compare with motor name plate data.

-Rated electrical overload cut-out.

-Check the ambient and discharge air temperatures to be sure they do not exceed allowed values one hour after starting. Exhaust Air should not exceed 230° F for all blowers except; R6PS and R7S models.

MAINTENANCE and INSPECTION

⚠WARNING Power must be de-energized and disconnected before servicing. Be sure all rotating parts have stopped. Electric shock or severe cuts can result if hazard is ignored.

The noise absorbing foam used in mufflers needs to be periodically replaced. The electric motor and blower also need periodic cleaning to remove accumulated dust & dirt. If they are not cleaned, this can result in excessive vibration, an increase in temperature, or can reduce the service life of the blower. Initial inspection is suggested at 8000 hours, then the user should deter-mine the frequency.

An increase in the differential pressure across an inlet filter indicates its getting clogged. Clean the inlet air filter as often as needed, blowing down against the current to clean it. Change the cartridge when cleaning no longer gets the cartridge clean. A dirty cartridge causes a high intake resistance resulting in an increase of differential pressure, absorbed power, and working temperature.

The motor bearings of small motors (Less than $5^1/_2$ HP,refer to motor nameplate), are greased for long life. Large motors ($5^1/_2$ HP or larger, refer to 60 Hz motor nameplate), are equipped with alemite grease fittings. To relubricate these bearings clean tip of grease gun and apply the grease to the fitting. Use one or two strokes of Shell Dolium R grease.

Gast will not guarantee a field rebuilt pump. If repairs are needed contact or send blower to a Gast authorized service facility .

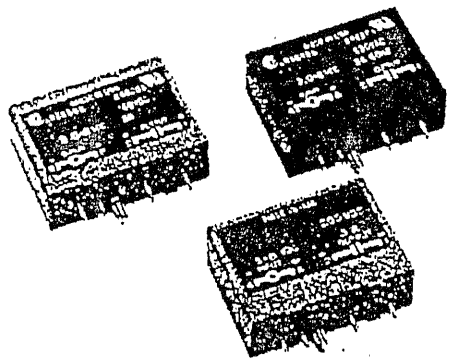
TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE DIAGNOSIS	POSSIBLE REMEDY
Abnormal Sound	Impeller damaged or contaminated by foreign material	Replace or clean impeller, install adequate filtration
Increase in Sound	Foreign material or heat can destroy muffler foam	Replace foam muffler elements, filter foreign material
Blown Fuse	Electrical wiring problem	Have qualified person check that impeller turns, check fuse, wiring diagram, or wiring capacity
Unit very hot	Running at too high a pressure or vacuum	Install a relief valve and pressure or vacuum guage

Motor Bearing Re-Lubrication
(5 1/2 HP or larger)

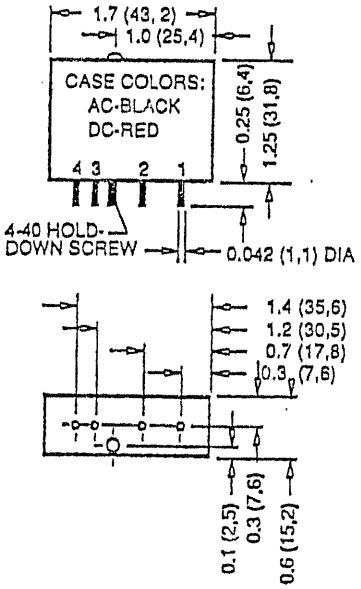
Hours of Service per year	Suggested Relubrication Interval
5,000	3 years
Continual Normal Application	1 year
Seasonal service (motor idle for 6 mos. or more)	1 year at beginning of season
Continuous-high ambients, dirty or moist applications	6 months

0.6 INCH OUTPUT MODULES

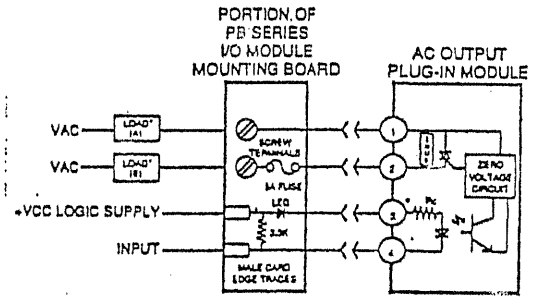


FEATURES

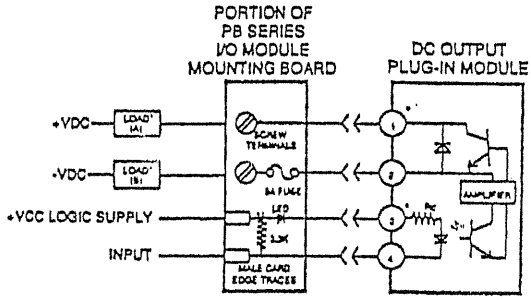
- UL Recognized/Horse Power Rated (E46203)/CSA Certified (38595)
- AC Modules have High Current Thyristor with 100 Amp Surge Capability
- Zero or Random Turn-On Available in AC Modules
- Plug into Mounting Boards for 0.6" Modules
- 4KV Optical Isolation (1500 VAC Optical Isolation for FET DC Output Modules)
- Industry Standard Packaging
- 3.5 Amp AC Modules Provide Extra Switching Capability
- Form "A" Output, Form "B" Optional on Certain Models (OAC5C)
- 5.0 Amp DC Modules Available



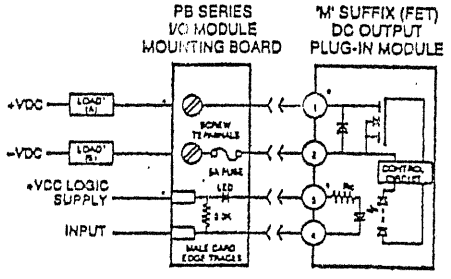
DIMENSIONS: INCHES (MILLIMETERS)
TOLERANCE:±0.020 (±0,50)



* LOAD MAY BE WIRED IN LOCATION A OR B



*LOAD MAY BE WIRED IN LOCATION A OR B
DC INDUCTIVE LOADS MUST BE DIODE SUPRESSED TO PREVENT DAMAGE TO THE I/O MODULE.



* LOAD MAY BE WIRED IN LOCATION A OR B
DC INDUCTIVE LOADS MUST BE DIODE SUPPRESSED TO PREVENT DAMAGE TO THE I/O MODULE.

(EQUIVALENT CIRCUIT DIAGRAMS)

Products and specifications subject to change without notice.
Consult factory for application assistance.

GORDOS

DIGITAL I/O MODULES

0.6 INCH OUTPUT MODULES

INPUT SPECIFICATIONS (1)

MODEL NUMBER	OAC5 OAC5A OAC5ARN OAC5C OAC5RN	ODC5 ODC5A ODC5F ODC5MA ODC5MC ODC5ML	OAC15 ODC15	OAC24 OAC24A ODC24 ODC24A ODC24F	
Parameter					Units
Nominal Voltage	5.0	5.0	15.0	24.0	VDC
Minimum Voltage (2)	2.75	2.75	9.0	18.0	VDC
Maximum Voltage	8.0	8.0	18.0	32.0	VDC
Drop-Out Voltage	1.0	1.0	1.0	1.0	VDC
Maximum Current (3)	20.0	18.0	16.0	13.0	mA
Resistance (4)	220	250	1000	2000	Ohms

OUTPUT SPECIFICATIONS (1)

MODEL NUMBER	OAC5 OAC5C OAC5RN OAC15 OAC24	OAC5A OAC5ARN OAC24A	ODC5 ODC15 ODC24	ODC5A ODC24A	ODC5F ODC24F	ODC5MA	ODC5MC	ODC5ML
Parameter								
Nominal Line Voltage	120 VAC	240 VAC	5-48 V	5-150 V	5-48 V	5-150 V	5-90 V	5-48 V
Minimim Line Voltage	12 VAC	24 VAC	3.0 V	3.0 V	3.0 V	1.0 V	1.0 V	1.0 V
Maximum Line Voltage	140 VAC	280 VAC	60 V	250 V	60 V	200 V	100 V	50 V
Max Off-State Voltage (5)	400 Vpeak	600 Vpeak	60 V	250 V	60 V	200 V	100 V	50 V
Max Off-State Leakage (6)	3.0 mArms	6.0 mArms	500 µA	2.0 mA	1.0 mA	10 µA	10 µA	10 µA
Static Off-State dv/dt (7)	200 V/µsec	200 V/µsec	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Rated On-State Current (8)	3.5 Arms	3.5 Arms	3.0 A	1.0 A	3.0 A	3.0 A	5.0 A	5.0 A
Minimum On-State Current	50 mArms	50 mArms	10 mA	10 mA	10 mA	1.0 mA	1.0 mA	1.0 mA
Maximum Surge Current (9)	100 Apeak	100 Apeak	5.0 A	5.0 A	5.0 A	10 A	10 A	10 A
On-State Voltage Drop or Resistance (10)	1.6 V	1.6 V	1.5 V	1.5 V	1.5 V	0.25 Ω	0.10 Ω	0.05 Ω
H.P. Rating (13)	1/4 H.P.	1/4 H.P.	N/A	N/A	N/A	N/A	N/A	N/A

GENERAL SPECIFICATIONS (1)

MODEL NUMBER	OAC5 OAC5A OAC5C OAC15 OAC24 OAC24A	OAC5RN OAC5ARN	ODC5 ODC5A ODC15 ODC24 PDC24A	ODC5F ODC24F	ODC5MA ODC5MC ODC5ML	
Parameter						Units
Operating Temperature Range	-30 to 80	-30 to 80	-30 to 80	-30 to 80	-30 to 80	°C
Storage Temperature Range	-40 to 100	-40 to 100	-40 to 100	-40 to 100	-40 to 100	°C
Maximum Turn-on Time (11)	8.33	0.1	0.1	0.025	1.0	mSec
Maximum Turn-off Time (11)	8.33	8.33	0.75	0.05	0.05	mSec
Input/Output Isolation Voltage (12)	4000	4000	4000	4000	1500	VAC
Input/Output Capacitance (typical)	8	8	8	8	8	pF
Line Frequency Range	47 to 63	47 to 63	DC	DC	DC	Hertz

TABLE OF MODEL NUMBER SUFFIXES IDENTIFYING OPTIONAL FEATURES

Suffix	Feature
A	High voltage versions (240 VAC for AC modules, 250 VDC for DC modules).
C	Normally closed output version of OAC module.
F	Fast-switching version of ODC modules.
MA	FET output version of DC module, 3.0A, 200 VDC.
MC	FET output version of DC module, 5.0A, 100 VDC.
ML	FET output version of DC module, 5.0A, 50 VDC.
RN	Random AC voltage turn-on.

Notes:

(1) Specifications apply to an ambient temperature of -30 to 80° C unless otherwise noted.
(2) Without external LED status indicator. Add 1.7 volt for external LED if utilized.
(3) At nominal input voltage, without external LED status indicator.
(4) +/- 10% at 25° C.
(5) Maximum 1 minute duration for OAC modules when applied as a DC voltage rather than peak AC voltage.
(6) At maximum line voltage, 25° C for OAC modules, and 80° C for ODC modules.
(7) Minimum dv/dt per EIA/NARM RS443, method RS397. dv/dt ratings do no apply to ODC modules.
(8) At 40 °C, derate OAC modules by 58 mA° C to 80° C; derate ODC, ODCxMC and ODCxML modules b 50 mA° C to 80° C; derate ODCxMA modules by 30 mA/°C to 80° C. CSA rating of OAC modules is 3.0 Arms at 40° C.
(9) At 25° C. Maximum duration: 1 AC cycle for OAC modules, 1 second for ODC modules.
(10) At maximum rated on-state current and 25 °C.
(11) At maximum line voltage, maximum rated output current, nominal input voltage, 25° C. Switching speed of OAC modules based upon 60 Hz line frequency.
(12) At 25° C for 1 second maximum duration.
(13) 1/4 H.P. at 240 VAC, 1/8 H.P. at 120 VAC.

Products and specifications subject to change without notice.

Consult factory for application assistance.

3237 Commander, Carrollton, Texas 75006 / Tel: (214) 250-1647 / (800) 677-5311 / FAX: (214) 250-3865

GORDOS

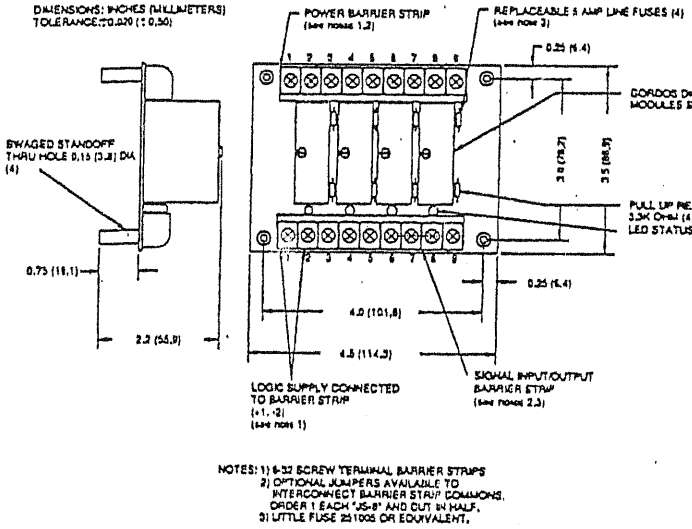
DIGITAL I/O MODULE MOUNTING BOARDS

FEATURES

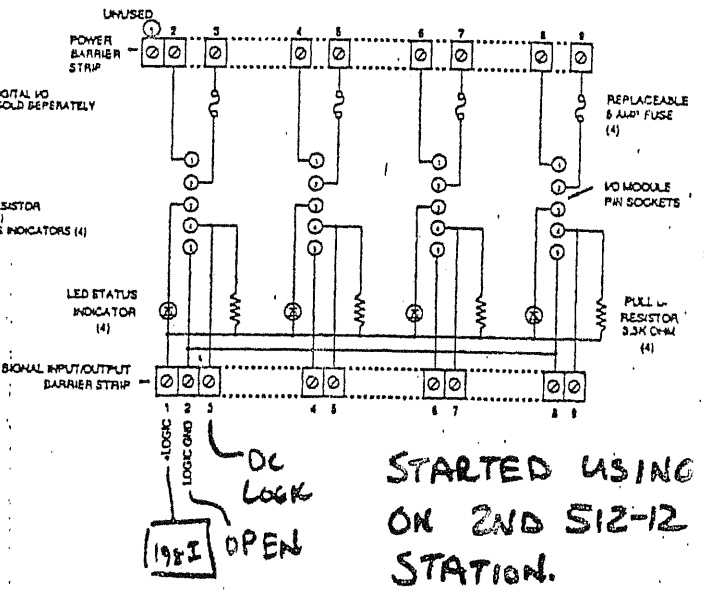
- Plug-compatible logic connections on 8, 16, 24 and 32 position boards. Screw terminal barrier block for logic connections on 4-positon boards.
- Screw terminal barrier block for load connections
- Resident pull-up resistors
- 5 amp field-replaceable fuses (LITTLEFUSE #251005 or equivalent)
- LEDs indicate logic status
- All even-numbered logic connections are logic ground
- Input and output modules accepted interchangeably
- Operate with 5, 15 or 24 volt logic supplies
- Captive-screw retaining system for standard-size modules and "Quad-Packs". Pin retaining system for "SM" series minature modules. Optional hold down bar for "M" and "SM" series miniature modules.
- PB-4, PB-4R, PB-8, PB-16, PB-16S, PB-16T, PB-24, PB-24Q and PB-32Q UL recognized and approved for field wiring (E79183) and CSA certified (38595). Additional approvials pending. Consult factory for updated list.

FOR 0.6 INCH MODULES (Compatible with "SM" Series Modules)

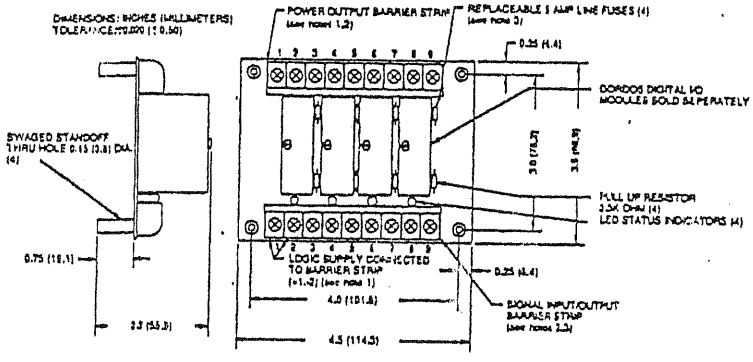
PB-4



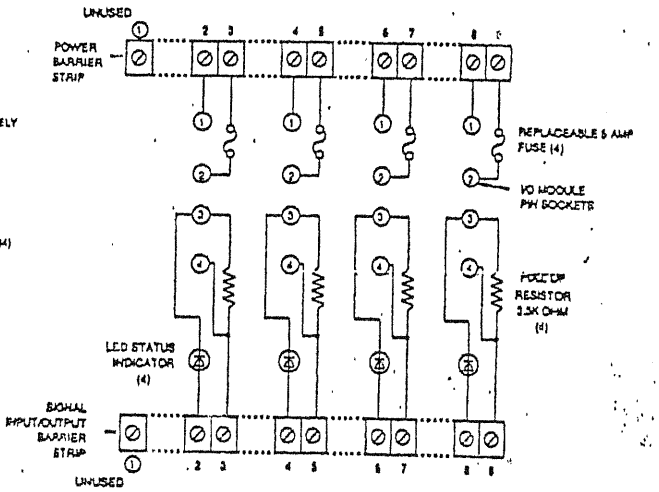
NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS
2) OPTIONAL JUMPERS AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS-8" AND CUT IN HALF.
3) LITTLE FUSE 251005 OR EQUIVALENT.



PB-4R



NOTES: 1) 6-32 SCREW TERMINAL BARRIER STRIPS.
2) OPTIONAL JUMPERS AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS-8" AND CUT IN HALF.
3) LITTLE FUSE 251005 OR EQUIVALENT
4) PB4R ACCEPTS ONLY OUTPUT MODULES. INPUT MODULES WILL NOT PLUG INTO PB4R



Products and specifications subject to change without notice.
Consult factory for application assistance.

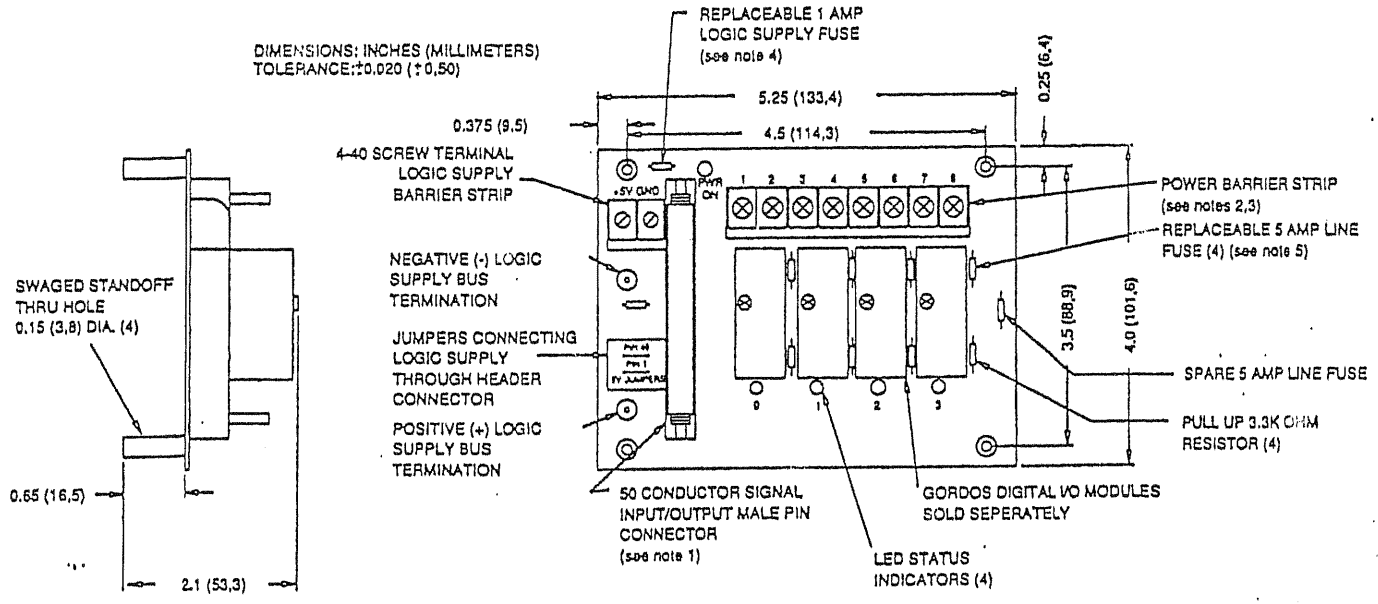
3237 Commander, Carrollton, Texas 75006 / Tel: (214) 250-1647 / (800) 677-5311 / FAX: (214) 250-3865

GORDOS

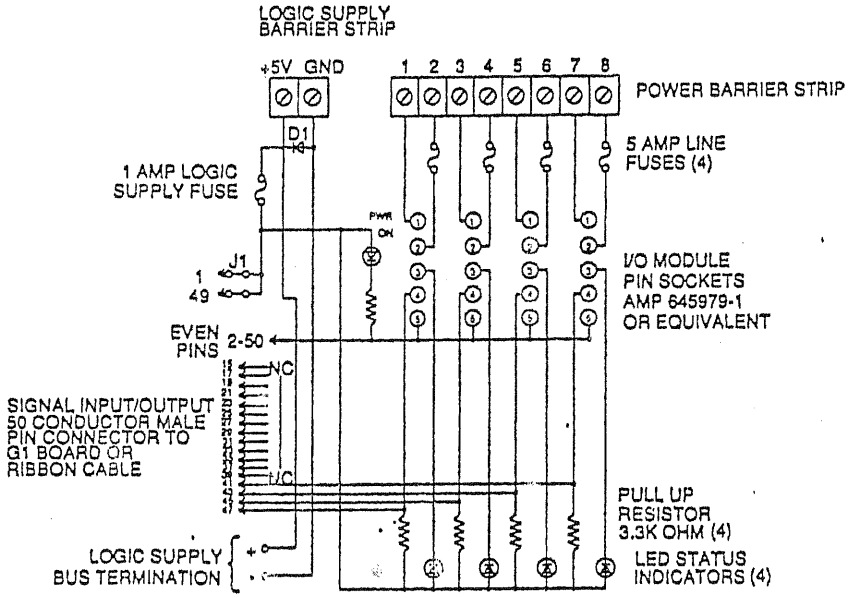
DIGITAL I/O MODULE MOUNTING BOARDS

FOR 0.6 INCH MODULES (Compatible with "SM" Series Modules)

PB-4H



NOTES: 1) CONNECTOR IS BERG 65863-145 OR EQUIVLAENT.
2) 6-32 SCREW TERMINAL BARRIER STRIPS.
3) OPTIONAL JUMPERS ARE AVAILABLE TO INTERCONNECT BARRIER STRIP COMMONS. ORDER 1 EACH "JS-8" AND CUT IN HALF.
4) LITTLE FUSE 251001 OR EQUIVALENT.
5) LITTLE FUSE 251005 OR EQUIVALENT.



Products and specifications subject to change without notice.
Consult factory for application assistance.

3237 Commander, Carrollton, Texas 75006 / Tel: (214) 250-1647 / (800) 677-5311 / FAX: (214) 250-3865

Installation Instructions for the **MICRO SWITCH 103SR Series Hall Effect Position Sensor**

PK 8878 0

GENERAL INFORMATION

103SR Series Hall effect position sensors are completely sealed in threaded aluminum bushings, and meet NEMA 3, 3R, 3S, 4, 4X, 12 and 13 requirements.

Output can be directly connected to most electronic circuitry such as microprocessors, integrated logic, discrete transistors and SCRs with compatible voltage specifications.

ABSOLUTE MAXIMUM RATINGS

Parameters	4.5 to 5.5 VDC	6 to 24 VDC	4.5 to 24 VDC
Supply Voltage (Vs)	-1.2 to +10 VDC	-1.2 to +24 VDC	-1.0 to +25 VDC
Voltage Externally Applied to Output	+10 VDC max. (OFF only) -0.5 VDC min. (ON or OFF)	+20 VDC max. (OFF only) -0.5 VDC min. (ON or OFF)	+25 VDC max. (OFF only) -0.5 VDC min. (ON or OFF)
Output Current	20 mA	40 mA	20 mA
Temperature	-40 to +100°C	-40 to +100°C	-40 to +105°C
Operate & Storage	(-40 to +212°F)	-40 to +212°F)	(-40 to +221°F)

NOTICE

DO NOT reverse supply voltage polarity.
DO NOT exceed maximum ratings.

TABLE 1 LEADWIRE LENGTH

103SR11A-1	152,4 mm (6 in.), Type 1
103SR11A-2	1 meter (39.37 in.), Type 2
103SR12A-1	152,4 mm (6 in.), Type 1
103SR12A-2	1 meter (39.37 in.), Type 2
103SR12A-3	1,52 meters (60 in.), Type 1
103SR12A-4	304,8 mm (12 in.), Type 1
103SR12A-7	3,66 meters (12 ft.), Type 2
103SR13A-1	152,4 mm (6 in.), Type 1
103SR13A-2	1 meter (39.37 in.), Type 2
103SR13A-4	1 meter (39.37 in.), Type 1
103SR13A-6	3,05 meters (120 in.), Type 1
103SR13A-8	1 meter (39.37 in.), Type 2 w/SST bushing
103SR13A-9	3 meters (118 in.), Type 3
103SR13A-11	1 meter (39.37 in.), Type 3
103SR14A-1	152,4 mm (6 in.), Type 1
103SR14A-2	1 meter (39.37 in.), Type 2
103SR17A-1	152,4 mm (6 in.), Type 1
103SR17A-2	1 meter (39.37 in.), Type 2
103SR17A-3	304,8 mm (12 in.), Type 1
103SR17S1A	152,4 mm (6 in.), Type 1 w/SST bushing
103SR18-1	99,1 mm (3.9 in.), Type 4
103SR18-2	171,5 mm (6.75 in.), Type 4

TABLE 2 LEADWIRE TYPE

Type 1	22 gage stranded, teflon insulated
Type 2	22 gage PVC insulated conductor with black molded PVC jacket
Type 3	22 gage insulated conductors with yellow thermoplastic polyurethane jacket
Type 4	24 gage irradiated polyethylene

ELECTRICAL AND MAGNETIC SPECIFICATIONS

Refer to Table 1 (Page 1) for leadwire lengths available to individual catalog listings, then order accordingly.
Refer to Table 2 (Page 1) for explanation of different leadwire types.

Listing	103SR11A-x	103SR12A-x	103SR13A-x	103SR14A-x	103SR17A-x	103SR3F-x*	103SR18A-x
Supply Voltage	4.5 - 5.5 VDC	6 - 24 VDC	4.5 - 24 VDC	4.5 - 24 VDC	4.5 - 24 VDC	4 - 10 VDC	4.5 - 24 VDC
Supply Current	4 mA max/	10 mA max.	10 mA max.	10 mA max.	10 mA max.	5 mA max.	10 mA max.
Output Type	Source (PNP)	Source (PNP)	Sink (NPN)	Sink (NPN)	Sink (NPN)	Linear Source	Sink (NPN)
Output Voltage	(Vs - 1.5) V max.	(Vs - 1.5) V max.	0.4 V max.	0.4 V max.	0.4 V max.	1.75 to 2.25 V @ 5 V, 0 gauss	0.4 V max.
Output Current	20 mA max.	20 mA max.	20 mA max.	20 mA max.	20 mA max.	—	20 mA max.
Magnetic Gauss**							
Type	Unipolar	Unipolar	Unipolar	Unipolar	Bipolar	Linear	Latching
0 to 70° C Temperature Range							
Max. Op	735	475	475	—	180		90
Min. Rel.	25	135	135	—	-180		-90
Min. Dif.	50	40	40	—	40		40
-40 to 100°C Temperature Range							
Max. Op.	—	495	495	160	205		120
Min. Rel.	—	40	40	5	-205		-120
Min. Dif.	—	35	35	8	35		40
25°C Typ.							
Typ. Op.	350	350	400	90	50		50
Typ. Rel.	215	245	200	45	-50		-50
Typ. Dif.	135	85	85	45	100		80

*Linear listings - 152,4 mm (6 in.), Type 1 leadwire. Contact Sales Office for other listings. All leadwire types and lengths not established for all other listings.

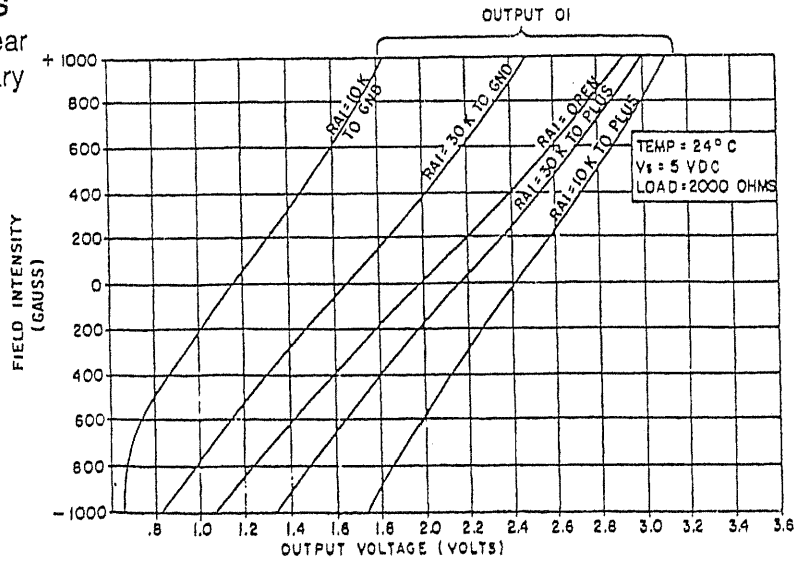
**Unipolar: sensor has plus maximum operate point, plus minimum release point. One magnetic pole (South) is required to operate and release a unipolar sensor.

Bipolar sensor has plus (south pole) operate point and minus (north pole) minimum release point. Operate and release points can be both positive or both negative. **Latching cannot be guaranteed.** Ring magnets are usually used with bipolar sensors.

TYPICAL LINEAR OUTPUT CHARACTERISTICS

The 103SR3F-5 features a single adjustable linear output. An external bias resistor can be used to vary output voltage.

TYPICAL OUTPUT CHARACTERISTICS WITH VARIOUS VALUES OF EXTERNAL BIAS RESISTORS



INTERFACING FOR MICRO SWITCH HALL EFFECT SENSORS

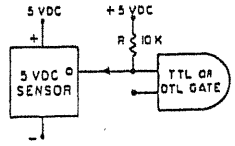
The schematics shown are typical of the outputs with which MICRO SWITCH Hall effect sensors can be interfaced. Values shown are representative only.

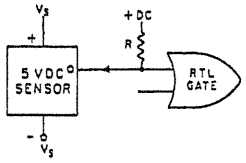
CURRENT SINKING OUTPUTS

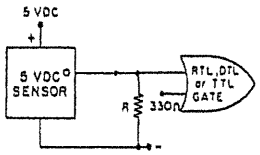
(Current flow through load into sensor.) Output terminal is open collector. In the unoperated condition ($I_L = 0$), the output voltage is normally high.

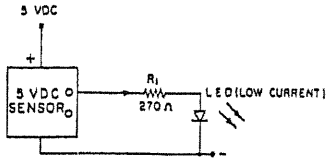
CURRENT SOURCING OUTPUTS

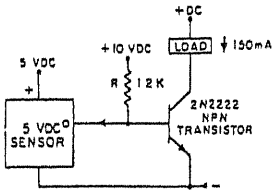
(Current flow from sensor through load.) Output terminal is open emitter. In the unoperated condition ($I_L = 0$), the output voltage is normally low.

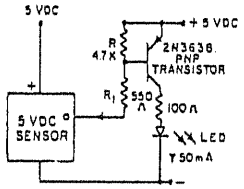


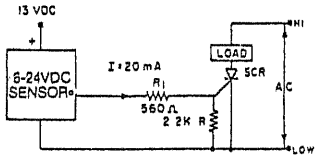


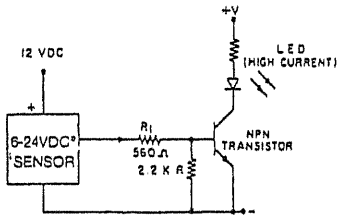


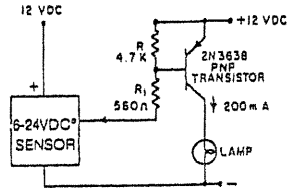


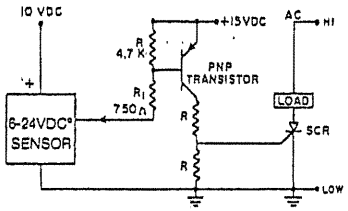


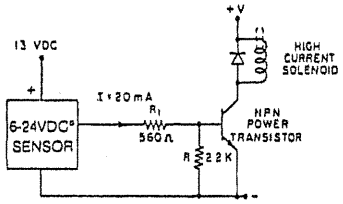


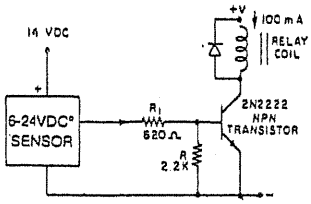


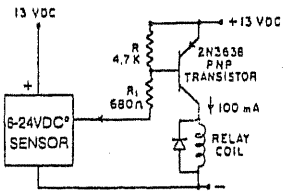


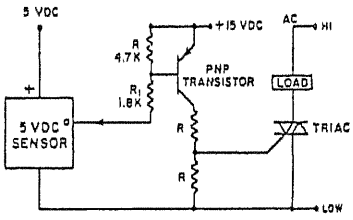


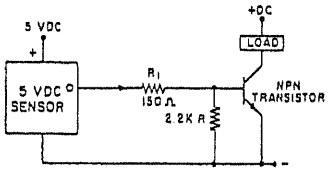


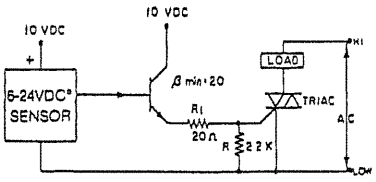


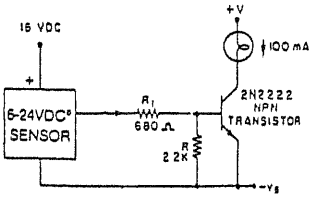








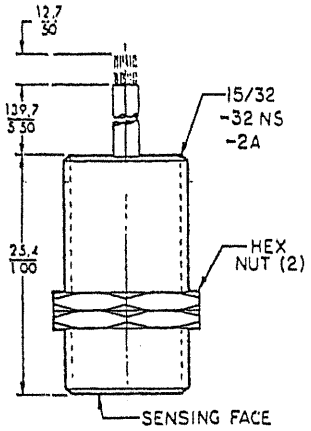




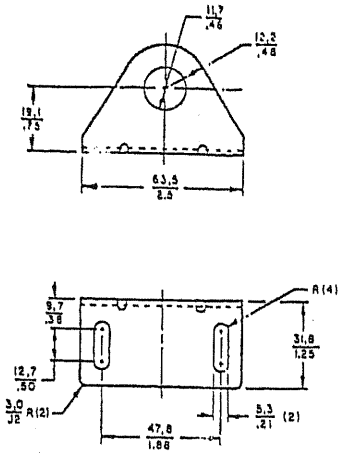
103SR Series

PK 8878 0

MOUNTING DIMENSIONS
(for reference only)



1SR15 MOUNTING BRACKET



LEADWIRE COLOR CODE

Stranded	
Red	Vs (+
Black	Ground (-)
Blue	Output (digital)
Gray	Output (linear)
White	R adjust
Cable	
Red	Vs (+)
Black	Ground (-)
White (Type 2)	Output (digital)
Brown (Type 3)	Output (linear)

TROUBLESHOOTING

If sensor does not operate, follow these steps:

1. Make certain wiring is correct. Load must be connected.
2. Measure supply voltage across Red (+) and Black (-) leads to verify presence of proper voltage.
3. Connect positive voltmeter lead to White or Brown (output) lead, and negative voltmeter lead to Black (ground). With magnet removed (or north pole present), reading should be:

103SR11A-1	0
103SR12A-1	0
103SR13A-1	Vs
103SR14A-1	Vs
103SR17A-1*	Vs

When magnet (south pole) moves toward sensor face (beyond operating point), output should change state, and read:

103SR11A-1	3.4 V min.
103SR12A-1	(Vs - 2)V min.
103SR13A-1	0.4 V max.
103SR14A-1	0.4 V max.
103SR17A-1*	0.4 V max.

*North magnetic pole must be present to assure device is OFF due to bipolar magnetic operation.

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, express or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time and without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

Honeywell

MICRO SWITCH
Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032

Helping You Control Your World

Printed with Soy Ink on 50% Recycled Paper

PK 8878-0 994 Printed in USA

INTERNATIONAL POWER
DC POWER SUPPLIES

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

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 µseconds 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 withstanding 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 at 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.

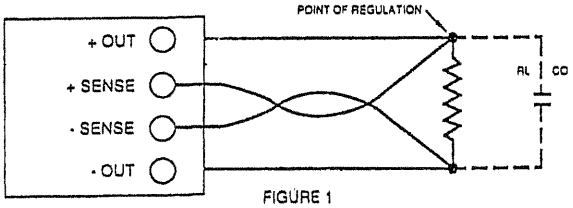


FIGURE 1

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 shoudl 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 10μ Fd) 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 100μ Fd per ampere or 50μ Fd 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 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 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.

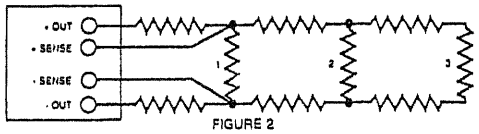


FIGURE 2

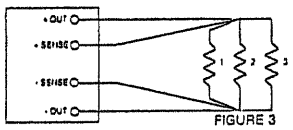


FIGURE 3

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** +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.

AC Input	47-63-Hz			
For Use at	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.

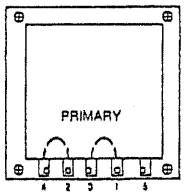


FIGURE 5

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.

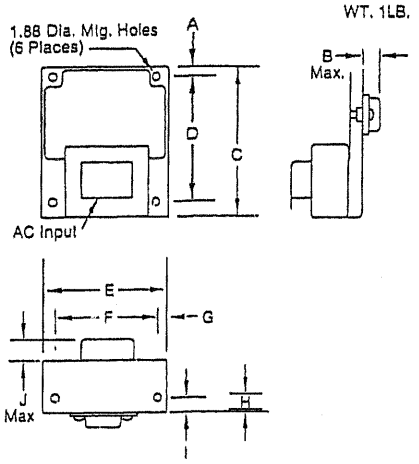
Ship to: International Power,

360 Bernoulli Circle • Oxnard, CA 93030-5167 • (805) 981-1188 • FAX (805) 981-1184 • (800) 845-5386

Outline and Mounting Drawings

A Case

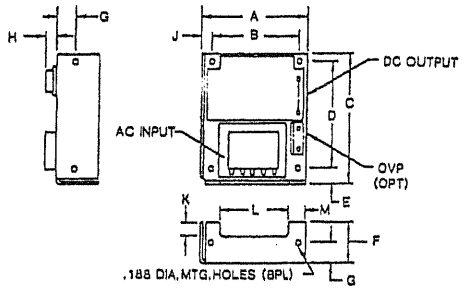
Overall Size: 3.75" x 3.00" x 2.20"
Weight 1 lb.



	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.

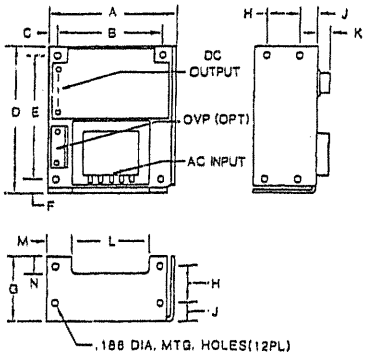


	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.62	41.15
G	0.75	19.05
H	0.450	11.43
J	0.38	9.65
K	0.57	14.48
L	2.60	66.04
M	0.794	20.17

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.

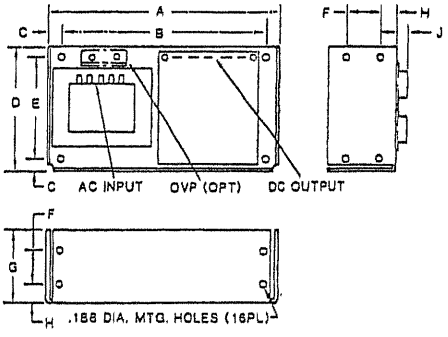


	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	5.62	142.75
E	4.875	123.83
F	0.50	12.70
G	2.50	63.50
H	1.250	31.75
J	0.75	19.05
K	0.450	11.43
L	2.85	72.39
M	1.025	26.04
N	0.665	16.89

FUSE AT: 1.0/0.5 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.

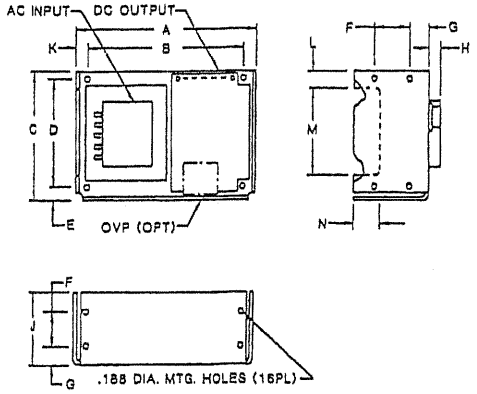


	INCH	mm
A	9.00	228.60
B	8.000	203.20
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

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.

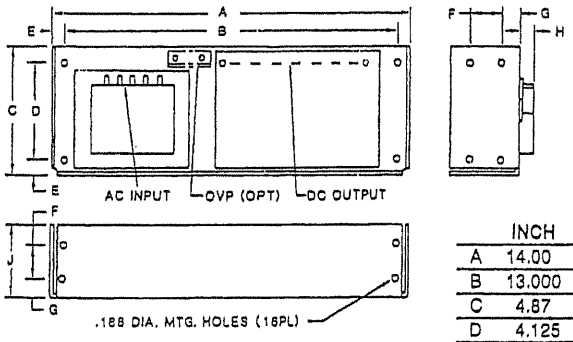


	INCH	mm
A	7.00	177.80
B	6.250	158.75
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.450	11.43
J	2.75	69.85
K	0.38	6.35
L	0.640	16.26
M	3.345	84.96
N	1.00	25.40

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.



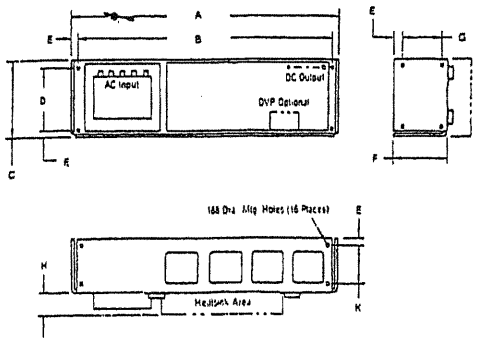
	INCH	mm
A	14.00	355.60
B	13.000	330.20
C	4.87	123.70
D	4.125	104.78
E	0.50	12.70
F	1.250	31.75
G	0.75	19.05
H	0.650	16.51
J	2.75	69.85

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

Outline and Mounting Drawings

F Case

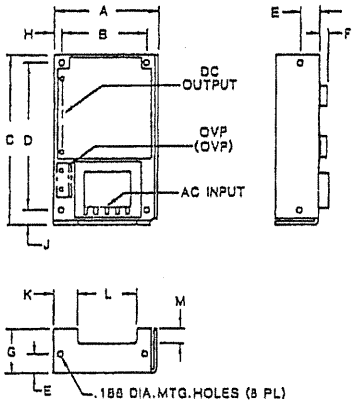
Overall Size: 16.75" x 5.50" x 4.88"
Weight 19 lbs.



	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.

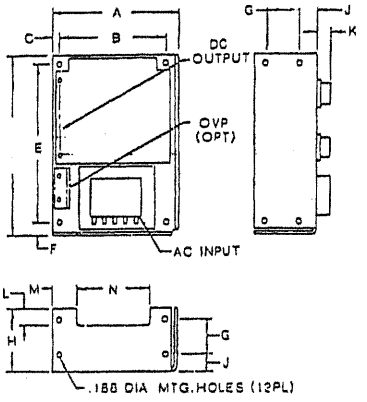


	INCH	mm
A	4.00	101.60
B	3.375	85.73
C	6.50	165.10
D	5.750	146.05
E	0.75	19.05
F	0.450	11.43
G	1.62	41.15
H	0.25	6.35
J	0.50	12.70
K	0.955	24.26
L	2.37	60.20
M	0.57	14.48

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.

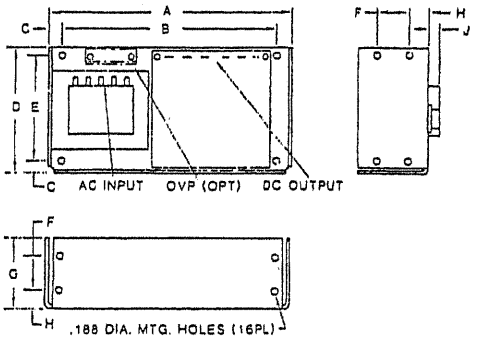


	INCH	mm
A	4.87	123.70
B	4.125	104.78
C	0.25	6.35
D	7.00	177.80
E	6.250	158.75
F	0.50	12.70
G	1.250	31.75
H	2.50	63.50
J	0.75	19.05
K	0.450	11.43
L	0.665	16.89
M	1.025	26.03
N	2.85	72.39

FUSE AT: 1.0/0.5 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.

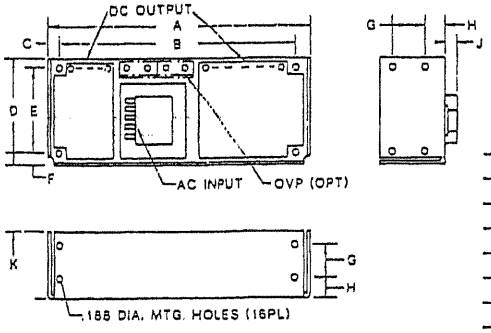


	INCH	mm
A	9.38	238.25
B	8.375	212.73
C	0.50	12.70
D	4.87	123.70
E	4.125	104.78
F	1.250	31.75
G	2.75	69.85
H	0.75	19.05
J	0.450	11.43

FUSE AT: 2.0/1.0 AMPS FOR 100-120/220-240 VAC
HCC512: 3.0/1.5 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.

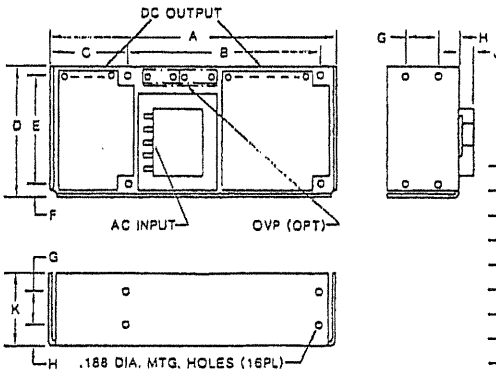


	INCH	mm
A	10.25	260.35
B	9.250	234.95
C	0.50	12.70
D	4.00	101.60
E	3.375	85.73
F	0.37	9.40
G	1.250	31.75
H	0.75	19.05
J	0.450	11.43
K	2.50	63.50

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.

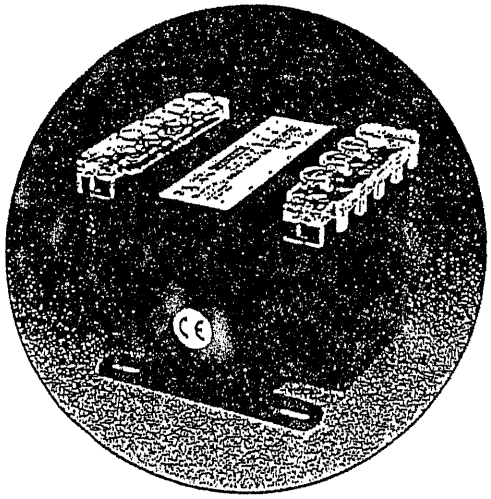


	INCH	mm
A	11.00	279.40
B	7.50	190.50
C	3.00	76.20
D	4.87	123.70
E	4.125	104.78
F	0.50	12.70
G	1.250	31.75
H	0.75	19.05
J	4.50	11.43
K	2.75	69.85

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

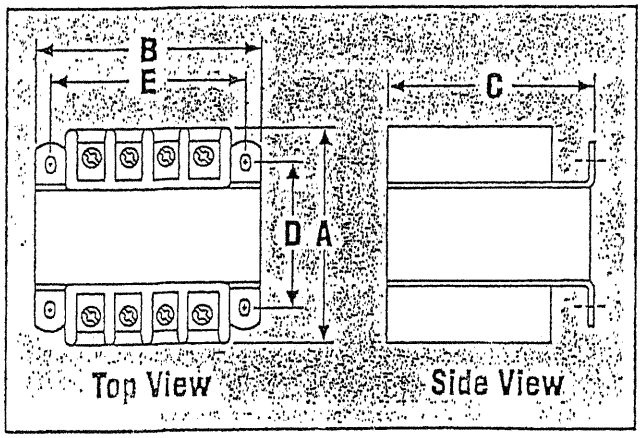
GlobalTRAN™

SPECIFICATIONS



GlobalTRAN... is Micron's newest line of control transformers, specifically designed to comply with the international requirements of IEC-742 for Non-Short Circuit Proof Isolating Transformers. GlobalTRAN also meets true IP20 terminal protection ratings as defined by IEC-529.

- Carries the CE mark
- 20-year warranty,* double the industry standard
- Epoxy encapsulated coils for cooler, safer operation
- SafeTouch terminal covers for additional safety
- Optional integral primary and/or secondary fusing
- 10-32 screw terminals, molded terminal barriers
- Molded-in terminals and phil-slot screws

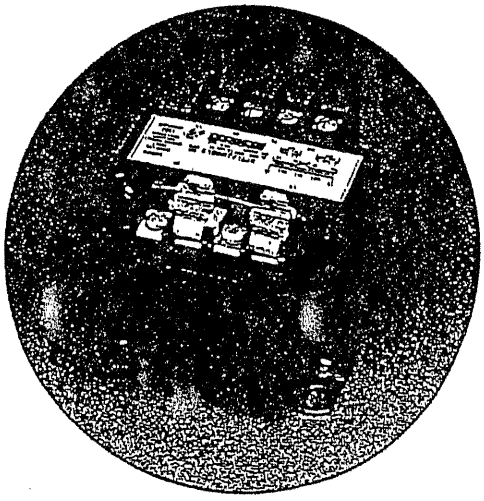


GlobalTRAN

ImperviTRAN Construction
Class 105°c Insulation system
55°c temperature rise
Epoxy encapsulated coils
40° c maximum ambient

ImperviTRAN®

SPECIFICATIONS



ImperviTRAN... is the ultra-reliable industrial control circuit transformer. Behind its clean design is a toughness that makes it measure up to any requirement placed upon it. Manufacturers of industrial and commercial equipment, control panels and centers have made ImperviTRAN the most accepted transformer in the industry.

- Epoxy encapsulated coils
- 20-year warranty,* double the industry standard
- Secondary fuse clips where applicable
- Optional primary fusing
- Molded terminal barriers
- 10-32 screw terminals
- Molded-in terminals and phil-slot screws

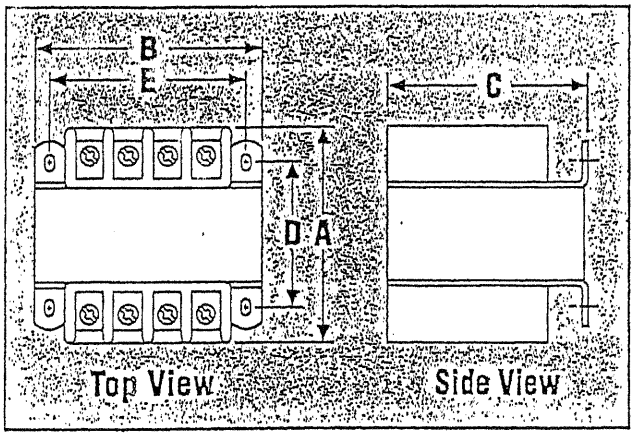
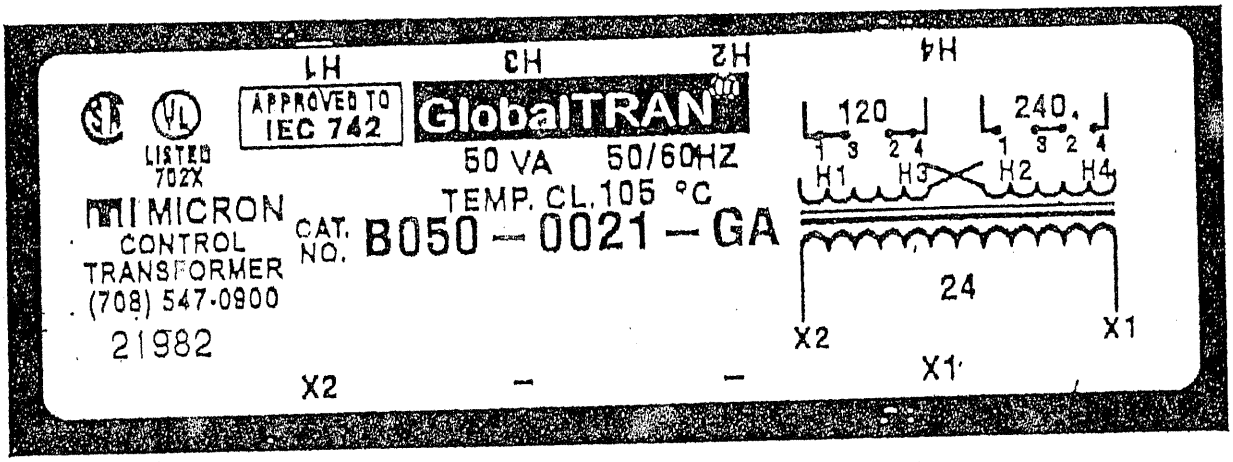


Figure **B**

ImperviTRAN Construction
Class 105°c Insulation system
55°c temperature rise
Epoxy encapsulated coils

* On transformers rated 600 volts and below. For complete warranty, see page 23.


H1
H3
H2
H4
APPROVED TO IEC 742
GlobalTRAN
50 VA 50/60HZ
TEMP. CL. 105 °C
LISTED 702X
MICRON
CONTROL TRANSFORMER
(708) 547-0900
21982
CAT. NO. B050 – 0021 – GA
120
240
1 3 2 4
1 3 2 4
H1 H3 H2 H4
24
X2
X1
X2
X1

IEC-742

The requirements for industrial control circuit transformers to be used in the European Common Market are identified by the International Electrotechnical Commission (IEC) and specified under IEC-742, Non-Short Circuit Proof Isolating Transformers, under the Low Voltage Directive 73/23/EEC. Manufacturers of control transformers indicate compliance with these requirements by placing a CE mark on the product.

In addition to being able to handle the inrush requirements of industrial control circuits and motor loads, transformers built to the requirements of IEC-742 will exhibit several major construction differences from those manufactured in accordance with UL506. These construction differences will typically increase not only the physical size of the transformer when compared to those built only to UL requirements, but the inrush capability as well.

- The winding insulation thickness requirements, depending upon electrical currents, are comparable layer to layer for IEC-742 versus UL506. Winding to winding insulation requirements, however, may be twice that for IEC-742 compared to UL506.
- The electrical clearances between current carrying parts are one-third greater to comply with IEC-742 requirements for units up to 250VA with voltages up to 440 volts ac.
- The dielectric strength (hipot) test voltages are twice as long in duration to comply with IEC-742 compared to UL506 for all units and up to one-and-a-half times greater in magnitude on smaller VA sizes.
- Transformers manufactured to IEC-742 requirements will have a minimum of 10% higher overload capacity than those manufactured only to UL506 requirements.
- IEC-742 requires that transformers in a failure mode under excessive current (10 times the unit rating) must not exhibit flame or molten material. There is no comparable requirement under UL506.

While no requirement exists in IEC-742 for the electrical connections to be either finger safe or touch proof, the specification does state that IF a transformer is supplied with a cover to prevent incidental contact with current carrying parts, that cover must utilize two separate methods or places of securing it to the component, with neither being dependent upon the other. Additionally, one of these methods MUST require a tool to remove it.

IEC-529

The requirements for finger-safe or touch-proof electrical connections are identified by the International Electrotechnical Commission (IEC) under specification 529, Classification of Degrees of Protection Provided by Enclosures. These various degrees of protection are identified and differentiated by IP ratings.

A variety of IP ratings are defined in IEC-529 ranging from IP00, which provides no protection from contact, to IP68, which identifies dust-proof and water-proof protection. Optionally, IP ratings may contain additional and supplementary designators. The IP specification which most closely approximates protection to a human finger is IP20. This IP rating would be the most common degree of touch-proof connection for electrical components such as transformers.

IEC-529 protection requirements would most commonly apply to products which fall under the requirements of the Machinery Directive 89/392/EEC, as opposed to the Low Voltage Directive 73/23/EEC, which covers components such as control transformers. Over time, however, users subject to the requirements of the Machinery Directive and/or IEC-529 have expanded their interpretation of finger-safe or touch-proof electrical connections to include the components of the equipment, such as transformers.

Transformer Selection Process

Selecting a transformer for industrial control circuit applications requires knowledge of the following terms:

INRUSH VA is the product of load voltage (V) multiplied by the current (A) that is required during circuit start-up. It is calculated by adding the Inrush VA requirements of all devices (contactors, timers, relays, pilot lights, solenoids, etc.), which will be energized together. Inrush VA requirements are best obtained from the component manufacturer.

SEALED VA is the product of load voltage (V) multiplied by the current (A) that is required to operate the circuit after initial start-up or under normal operating conditions. It is calculated by adding the sealed VA requirements of all electrical components of the circuit that will be energized at any given time. Sealed VA requirements are best obtained from the component manufacturer. Sealed VA is also referred to as steady state VA.

PRIMARY VOLTAGE is the voltage available from the electrical distribution system and its operational frequency, which is connected to the transformer supply voltage terminals.

SECONDARY VOLTAGE is the voltage required for load operation which is connected to the transformer load voltage terminals.

Once the circuit variables have been determined, transformer selection is a simple 5-step process as follows:

1. Determine the Application Inrush VA by using the following industry accepted formula:

$$\text{Application Inrush VA} = \sqrt{(\text{INRUSH VA})^2 + (\text{SEALED VA})^2}$$

2. Refer to the Regulation Data Chart. If the primary voltage is basically stable and does not vary by more than 5% from nominal, the 90% secondary voltage column should be used. If the primary voltage varies between 5 and 10 % of nominal, the 95% secondary voltage column should be used.

3. After determining the proper secondary voltage column, read down until a value equal to or greater than the Application Inrush VA is found. In no case should a figure less than the Application Inrush VA be used.

4. Read left to the Transformer VA Rating column to determine the proper transformer for this application. As a final check, make sure that the Transformer VA Rating is equal to or greater than the total sealed requirements. If not, select a transformer with a VA rating equal to or greater than the total sealed VA.

5. Refer to pages 9 to 23 to determine the proper catalog number based on the transformer VA, and primary and secondary voltage requirements.

Regulation Data Chart

Transformer VA Rating	Inrush VA at 20% Power Factor		
	NEMA / IEC 95% Sec. Voltage	NEMA / IEC 90% Sec. Voltage	NEMA / IEC 85% Sec. Voltage
25	100 / ----	130 / ----	150 / ----
50	170 / 190	200 / 220	240 / 270
75	310 / 350	410 / 460	540 / 600
100	370 / 410	540 / 600	730 / 810
150	780 / 860	930 / 1030	1150 / 1270
200	810 / 900	1150 / 1270	1450 / 1600
250	1400 / 1540	1900 / 2090	2300 / 2530
300	1900 / 2090	2700 / 2970	3850 / 4240
350	3100 / 3410	3650 / 4020	4800 / 5280
500	4000 / 4400	5300 / 5830	7000 / 7700
750	8300 / 9130	11000 / 12100	14000 / 15400
1000 *	15000 / -----	21000 / ------	27000 / ------
1000 **	9000 / ------	13000 / ------	18500 / ------
1500	10500 / -----	15000 / ------	20500 / ------
2000	17000 / -----	25500 / ------	34000 / ------
3000	24000 / -----	36000 / ------	47500 / ------
5000	55000 / -----	92500 / ------	115000 / ------

To comply with NEMA standards, which require all magnetic devices to operate successfully at 85% of rated voltage, the 90% secondary voltage column is most often used in selecting a transformer.

* For units with class 105°c insulation systems
** For units with class 180°c insulation systems

CB Scheme

A CE mark indicates compliance to the applicable requirements of a particular product as outlined by the International Electrotechnical Commission (IEC) and by mutual agreement is recognized throughout the European Union. By itself, however, the CE mark may not necessarily be accepted as evidence of product compliance in countries outside of the European Union. Additionally, even countries within the European Union may require their own country's approval mark in addition to the CE mark. To that end, a system of mutual recognition and reciprocal acceptance has been developed which would allow product acceptance outside of the European Union and the ability to obtain the approval mark of countries within it.

The official title for this mutual acceptance agreement is The Scheme of the IECEE for Recognition of Results of Testing to Standards for Safety of Electrical Equipment (CB Scheme for short). The basis of the CB Scheme is a CB Test Certificate providing evidence that representative samples of a particular product have been tested to a particular IEC standard and successfully passed the required tests.

Each country participating in the CB Scheme, currently over 50, including East and West Europe, the Middle and Far East, and the Pacific Rim, has a representative agency, referred to as a National Certification Body, in the IECEE. Each participant has agreed that they will accept the test results of other members if such results are based on a reasonably harmonized IEC standard. Thus, by utilizing the CB Scheme, a manufacturer of product carrying a CE mark may be able to have that product accepted throughout the world, or obtain additional listing marks, with no further product testing being required.

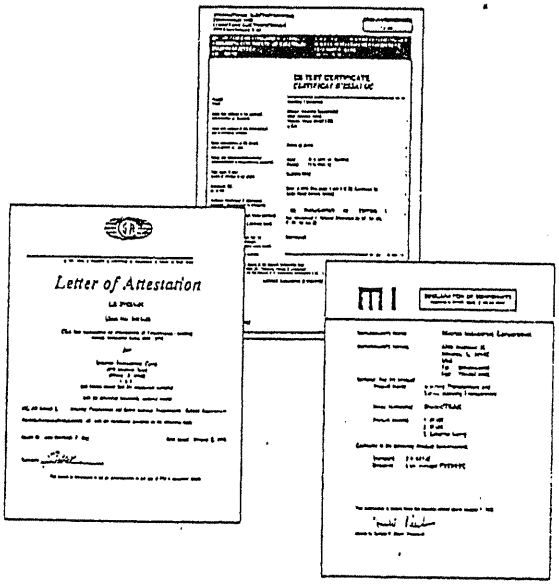
To utilize the CB Scheme, a manufacturer must present the appropriate test reports, along with a CB Test Certificate prepared by the National Certification Body responsible for the original product listing, to the National Certification Body of the country to which the product is being supplied. At such time as the reports are accepted, the product manufacturer may place the certification mark of the country on the product without the need for additional testing.

Micron Meets International Standards

Micron has utilized the Canadian Standards Association (CSA) as a Competent Body in reviewing, interpreting and properly complying with the requirements of IEC-742 to place a CE mark on its GlobalTRAN product. As a National Certification Body, CSA also has the proper documentation and reports on file for GlobalTRAN to utilize the CB Scheme, ensuring acceptance throughout the world.

In addition to the CE mark, a Declaration of Conformity may be required by some customs agencies. Micron will furnish copies of this Declaration upon request. Copies of the related CB Test Certificate and CSA Letter of Attestation (right) are also available.

The standard GlobalTRAN product is supplied with terminal covers which meets the requirements of IEC-529, IP20 degree of protection and meets the applicable requirements for covers per IEC-742.



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 desired, 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.

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.

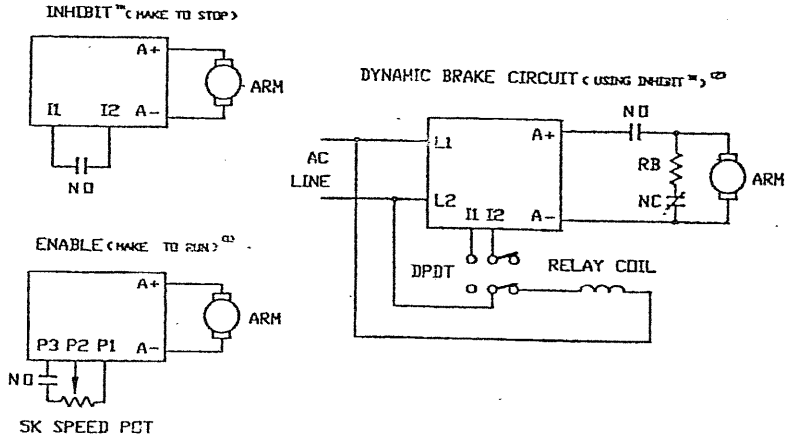
E. *Current Limit (CL/Torque Adjustment).* CL circuitry is provided to protect the motor and control against overloads. The CL also limits the inrush current to a safe level during startup. The CL is factory set to approximately 1.5 times the full load rating of the motor. (CL trimpot is nominally set to 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 .75 times motor rating.

FIG. (5) SWITCHING CIRCUITS—CONNECTION DIAGRAMS



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.

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 3% 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 I_1 and I_2 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 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

FIG. (6) KBMM™ SCHEMATIC

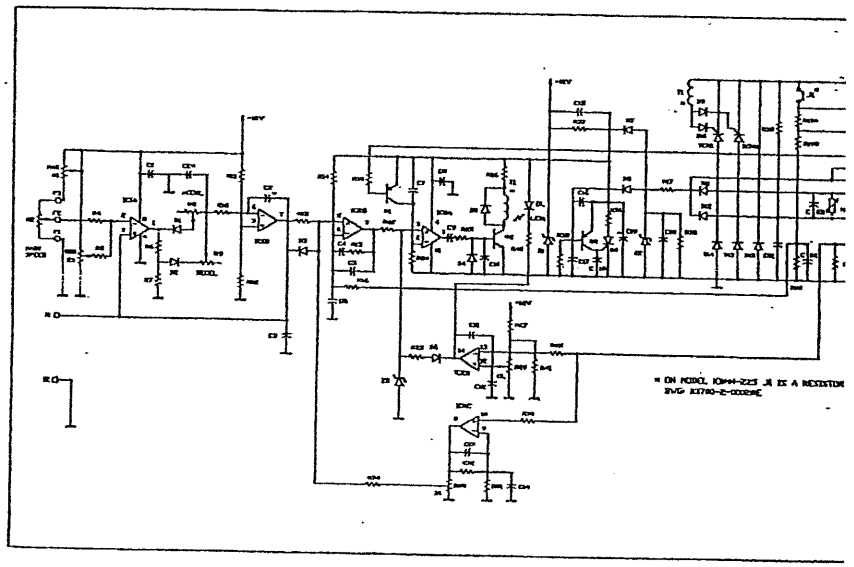


TABLE 7. KBMM™ PARTS LIST

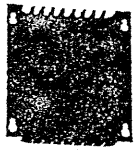
MODELS	CKT. REF.	VALUE/RATING	MFG. TYPE	FUNCTION
All Models	C1	0.01ufd-25V	Ceramic Tubular	Capacitor
	C14-16,18	0.01ufd-25V	Ceramic Tubular	Capacitor
	C2	1.5ufd-50V	Electrolytic	Capacitor
	C3	0.47ufd-50V	Film/lytic	Capacitor
	C4	0.33ufd-50V	Metal Film	Capacitor
	C5	0.033ufd-50V	Metal Film	Capacitor
	C6,8,10,12,24	0.022ufd-25V	Ceramic Tubular	Capacitor
	C7	0.1ufd-50V	Metal Film	Capacitor
	C9,11,13	0.01ufd-50V	Metal Film	Capacitor
	C17	4.7ufd-35V	Electrolytic	Capacitor
	C19	100-0ufd-35V	Electrolytic	Capacitor
	C20	0.047ufd-50V	Metal Film	Capacitor
	C22	0.022ufd-50V	Metal Film	Capacitor
	D1-D10	1A-600V	1N4005GP	Diode
	D11,12	1.5A-600V	1N5397GP	Diode
	D13, D14	25A-600V	D6025L	Power Diode
	D15	15A-600V	D6015L	Power Diode
	IC1		LM358P	Dual Op-Amp
	IC2		LM324	Quad Op-Amp
	LED1	35MA-30mcd	MV5753	CL Indicator
	Q1,3	0.6A-40V	2N4403	Small Signal Transistor
	Q2	0.6I-40V	2N4401	Small Signal Transistor
	Q4	0.6A-50V	S347S101E	Small Signal SCR
	R1	10K-0.33W-10%	PTC-10YV	Max Trimpot
	R2	5K-5W-20%		Main Speed Pot
	R3	25K-0.33W-10%	PTC-10YV	Min Trimpot
	R4	33K-0.25W-5%	Carbon Film	Resistor
	R5,16,18,27	47K-0.25W-5%	Carbon Film	Resistor
	R28,30,31	47K-0.25W-5%	Carbon Film	Resistor
	R6	24K-0.25W-5%	Carbon Film	Resistor
	R7,12	3.3K-0.25W-5%	Carbon Film	Resistor
	R8	500K-0.33W-10%	PTC-10YV	Accel Trimpot
	R9	500K-0.33W-10%	PTC-10YV	Decel Trimpot
	R10,41	1K-0.25W-5%	Carbon Film	Resistor
	R11	56K-0.25W-5%	Carbon Film	Resistor
	R13,23,35	22K-0.25W-5%	Carbon Film	Resistor
	R14,32	2.2M-0.25W-5%	Carbon Film	Resistor
	R15	1M-0.25W-5%	Carbon Film	Resistor
	R19B	12K-0.25W-5%	Carbon Film	Resistor
	R20	3.9K-0.25W-5%	Carbon Film	Resistor
	R21*	0.006 ohm-1.0 ohm-5W-5%	Wire Wound	Plug-In-Horsepower Res.
	R22,24,34	100K-0.25W-5%	Carbon Film	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-0.25W-5%	Carbon Film	Resistor
	R29	25K-0.33W-10%	PTC-10YV	CL Trimpot
	R33	10K-0.33W-10%	PTC-10YV	IR Trimpot
	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%	Carbon Film	Resistor
	R39	1K-0.25W-5%	Flameproof	Resistor
	R40	4.7K-0.25W-5%	Carbon Film	Resistor
	SCR1,2	25A-600V	S6025L	Power SCR
	T1	1:1	KB Standard	Pulse Transformer
	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	C21,23	.1ufd-250VDC	Metal Film	Capacitor
	J1	22 AWG		Jumper
	MOV1	150V	V150LA10A	Transient Suppressor
	R17	4.7K-3W-5%	MO-3	Resistor
	R19A	62K-0.25W-5%	Carbon Film	Resistor
240V Input KBMM-225	C21	.047ufd-400VDC	Metal Film	Capacitor
	C23	.047ufd-250VAC/630VDC	Rifa or Wima	Capacitor
	J1	82K-0.25W-5%	Carbon Film	Resistor
	MOV1	275V	V275LA20A	Transient Suppressor
	R17	12K-7W-5%	CW-7	Resistor
	R19A	62K-0.25W-5%	Carbon Film	Resistor
Dual Voltage KBMM-225D	C21	.047ufd-400VDC	Metal Film	Capacitor
	C23	.047ufd-250VAC/630VDC	Rifa or Wima	Capacitor
	MOV1	275VAC	V275LA20A	Transient Suppressor
	R17	12K-7W-5%//	CW-7	Resistor
		8.2K-3W-5%	MO-3	Resistor
	R19A	150K-0.25W-5%//	Carbon Film	Resistor
		120K-0.25W-5%	Carbon Film	Resistor

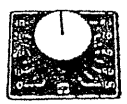
NOTES

ACCESSORY ITEMS FOR KBMM™CONTROLS available from your distributor



Auxiliary Heatsink Part No. 9861

Barrier Terminal Accessory Kit (MM) Part No. 9883



Knob/Dial Kit Part No. 9832

Potentiometer Kit Part No. 9831

Barrier Termina Part No. 98

LIMITED WARRANTY—KBMM-125, 225, 225D

For a period of 5 years from date of original purchase KB will repair or replace without charg devices which our examination proves to be defective in material or workmanship. This warrant is valid if the unit has not been tampered with by unauthorized persons, misused, abused, o 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 nc responsible for any expense (including installation and removal), inconvenience, or consequen tial damage, including injury to any person, caused by items of our manufacture or sale. Som states do not allow certain exclusion or limitations found in this warranty so that they may nc apply to you. In any event, KB's total liability, under all circumstances, shall not exceed the fu 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 chan in design which may not be included herein.

KB ELECTRONICS, INC.
12095 NW 39th Street, Coral Springs, FL 33065 USA
(305) 346-4900 Fax: (305) 346-3377

BP 3164 9/95 20M F
KB Part No. 1245 PRINTED

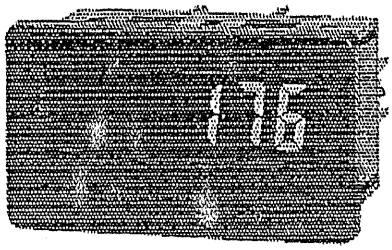
BULLETIN NO. CUB5-F
DRAWING NO. LP0268
REVISED 2/98

RED LION CONTROLS

INTERNATIONAL HEADQUARTERS
20 Willow Springs Circle, York, Pa. 17402. (717) 767-6511 FAX: (717) 764-0839
Web site- http://www.redlion-controls.com E-mail- sales@redlion-controls.com

EUROPEAN HEADQUARTERS
892 Plymouth Road, Slough, Berkshire SL1 4LP
ENGLAND +44 1753 696888 FAX: +44 1753 696339

MODEL CUB5 - MINIATURE ELECTRONIC 8-DIGIT DUAL COUNTER & RATE INDICATOR



- LCD, POSITIVE REFLECTIVE OR NEGATIVE TRANSMISSIVE WITH YELLOW/GREEN OR RED LED BACKLIGHTING
- 0.46 INCH (11.7 mm) HIGH DIGITS
- PROGRAMMABLE DECIMAL POINT
- FRONT PANEL AND REMOTE RESET
- COUNT SPEEDS UP TO 20 KHz (High Speed Input)
- OPERATES FROM 9 to 28 VDC POWER SOURCE
- PROGRAMMABLE PRESCALER FOR TOTALING
- BI-DIRECTIONAL COUNTING, UP/DOWN CONTROL
- QUADRATURE SENSING (Up to 4 Times Resolution)
- ANTI-COINCIDENCE COUNTING (ADD/ADD & ADD/SUB)
- SEPARATE COUNT AND RATE INPUT MODE
- WIRE CONNECTIONS MADE VIA SCREW CLAMP TYPE TERMINALS
- DUAL COUNTER MODE
- COUNT INPUT VOLTAGE UP TO +28 VDC
- NEMA 4X/IP65 SEALED FRONT BEZEL

CE

DESCRIPTION

The CUB5 provides up to three functions in a single display package (rate indicator and two counters). The display can be toggled either manually or automatically between the rate and counter(s) display.

The CUB5 display has 0.46" (11.7 mm) high digits. The LCD display is available in Positive Image Reflective (CUB50000), Negative Image-Transmissive with yellow/green backlighting (CUB50010), or Negative Image-Transmissive with red backlighting (CUB50020).

The counters may be programmed for one of eight different count modes. The counters and rate indicator have separate scaling and decimal point placement for read-outs in different engineering units.

Input A accepts a signal for the Count and Rate displays. Input B accepts a signal for the Count display or direction control. In the anti-coincidence mode, both inputs are monitored simultaneously so that no counts are lost. The final count can be chosen as the sum or difference of the two inputs. The Rate Indicator has programmable low (minimum) and high (maximum) update times to provide optimal display response at any input frequency. There is a programmable user input that can be set for one of a variety of functions.

The unit is housed in a lightweight, high-impact plastic case with a clear viewing window. The sealed front panel meets NEMA 4X/IP65 specifications for wash-down and/or dusty environments, when properly installed.

The CUB5 can be powered from an optional RLC Micro Line/Sensor Power Supply (MLPS0000) attached directly to the rear of a CUB5. The MLPS0000 is powered from either a 115 or 230 VAC source.

CAUTION: Read complete Instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

SAFETY SUMMARY

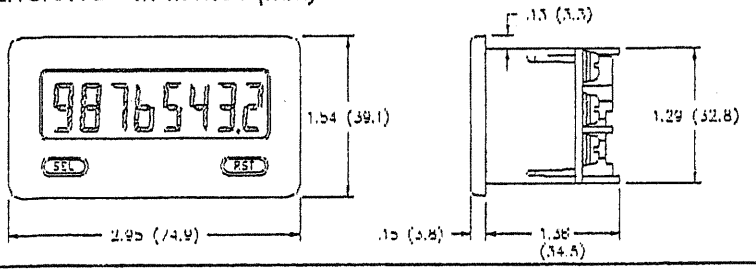
All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SPECIFICATIONS

1. DISPLAY: 8 digit LCD 0.46" (11.7 mm) high digits
   Transmissive red or yellow/green backlight, or Reflective. The viewing angle of a transmissive display is designed for viewing at eye level or above the display. Reflective display units have a full viewing angle.
2. POWER REQUIREMENTS:
   Reflective Versions: 9 to 28 VDC @ 15 mA max.
   Backlight Versions: 9 to 28 VDC @ 60 mA max.
   Above 24 VDC, derate operating temperature to 50°C.
   Must use an RLC model MLPS or a Class 2 or SELV rated power supply.
3. MEMORY: Nonvolatile E²PROM memory retains all programming parameters and the count value when power is removed.
4. USER INPUT: Programmable, connect to common to activate function.
   Threshold Levels: V_{IH} = 4.2 V min, V_{IL} = 0.5 V max, V_{MAX} = 28 VDC.
   Response Time: 50 msec for Inhibit function, 100 msec for all others.
   Current Sinking: Internal 40 KΩ typical. Pull-up to 15 V.
   Current Sourcing: External pull-down resistor required, 2KΩ max.
5. INPUTS A and B:
   Trigger Levels: V_{IH} = 4.2 V min, V_{IL} = 0.5 V max, V_{MAX} = 28 VDC.
   Max Input Frequency: 20 KHz, 50% duty cycle.
   Current Sinking: Internal 40 KΩ typical. Pulled-up to +5 V.
   Current Sourcing: External pull-down resistor required, 2 KΩ max.
   Filter A and B: Limits Input signal to a max. frequency of 100 Hz. Connect to common to activate.

DIMENSIONS "In Inches (mm)"

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.15" (58.6) H x 3.00" (76.2) W



SPECIFICATIONS (Cont'd)

6. FRONT PANEL BUTTONS:
   SELECT: Toggles display in the normal operating mode if enabled. Advances menu selection in programming mode.
   RESET: Resets counter to zero in the normal operating mode if enabled. Changes data in programming mode.
7. COUNT DISPLAY: 8-digit with positive count, 7-digit with minus sign indication for negative count and the display flashes "tot OVEr" for an overflow condition. Dual count mode only, "B" counter, seven digit positive count; "btot OVEr" appears for an overflow condition.
8. RATE DISPLAY: 6 digits with an annunciator "R" on the left hand side of the LCD.
   Overflow Indication: "R. OLOLOL" appears when max. display digits are exceeded.
9. RATE ACCURACY: 0.05%
10. RATE MINIMUM INPUT FREQUENCY: 0.01 Hz
11. RATE MAXIMUM FREQUENCY: 10 KHz
12. MAXIMUM COUNT RATES:

COUNTER MODE	RATE ENABLED	RATE DISABLED
cnt ud	10 KHz	20 KHz
rtE cnt	7.5 KHz	20 KHz
QUAd1	5 KHz	10 KHz
QUAd2	5 KHz	8 KHz
QUAd4	2.5 KHz	5 KHz
Add Add	7.5 KHz	10 KHz
Add Sub	7.5 KHz	10 KHz
dUAL cnt	7.5 KHz	10 KHz

13. ENVIRONMENTAL CONDITIONS:
    Operating Temperature: 0 to 60°C (above 50°C, derate backlight operating voltage to 24 VDC max.).
    Storage Temperature: -30 to 85°C
    Operating and Storage Humidity: 85% max. (non-condensing) from 0°C to 50°C.
    Altitude: Up to 2000 meters
14. CERTIFICATIONS AND COMPLIANCES:
    ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2		
electrostatic discharge	EN 61000-4-2	level 2; 4 Kv contact level 3; 8 Kv air
electromagnetic RF fields	EN 61000-4-3	level 3; 10 V/m 80 MHz - 1 GHz
fast transients (burst)	EN 61000-4-4	level 4; 2 Kv I/O level 3; 2 Kv power
RF conducted interference	EN 61000-4-6	level 3; 10 V/rms 150 KHz - 80 MHz
simulation of cordless telephone	ENV 50204	level 3; 10 V/m 900 MHz ± 5 MHz 200 Hz, 50% duty cycle
Emissions to EN 50081-2		
RF interference	EN 55011	enclosure class A power mains class A

Note:

1. Cable shields connected to earth ground at both ends. Test: RF Conducted Immunity I/O lines per ENV 50141

Refer to EMC Installation Guidelines for additional information.

15. CONSTRUCTION: High impact plastic case with clear viewing window. The front panel meets NEMA 4X/IP65 requirements for indoor use when properly installed. Installation Category I, Pollution Degree 2. Panel gasket and mounting clip included.
16. WEIGHT: 3 oz *(85 grams)*

BASIC OPERATION

When power is applied to the unit, it performs an internal self-diagnostic test and then the unit displays its revision level. If all P's appear in the display, press the select (SEL) button and check all of the data setups.

The CUB5 can be programmed to function as a single counter, dual counters, single counter with rate indication or dual counters with rate indication.

Counter

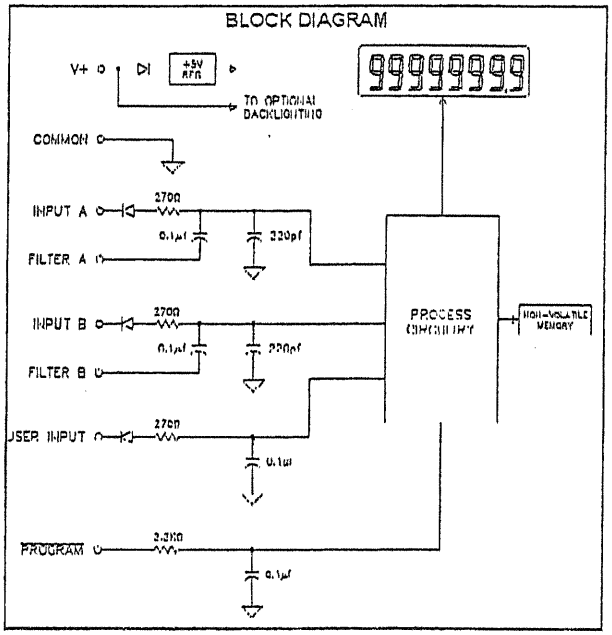
The CUB5 receives incoming pulses and multiplies them by the Count Scale Factor. The unit's counter (internal count value) keeps track of the scaled input pulse count which results in the desired reading value for the count display. Input A accepts the signal for the count and Input B is used for quadrature, dual counter, anti-coincidence counting, or up/down control counting.

The count(s) reset to zero when a manual reset is performed. At loss of power to the unit, the contents of the counter are saved. This allows counting over consecutive shifts, days, etc. The total count can accumulate to 99,999,999. The "B" counter, if enabled, can accumulate 9,999,999 counts.

Note: The counter value will roll over and flash "tot OVEr" when the count value exceeds 99,999,999, indicating an overflow condition. The "B" counter, if enabled, will roll over and flash "btot OVEr" when the count exceeds 9,999,999.

Rate

The signal at Input A is for the Rate indicator, which uses a time interval method (1/tau) to calculate the rate value. The unit counts on the negative edge of the input pulses. After the programmed minimum update time elapses and the next negative edge occurs, the unit counts the number of edges that occurred during the elapsed time. The number of edges is multiplied by the rate scaling value to calculate the rate value. At slower rates, averaging can be accomplished by programming the rate minimum update time for the desired response. Extensive scaling capabilities allow practically any desired reading at very slow count rates.



DISPLAY SELECTION

In the normal operating mode the program terminal is not connected to common. The display indicates either:

Rate value designated by an "R" to the left of the display,
"A" count value (no designator), or
"B" count value designated by a "b" to the left of the display

If the Select button is enabled, the display may be toggled by pressing the select button. If display scroll is enabled, the display will toggle automatically approximately every four seconds between the rate and count values. If both the select button and display scroll are enabled, pressing and holding the select button pauses the automatic toggle (if enabled) as long as the select button is held.

PROGRAMMING GENERAL DESCRIPTION

Programming the CUB5 is done with the front panel buttons. Although the unit has been programmed at the factory, the parameters generally have to be changed to meet the user's requirements. To enter the programming mode, connect the program terminal to the common terminal.

Pressing the select button scrolls through the menus. The display alternately flashes between the menu and the currently selected data. Pressing the reset button stops the display from flashing and enters the unit into the data modification mode.

In the data modification mode, a menu has one of two types of parameters to program.

1. Selection type - The operator presses the reset button to scroll through the various parameters available for that menu or to toggle between a Yes or No selection. Pressing and holding the Select button exits the data modification mode and advances to the next menu.
2. Numerical type - The reset button increments the numerical value of the flashing digit. Momentarily pressing the Select button advances to the next digit. Pressing and holding the Select button for more than two seconds exits the data modification mode and advances to the next menu.

All parameter values are saved when exiting the programming mode. To exit the programming mode, remove the connection between the Program terminal and the Common terminal. If power is removed from the CUB5 prior to exiting the programming mode, the new data is not saved.

PROGRAMMING MENUS

1. COUNT MODES (INP A-b)

There are eight count modes to select from. This selection determines the function of Input A and Input B and assigns the function to either COUNTER A, COUNTER B, RATE INDICATOR or a combination of the three. The user input terminal programmed for the inhibit function, can be used with any of the count modes. Input A is always assigned to the RATE INDICATOR.

Counting with Direction (cnt ud)

Counter A will increment/decrement a count on every negative edge of the input signal at Input A. The direction of the count is determined by the logic state of Input B. A high level at Input B will cause Counter A to increment one count. A low level will cause the unit to decrement a count. The rate display is NOT affected by the logic state of Input B.

Rate Counter (rtE cnt)

Counter A increments one count on every negative edge of the input signal at Input B. The direction of the count is only positive. Input A is used exclusively for the RATE INDICATOR.

Dual Counter (dUAL cnt)

Counter A increments one count on every negative edge of the input signal at Input A. Counter B increments one count on every negative edge of the input signal at Input B.

Note: This is the only mode in which Dual Counting is available.

Quadrature X 1 (QUAd1)

Quadrature counting modes are primarily used in positioning and anti-jitter applications. This mode requires two identical square wave signals with one of them (QUAD) shifted 90° relative to the other (COUNT). These two signals are processed by the CUB5 as follows.

Input A serves as the count and rate input, while Input B serves as the quadrature input. For quadrature with single edge counting, the counter will count in a positive direction when Input A is a negative going edge and Input B is at a low level. The counter will count in a negative direction when Input A is a positive going edge and Input B is at a low level. All transitions on Input A are ignored when Input B is at a high level. These logic rules provide the basis for anti-jitter operation which prevents false counts from occurring due to back-lash, vibration, chatter, etc.

Quadrature X 2 (QUAd2)

When two edge counting is used, the quadrature mode works the same as single edge counting when Input B is low. When Input B is a high level, counts at Input A are no longer ignored. Instead, the logic rules for Input A are complimented, allowing both edges of Input A to be counted. This doubles the effective resolution of the encoded input.

Quadrature X 4 (QUAd4)

This mode takes the quadrature mode with two-edge counting one step further. In quadrature times 4, both Input A and B serve as the count or quadrature input, depending on their state. In one instance, Input A will serve as the count input and Input B will serve as the quadrature input. In another instance, Input A will be the quadrature input and Input B will be the count input. This enables each edge, positive and negative going, of both inputs, A and B, to be counted. This results in a resolution four times greater than in the basic quadrature X1 mode. As in the other modes, Input A is also used for the rate input.

Two Input Anti-Coincidence Add/Add (Add/Add)

This mode effectively sums count pulses that may simultaneously appear on the two inputs. Counter A processes the pulses into a string of time separated pulses so the internal counter will not lose any counts. Input A serves as an add input (count increments) and Input B serves as an additional add input (count increments).

Two Input Anti-Coincidence Add/Subtract (Add/Sub)

This mode effectively separates count pulses that may simultaneously appear at the two inputs. Counter A processes the pulses into a string of time-separated pulses, so the internal counter will not lose any counts. Input A serves as the add input (count increments) and Input B serves as the subtract input (count decrements).

2. SELECT ENABLE (dSPSEL)

The front panel Select button can be enabled (Yes) OR disabled (NO) during normal operation. If "NO" is selected, the display remains either on the rate or count display(s) depending on which was viewed when programming was entered.

3. RESET ENABLE (rSt Enb)

When the count mode INP A-b is not equal to "dUAL cnt", the front panel Reset button can be enabled (Yes) or disabled (No) during programming. The count may not be reset via the front panel if disabled.

When the count mode INP A-b is programmed for "dUAL cnt" the front panel reset button can be enabled to reset:

- (total) Counter A
- (b total) Counter B
- (both) Counters A and B
- (diSPLy) Displayed count
- (NONE) None.

If "NONE" is selected, neither counter can be reset from the front panel.

4. COUNTER A DECIMAL POINT (tot dP)

There are six decimal point locations available for the count display. The decimal point locations are used for the count display only and are independent of the rate display.

0
0.0
0.00
0.000
0.0000
0.00000

5. COUNTER A SCALE FACTOR (SCLFAC)

The scale factor is a prescaler, therefore changing the scale factor value does not change the existing internal count, and only effects the incoming pulse count. The Count Scale Factor Value can range from 0.0001 to 99.9999.

Note: The precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit.

6. COUNTER B DECIMAL POINT (btot dP) INP A-b = dUAL cnt

There are six decimal point locations available for the count display. The decimal point locations are used for the count display only and are independent of the rate display.

0
0.0
0.00
0.000
0.0000
0.00000

7. COUNTER B SCALE FACTOR
(b SCLFAC) INP A-b = dUAL cnt

The scale factor is a prescaler, therefore changing the scale factor value does not change the existing internal count, and only affects the incoming pulse count. The Count Scale Factor Value can range from 0.0001 to 99.9999.

Note: The precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit.

8. RATE ENABLE (rAtE Enb)
Selecting "YES" enables the rate indicator function. If disabled (NO), the rate programming steps will not appear. This affects the rate only.

9. RATE DECIMAL POINT (rAtE dP)
Select the desired decimal point position for the rate display, independent of the count display.

0
0.0
0.00
0.000
0.0000
0.00000

10. RATE DISPLAY(rAtE dSP)
Program the desired rate display value which corresponds to the programmed rate input (rate INP) value. The rate display value can be programmed from 000001 to 999999.

11. RATE INPUT(rAtE INP)
Program the rate input value that should correspond to the rate display (rate dSP) value. The rate input value can be programmed from 00000.1 to 99999.9 and should correspond to the signal input frequency.

12. MINIMUM UPDATE TIME (Lo-Udt)
This is the minimum amount of time between display updates for the rate display. This effects the rate display only. The low update time ranges from 00.1 to 99.9 seconds.

13. MAXIMUM UPDATE TIME (HI-Udt)
This is the maximum amount of time before the rate display goes to zero. The rate display goes to zero if the time between successive pulses exceeds the high update (Hi-Udt) time. The high update time ranges from 00.1 to 99.9 seconds.

14. DISPLAY SCROLL (dSPScroL)
The unit can be programmed to automatically toggle between the rate display and count displays by selecting "YES". The display time for each display is fixed and is approximately four seconds per display.

15. USER INPUT (USEr INP)
The User Input is activated when the user terminal is connected to common. The function of the User Input can be programmed for one of the following.

Reset (rESEt) - A low level resets the count*(s)* to zero and as long as the input is low, the unit will not process the input signal.

Store/Reset (Stor-rSt) - A low level freezes the display. The internal count*(s)* are reset to zero and the unit accumulates counts even when the user input is held low. The count value*(s)* update when the user input goes high.

Store (StorE) - A low level freezes the display and the unit continues to accumulate counts. The count value*(s)* update when the user input goes high.

Inhibit (INHIbIt) - A low level "freezes" the display and the input signal is ignored.

Select Display (dSPSEL) - A low level toggles between the rate display and count display*(s)*.

16. USER INPUT ASSIGNMENT (USEr ASg) -
(INP A-b is "dUAL cnt" and USEr INP not "dSPSEL")

If the CUB5 is programmed for the "dUAL cnt" mode, the User Input may be assigned to:

- (totAL) "A" Counter
- (b totAL) "B" Counter
- (both) "A" and "B" Counters

17. FACTORY SETTINGS (FACt SEt)
All of the parameters are restored to the factory default settings when YES is selected and the front panel select button is pressed. The CUB5 displays "LOAd" for several seconds and then returns to programming of INP A-b (Count Mode) parameter. Factory settings for all the programmable values are listed below.

INP A-b	cnt ud
dSPSEL	YES
rSt Enb	YES
tot dP	0
SCLFAC	01.0000
rAtE Enb	YES
rAtE dP	0
rAtE dSP	001000
rAtE INP	01000.0
Lo-Udt	01.0
Hi-Udt	01.0
dSPScrol	No
USEr INP	rESET

SCALING FOR COUNT INDICATION

The CUB5's scale factor is factory set to 1, to provide one count on the display for each pulse that is input to the unit. In many applications, there will not be a one-to-one correspondence between input pulses and display units. Therefore, it is necessary for the CUB5 to scale or multiply the input pulses by a scaling factor to achieve the desired display units (feet, meters, gallons, etc.)

The incoming pulses are multiplied by the count scale factor value and stored in the internal count register which results in the desired count display value. The scale factor is a prescaler, which means changing the scale factor does not change the existing internal count, but only effects the incoming pulse count.

The Count Scale Factor Value can range from 0.0001 to 99.9999. It is important to note that the precision of a counter application cannot be improved by using a scale factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit. The following formula is used to calculate the scale factor.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of Pulses}} \times \text{Decimal Point Position}$$

WHERE:

Desired Display Units: Count display units acquired after pulses that occurred.

Number of Pulses: Number of pulses required to achieve the desired display units.

Decimal Point Position:

0	=	1
0.0	=	10
0.00	=	100
0.000	=	1000
0.0000	=	10000
0.00000	=	100000

EXAMPLE: The counter display is used to indicate the total number of feet used in a process. It is necessary to know the number of pulses for the desired units to be displayed. The decimal point is selected to show the resolution in hundredths.

$$\text{Scale Factor} = \frac{\text{Desired Display Units}}{\text{Number of Pulses}} \times \text{Decimal Point Position}$$

Given that 128 pulses are equal to 1 foot, display total feet with a one-hundredth resolution.

$$\text{Scale Factor} = \frac{1.00}{128} \times 100$$

$$\text{Scale Factor} = 0.007812 \times 100$$

$$\text{Scale Factor} = 0.7812$$

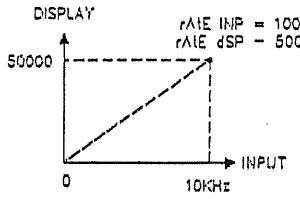
SCALING FOR RATE INDICATION

Scaling the Rate channel involves programming the CUB5 so that input pulses to the unit are scaled to the desired display units.

Note: It is not necessary to increase the pulse information to obtain higher resolution.

The operator keys-in a display value and a corresponding rate value. The location of the scaling point should be near the process end limit for the best possible accuracy. Once these values are programmed, the indicator calculates the slope of the rate display automatically and scaling is complete after decimal point selection. Input frequency can be read directly if rate display and rate input values are programmed to "1" and "1.0".

Note: The rate display will flash "r OLOLOL" if the display exceeds 999,999, which means the unit must be re-scaled.



NOTE: STARTING POINT OF SLOPE DIAGRAM IS ALWAYS ZERO (0).

If the rate application is to display a specific display unit, it is only necessary to know the number of pulses per desired display unit/s (feet, revolutions, etc.) and in the desired time format, per second (1), per minute (60), or per hour (3600) to scale the rate display. Use the following formula to calculate the rate input value:

$$\text{rAtE INP (Hz)} = \text{rAtE dSP} \times \frac{\text{pulses per unit}}{\text{desired time format}}$$

WHERE:

rAtE INP	=	Rate input value.
rAtE dSP	=	Desired rate display value.
Pulses per unit	=	Number of actual input pulses.
Desired time format	=	1 if rAtE dSP is to display units per second, 60 if rAtE dSP is to display units per minute, 3600 if rAtE dSP is to display units per hour.

EXAMPLE: Display is in/minute 1575 revolutions per minute (RPM). Input pulses are 39 pulses per revolution.

$$\text{rAtE INP (Hz)} = 1575 \text{ RPM} \times \frac{39 \text{ PPR}}{60}$$

$$\text{rAtE INP (Hz)} = 1023.75$$

Since the rate input value can only be programmed in tenths, the value is re-calculated by increasing the rate display value by a factor of ten. The display value is continually increased until one of the following is reached.

1. The rAtE INP value's least significant digit is no smaller than a tenth.
2. The rAtE dSP value exceeds 999,999.
3. The rAtE INP value exceeds 99999.9.

Note: For two and three, use the value that was calculated prior to exceeding that value.

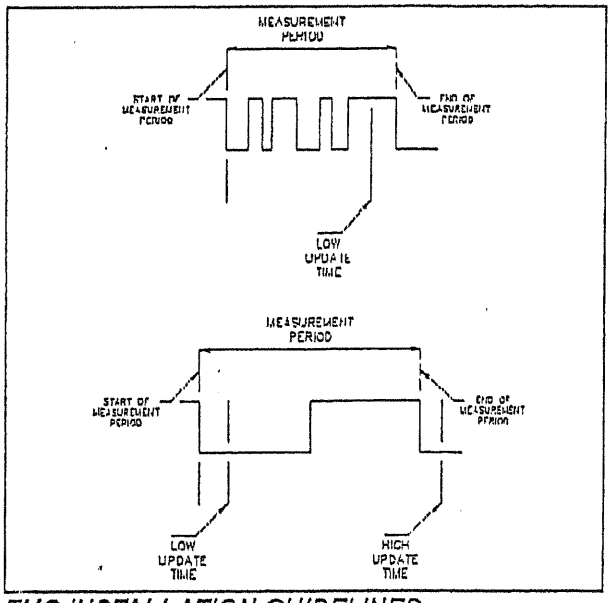
$$\text{rAtE INP (Hz)} = 15750 \text{ RPM} \times \frac{39 \text{ PPR}}{60}$$

$$\text{rAtE INP (Hz)} = 10237.5$$

15750 is entered for the rAtE dSP.
10237.5 is entered for the rAtE INP.

RATE

The rate value calculation uses the time measured between the first and last pulse as the measurement period. The measurement period begins when a negative going edge is received at the signal input A. When the Low Update time has expired, the unit will end the measurement period on the next negative going edge and update the display. The unit will count the number of pulses that occurred during the measurement period and update the display, according to the scaling value, at the end of the measurement period. If the unit does not receive a negative edge within the period between the low update and high update time, the unit will end the measurement period and the input (rate) display will go to zero. At very low count rates, the update time (measurement period) will be the actual period of one count cycle.



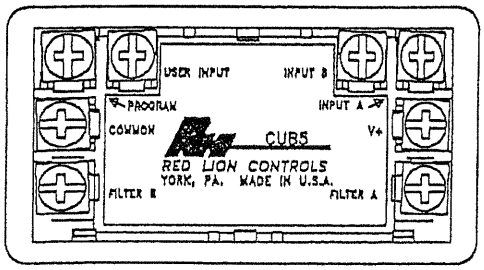
EMC INSTALLATION GUIDELINES

Although this unit is designed with a high degree of immunity to ElectroMagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the unit may be different for various installations.

In extremely high EMI environments, additional measures may be needed. The unit becomes more immune to EMI with fewer I/O connections. Cable length, routing and shield termination are very important and can mean the difference between a successful installation or a troublesome installation.

Listed below are some additional EMC guidelines for successful installation in an industrial environment.

1. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the unit and leave the other end of the shield unconnected and insulated from earth ground.
2. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
3. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.
4. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC #FCOR0000)
   TDK # ZCAT3035-1330A
   Steward #28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC #LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom #1VR3
   Note: Reference manufacturer's instructions when installing a line filter.
5. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.



WIRING CONNECTIONS

The electrical connections are made with screw-clamp terminals located on the back of the unit. All conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit (AC or DC) be protected by a fuse or circuit breaker. When wiring the unit, use the label to identify the wire position with the proper function. Strip the wire, leaving approximately 1/4" bare wire exposed (strand wire should be tinned with solder). Insert the wire into the screw-clamp terminal and tighten the screw until the wire is clamped tightly. Each terminal can accept up to two # 14 AWG wires.

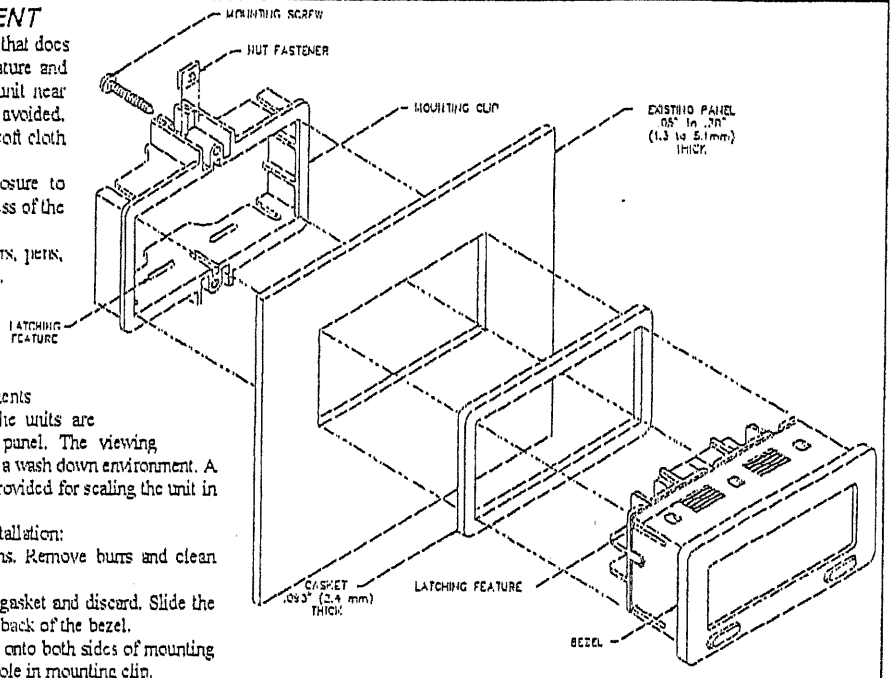
INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product.

Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.



INSTALLATION

The CUB5 meets NEMA 4X/IP65 requirements for indoor use, when properly installed. The units are intended to be mounted into an enclosed panel. The viewing window and reset button are factory sealed for a wash down environment. A sponge rubber gasket and mounting clip are provided for sealing the unit in the panel cut-out.

The following procedure assures proper installation:

1. Cut panel opening to specified dimensions. Remove burrs and clean around panel opening.
2. Carefully remove the center section of the gasket and discard. Slide the panel gasket over the rear of the unit to the back of the bezel.
3. Assemble nut fastener and mounting screw onto both sides of mounting clip. Tip of screw should not project from hole in mounting clip.
4. Install CUB5 unit through the panel cut-out until front bezel flange contacts the panel-mounted gasket.
5. Slide the mounting clip over the rear of the unit until the mounting clip is against the back of the panel. The mounting clip has latching features which engage into mating features on the CUB5 housing.
6. Alternately tighten each screw to ensure uniform gasket pressure. Visually inspect the front panel gasket. The gasket should be compressed about 75 to 80% of its original thickness (recommended torque is 28 to 36 in-oz.). If not, gradually turn mounting screws to further compress gasket.
7. If gasket is not adequately compressed, and mounting screws can no longer be turned, loosen mounting screws and check that mounting clip is latched as close as possible to panel.

Repeat the procedure for tightening mounting screws.

APPLICATION

A dairy producer wishes to indicate the flow rate and record the total gallons of milk dispensed from its processing tank. The CUB5 is installed to meet these requirements.

A PSAC is used to sense a bolt head attached to the shaft of the pump. This results in 32 pulses per gallon dispensed and the counter displays the total gallons in tenths.

The pump typically dispenses 15.0 gallons per minute and the rate display is to indicate tenths of gallons per minute (GPM). The front panel reset button is disabled to prevent unauthorized reset of the total. An external key switch is used for the reset function and the display select button is enabled to allow viewing of either the rate or the total count.

PROGRAMMING:

INP A-b	=	cnt ud
dSPSEL	=	YES
totrst	=	NO
dSPScroL	=	NO
USEr INP	=	rESEt

Count Display Set-up:

tot dP = 0.0

$$SCLFAC = \frac{\text{Desired Display Units}}{\text{Number of Pulses}} \times \text{Decimal Point Position}$$

$$= \frac{1.0}{32} \times 10$$

$$= 0.3125$$

Rate Display Set-up:

rAtE ENb	=	YES
rAtE dP	=	0.0
rAtE dPS	=	15.0 GPM

$$rAtE\ INP = rAtE\ dSP \times \frac{\text{pulses per unit}}{\text{desired time format}}$$

$$= 15.0 \times \frac{32}{60}$$

$$= 8.0\ Hz$$

Lo-Udt	=	1.0 sec.
Hi-Udt	=	5.0 sec.

TROUBLESHOOTING

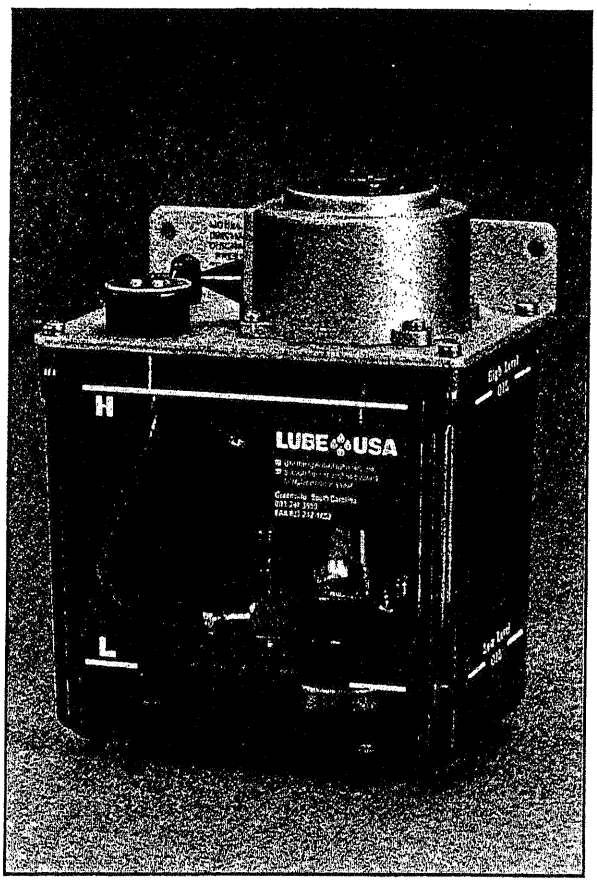
For further technical assistance, contact technical support at the appropriate company numbers listed.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBERS
CUB5	Dual Counter & Rate Indicator Positive Image Reflective	CUB50000
	Dual Counter & Rate Indicator w/Yel-Grn Backlighting	CUB50010
	Dual Counter & Rate Indicator w/Red Backlighting	CUB50020
MLPS	Micro Line/Sensor Power Supply	MLPS0000

For more information on Pricing, Enclosures & Panel Mount Kits refer to the RLC Catalog or contact your local RLC distributor.

AMS CONTINUOUS GEAR PUMP



The AMS lubricators are continuous gear pumps which will deliver up to 3.0cc's per minute. They are designed to be used with control unit systems or any continuous low output requirement system. The system can be a closed system or a recirculating system. The AMS pumps incorporate synchronous single phase motors for a long trouble free service life.

FEATURES:

- Continuous duty
- Recirculating option
- Adjustable output

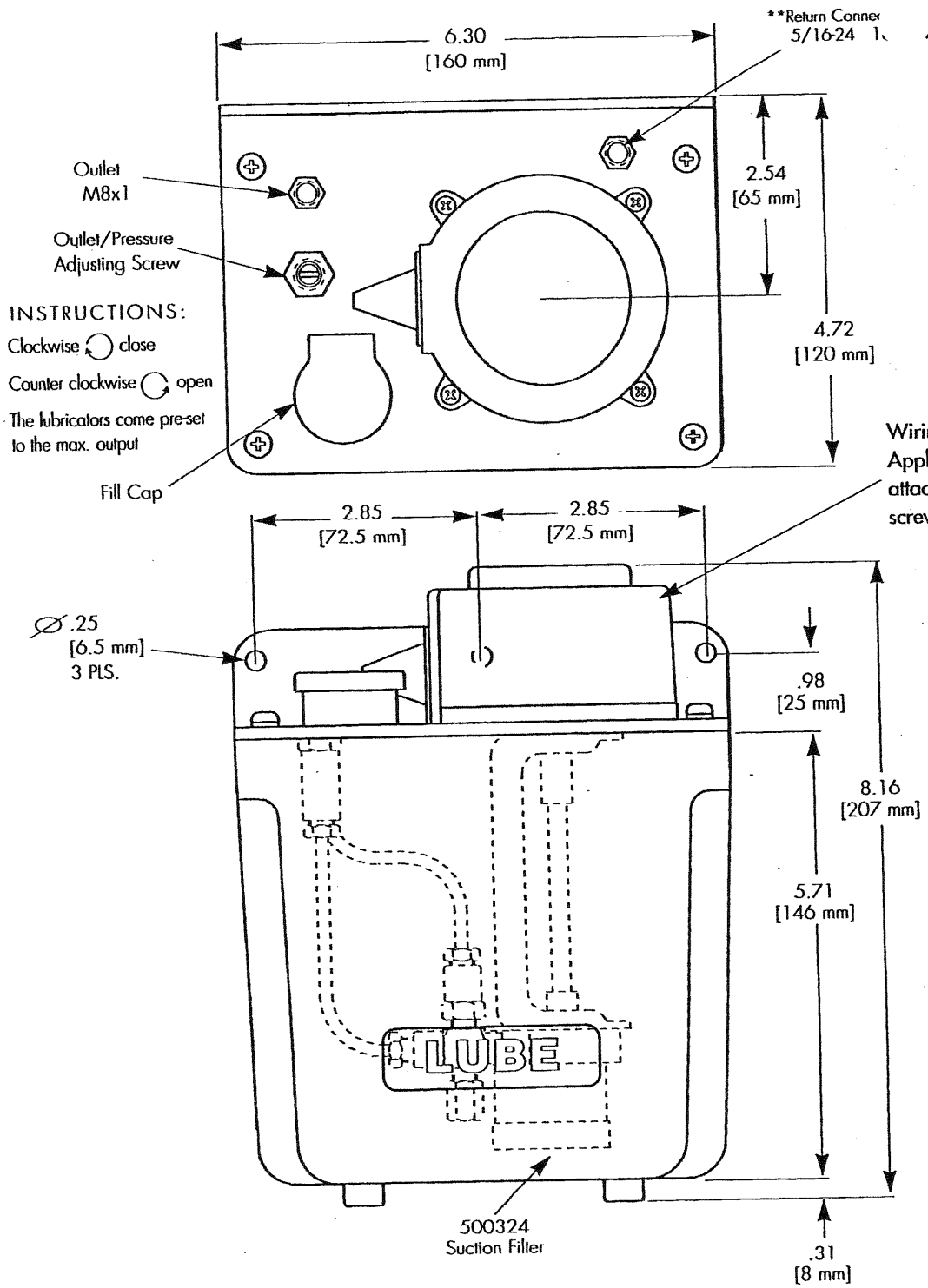
APPLICATIONS:

- Small precision machine tools
- All types of production & industrial machines
- Anywhere automatic & accurate lubrication is needed

LUBE USA
781 Congaree Rd., Greenville, SC 29607
1-800-326-3765 • TEL 864-297-3950 • FAX 864-242-1652

Form #0008
1/96
REV. 1

AMS CONTINUOUS



PART NUMBER SELECTION

	1.5 cc/min.		3.0cc/min.	
	Oil Level Switch		Oil Level Switch	
Voltage	With	Without	With	Without
100/110 VAC	102443	102441	102447	102445
			**102452	
200/220 VAC			102408	

*Optional 3, 4 & 8 liter reservoirs available

**Equipped with recirculating adapter, outlet & return connections are 5/16-24 female threads

SPECIFICATIONS

TYPE	AMS-1.5	AMS-3
Discharge Pressure	113 PSI (8 Kg/cm²) relief valve set pressure	
Max. Discharge Volume (adjustable)	1.25 cc/min (50 HZ) 1.5 cc/min (60 HZ)	2.5 cc/min (50 HZ) 3.0 cc/min (60 HZ)
Motor	Synchronous Motor Single Phase	
Voltage	100/110 VAC 200/220 VAC	
Output	3 Watts	
Current	100/110 VAC	200/220 VAC
	50 mA (50 HZ) 42 mA (60 HZ)	25 mA (50 HZ) 18 mA (60 HZ)
RPM	10/12 RPM clockwise	
Oil Level Switch	max volt 200 VAC/VDC contact point rating: 30W Resistance load (auxiliary relay required)	
*Reservoir	1.8 liter (2 qt) Acetate material	
Working Oil Viscosity	30-1500 cst	

LUBE USA

781 Congaree Rd., Greenville, SC 29607
1-800-326-3765 • TEL 864-297-3950 • FAX 864-242-1652

GlobalTRAN B

MICRON

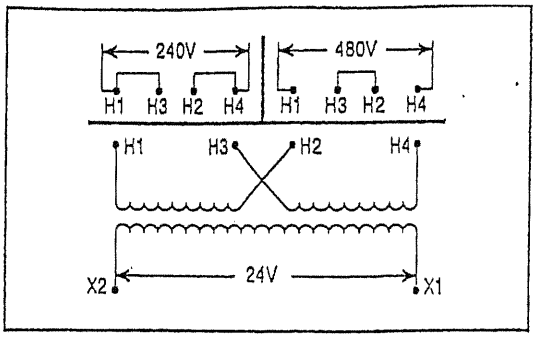
Primary Volts

240 x 480

Secondary Volts

24

CE Mark UL Listed and CSA Certified 50 / 60 Hz



VA Rating	Catalog Number	Output Amps	DIMENSIONS (inches) • mm A	B	C	D	E	Mounting Slots	Approx. Wt. (lbs.) • kg
50	B050-0011-GA	2.08	3 1/4 •83	3 •76	3 •76	2 1/4 •57	2 1/2 •64	.203x.460 (5.1x11.7)	3.4 • 1.6
75	B075-0012-GA	3.13	3 1/2 •83	3 3/8 •86	3 1/4 •83	2 1/4 •57	2 13/16 •71	.203x.460 (5.1x11.7)	4.2 • 1.9
100	B100-0013-GA	4.17	3 5/8 •92	3 3/4 •95	3 1/2 •89	2 1/2 •64	3 1/8 •79	.203x.460 (5.1x11.7)	5.9 • 2.7
150	B150-0014-GA	6.25	4 •102	4 1/2 •114	4 •102	2 1/2 •64	3 3/4 •95	.203x.460 (5.1x11.7)	8.5 • 3.9
200	B200-0015-GA	8.33	4 3/8 •111	4 1/2 •114	4 •102	2 13/16 •71	3 3/4 •95	.203x.460 (5.1x11.7)	10.0 • 4.6
250	B250-0016-GA	10.42	4 3/4 •121	4 1/2 •114	4 •102	3 3/16 •81	3 3/4 •95	.203x.460 (5.1x11.7)	11.3 • 5.1
300	B300-0017-GA	12.50	5 1/8 •130	4 1/2 •114	4 •102	3 3/4 •95	3 3/4 •95	.203x.460 (5.1x11.7)	13.2 • 6.0
350	B350-0018-GA	14.58	5 •127	5 1/4 •133	4 1/2 •114	3 3/4 •95	4 3/8 •111	.312x.687 (8x17.5)	14.9 • 6.8
500	B500-0019-GA	20.83	5 1/2 •140	5 1/4 •133	4 1/2 •114	4 1/4 •108	4 3/8 •111	.312x.687 (8x17.5)	19.2 • 8.7
750	B750-0020-GA	31.25	7 •178	5 1/4 •133	4 1/2 •114	5 3/8 •137	4 3/8 •111	.312x.687 (8x17.5)	28.1 • 12.8

GA suffix denotes transformer supplied with SafeTouch terminal covers installed. No integral fusing capability.

GlobalTRAN C

MICRON

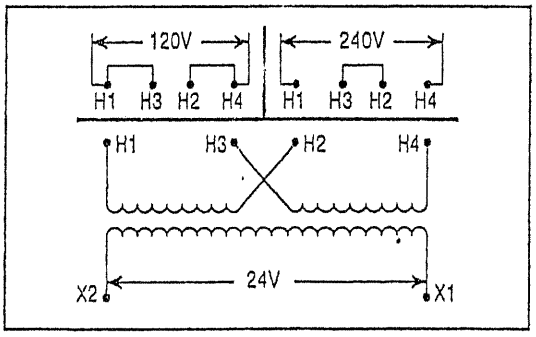
Primary Volts

120 x 240

Secondary Volts

24

CE Mark UL Listed and CSA Certified 50 / 60 Hz



VA Rating	Catalog Number	Output Amps	DIMENSIONS inches • mm A	B	C	D	E	Mounting Slots	Approx. Wt. (lbs.) • kg
50	B050-0021-GA	2.08	3 1/4 •83	3 •76	3 •76	2 1/4 •57	2 1/2 •64	.203x.460 (5.1x11.7)	3.4 • 1.6
75	B075-0022-GA	3.13	3 1/4 •83	3 3/8 •86	3 1/4 •83	2 1/4 •57	2 13/16 •71	.203x.460 (5.1x11.7)	4.2 • 1.9
100	B100-0023-GA	4.17	3 5/8 •92	3 3/4 •95	3 1/2 •89	2 1/2 •64	3 1/8 •79	.203x.460 (5.1x11.7)	5.9 • 2.7
150	B150-0024-GA	6.25	4 •102	4 1/2 •114	4 •102	2 1/2 •64	3 3/4 •95	.203x.460 (5.1x11.7)	8.5 • 3.9
200	B200-0025-GA	8.33	4 3/8 •111	4 1/2 •114	4 •102	2 13/16 •71	3 3/4 •95	.203x.460 (5.1x11.7)	10.0 • 4.6
250	B250-0026-GA	10.42	4 3/4 •121	4 1/2 •114	4 •102	3 3/16 •81	3 3/4 •95	.203x.460 (5.1x11.7)	11.3 • 5.1
300	B300-0027-GA	12.50	5 1/8 •130	4 1/2 •114	4 •102	3 3/4 •95	3 3/4 •95	.203x.460 (5.1x11.7)	13.2 • 6.0
350	B350-0028-GA	14.58	5 •127	5 1/4 •133	4 1/2 •114	3 3/4 •95	4 3/8 •111	.312x.687 (8x17.5)	14.9 • 6.8
500	B500-0029-GA	20.83	5 1/2 •140	5 1/4 •133	4 1/2 •114	4 1/4 •108	4 3/8 •111	.312x.687 (8x17.5)	19.2 • 8.7
750	B750-0030-GA	31.25	7 3/8 •187	5 1/4 •133	4 1/2 •114	5 3/4 •146	4 3/8 •111	.312x.687 (8x17.5)	29.8 • 13.6

GA suffix denotes transformer supplied with SafeTouch terminal covers installed. No integral fusing capability.

IEC Overcurrent Protection - Primary

ACCEPTABLE RATING OF PRIMARY OVERCURRENT PROTECTION

Primary Voltage	VA Rating 50	75	100	150	200	250	300	350	500	750
115	2.0	2.0	4.0	4.0	6.0	6.0	8.0	10.0	12.0	20.0
120	2.0	2.0	4.0	4.0	6.0	6.0	8.0	10.0	12.0	20.0
200	1.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0	8.0	12.0
208	1.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0	8.0	12.0
220	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0	6.0	10.0
230	1.0	1.0	2.0	4.0	4.0	4.0	4.0	6.0	6.0	10.0
240	1.0	1.0	2.0	4.0	4.0	4.0	4.0	4.0	6.0	10.0
277	0.5	1.0	1.0	2.0	4.0	4.0	4.0	4.0	6.0	8.0
380	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0	6.0	6.0
400	0.5	0.5	1.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0
415	0.5	0.5	1.0	1.0	2.0	4.0	4.0	4.0	4.0	6.0
440	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0	6.0
460	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0	6.0
480	0.5	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	6.0
550	0.5	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0
575	0.5	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0
600	0.5	0.5	0.5	1.0	1.0	2.0	2.0	4.0	4.0	4.0

Protection Index - IP00. Protection Index with supplied terminal covers attached to primary, secondary and fuse block terminals is IP-20. Fuses 10x38 mm (13/32"x1 1/2) Time-lag IEC 269

IEC Overcurrent Protection - Secondary

ACCEPTABLE RATING OF SECONDARY OVERCURRENT PROTECTION

Secondary Voltage	VA Rating 50	75	100	150	200	250	300	350	500	750
23	2.50	4.00	5.00	8.00	10.00	12.00	16.00	16.00	25.00	
24	2.50	4.00	5.00	8.00	10.00	12.00	16.00	16.00	25.00	32.00
25	2.50	4.00	5.00	8.00	10.00	12.00	16.00	16.00	25.00	32.00
90	0.63	1.00	1.25	2.00	2.50	3.15	4.00	4.00	6.30	10.00
95	0.63	0.80	1.25	1.60	2.50	3.15	4.00	4.00	6.30	8.00
100	0.50	0.80	1.00	1.60	2.00	2.50	3.15	4.00	5.00	8.00
110	0.50	0.80	1.00	1.60	2.00	2.50	3.15	4.00	5.00	8.00
115	0.50	0.80	1.00	1.60	2.00	2.50	3.15	3.15	5.00	8.00
120	0.50	0.63	1.00	1.25	2.00	2.50	2.50	3.15	5.00	6.30
220	0.25	0.40	0.50	0.80	1.00	1.25	1.60	1.60	2.50	4.00
230	0.25	0.40	0.50	0.80	1.00	1.25	1.60	1.60	2.50	4.00
240	0.25	0.315	0.50	0.63	1.00	1.25	1.25	1.60	2.50	3.15

Miniature fuses 5x20 mm time-lag (IEC 127-2/III). For values over 6.3A use 10x38 mm time lag (IEC 269-3-1).

GlobalTRAN Accessories

GLOBALTRAN FUSING OPTIONS

The standard GlobalTRAN product is supplied with no integral fusing capability due to differences in the physical size of the fuses for either domestic or European applications. Should "K" secondary fuse clips for a 13/32 x 1½ fuse and/or primary class cc fusing capability be required, make the part number modification shown below. The appropriate SafeTouch terminal covers are installed on the primary fuse block as well as the fused and unfused transformer terminals.

Description	Change P/N Suffix From	To
Install "K" secondary fuse clips *(Not applicable for Group E transformers or 750VA units of Group B, C, or G)*	GA	GF
Install class cc primary fuse block	GA	GK
Install "K" clips and primary block	GA	GG

PRIMARY FUSE KIT

A primary fuse kit is available for GlobalTRAN for field installation. The primary fuse kit includes a 2-pole class cc fuse block, instructions, and all associated mounting and wiring hardware. Additionally, this fuse kit will fit most competitors' units. To order this kit, use catalog number FKTP-1001. The primary fuse kit, when installed, will add a maximum of 11/16" to the transformer "A" dimension and 1 15/16" to the "C" dimension.

TERMINAL COVERS

The standard GlobalTRAN product is supplied with terminal covers installed. To order GlobalTRAN without covers, make the appropriate part number modifications shown below.

Description	Change P/N Suffix From	To
Standard unit	GA	GB
Unit with secondary fuse clips only	GF	GC
Unit with primary fusing only	GK	GD
Unit with primary and secondary fusing	GG	GJ

To order terminal and fuse block cover kits separately, see SafeTouch Terminal Covers on page 28.

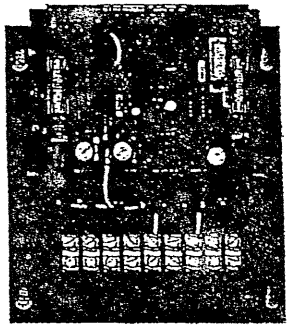
KBMM™* Solid State DC Motor Speed Control

Installation and Operating Instructions**

* Patented

** See Safety Warning on Page 2.

Basic KBMM™



KBMM mounted on KB Auxiliary Heatsink and with Barrier Terminal Kit

Dial Plate & Knob (Optional)

5K Speed Potentiometer (Included)

PENTA KB POWER

A COMPLETE LINE OF SCR DRIVES

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SAFETY WARNING—PLEASE READ CAREFULLY

This product should be installed and serviced by a qualified technician, electrician or electrical maintenance personnel familiar with its operation and the hazards involved. Proper installation (see instruction information which accompanies product), which includes wiring, mounting in proper enclosure, fusing or other overcurrent protection and grounding, can reduce the chance of electric shocks, fires or explosion in this product or products used with this product, such as electric motors, switches, coils, solenoids and/or relays. Eye protection must be worn when working with control under power. This product is constructed of materials (plastics, metals, carbon, silicon, etc.) which may be a potential hazard. Individual material safety data sheets (MSDS) are available upon request. Proper shielding, grounding and filtering of this product can reduce the emission of radio frequency interference (RFI) which may adversely affect sensitive electronic equipment. If information is required on this product, contact our factory. It is the responsibility of the equipment manufacturer and individual installer to supply this safety warning to the ultimate user of this product. (SW effective 3/88).

IMPORTANT

You must read these simplified instructions before operating control.

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

TABLE 1: NOMINAL TRIMPOT SETTINGS For detailed instructions see Sec. III

MIN (minimum speed):	15%	CL (current limit/torque):	65%
MAX (maximum speed):	65%	ACCEL (acceleration start):	20%
IR (IR compensation):	25%	DECEL (deceleration):	20%

TABLE 2. ELECTRICAL RATINGS

MODEL NUMBER	AC LINE VOLTAGE (VAC)**	MOTOR VOLTAGE (VDC)	RATING WITHOUT AUXILIARY HEATSINK			RATING WITH AUXILIARY HEATSINK		
			AC LOAD CURRENT (RMS AMPS)	DC LOAD CURRENT (AVG. AMPS)	MAX. HP	AC LOAD CURRENT (RMS AMPS)	DC LOAD CURRENT (AVG. AMPS)	MAX. HP
KBMM-125	120	90-130	12.0	8.0	¾	24.0	16.0	1½
KBMM-225	240	180	12.0	8.0	1½	24.0	16.0	3
KBMM-225D*	120/240	90/180	12.0	8.0	1½	24.0	16.0	3

*Model KBMM-225D is wired at the factory for 120 VAC input and 90VDC output. It can be converted to 240VAC input for use with 180VDC or 90VDC motors (see page 9 for full 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
Load regulation—armature feedback (0-full load, 50:1 speed range) (% base speed)	1*
Load regulation—tachometer feedback (0-full load, 50:1 speed range) (% set speed)	1*
Line voltage regulation—armature feedback (at full load, ±10% line variation(% base speed)	½*
Line voltage regulation—tachometer feedback (at full load, ±10% line variation) (% set speed)	½*
Control linearity (% speed vs. dial rotation)	2
CL/torque range (% full load)	0-200
Accel time range (0-full speed) (secs.)	.2-10
Decel time range (full-0 speed) (secs.)	.2-10
Min. speed trimpot range (% full speed)	0-30*
Max. speed trimpot range (% full speed)	50-110*
IR compensation trimpot range (at specified full load) (volts)	0-24
Maximum allowable ambient temperature at full rating (°C/°F)	45/113
Tachometer feedback input volts (per 1000 RPM) (VDC)	7/50

*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-150% 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).

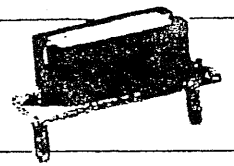


TABLE 4, PLUG-IN HORSEPOWER RESISTOR® CHART*

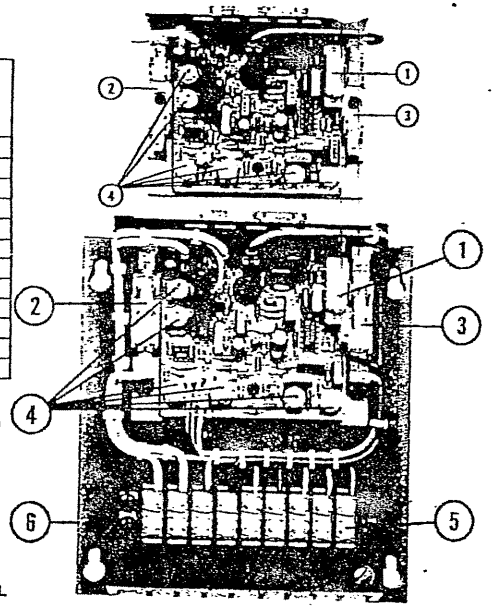
MOTOR HORSEPOWER RANGE**		Plug-in Horsepower Resistor* Resistance Value (Ohms)	KB P/N
Armature Voltage 90-130V DC	Armature Voltage 180V DC		
1/100-1/50	1/50-1/25	1.0	9833
1/50-1/30	1/25-1/15	.51	9834
1/30-1/20	1/15-1/10	.35	9835
1/20-1/12	1/10-1/6	.25	9836
1/12-1/8	1/6-1/4	.18	9837
1/8-1/5	1/4-1/3	.1	9838
1/4	1/2	.05	9839
1/3	3/4	.035	9840
1/2	1	.025	9841
3/4	1-1/2	.015	9842
1***	2***	.01	9843
1-1/2***	3***	.008	9850

*Motor horsepower and armature voltage must be specified when ordering so that proper resistor will be supplied.
**For overlapping motor horsepower range use lower value Plug-In Horsepower Resistor.
*** Auxiliary heatsink 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) Trimpots: MIN, MAX, IR, CL, ACCEL & DECEL
(5) Barrier Terminal Accessory Kit (optional)
(6) Auxiliary Heatsink (optional)

BASIC KBMM™



KBMM™ mounted on KB Auxiliary Heatsink (optional) and with Barrier Terminal Kit (opt.)

INTRODUCTION

The KBMM™ Full Wave Solid State DC Motor Speed Control rep...nts the latest state-of-t design achievable through modern technology.

Features Include:

- *Integrated Circuitry*
  Used to control and amplify command and reference levels with both closed and open loop back to provide superior motor regulation. (Speed changes due to load, line voltage, or tempe 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
- *High Reliability*
  When used in accordance with the instructions included in this manual, the KBMM™ will pr 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 D.C. m Controls operated on 120 volt AC inputs are designed for 90 volt SCR rated motors. Controls ope on 240 volt AC inputs are designed for 180 volt SCR rated motors. Use of higher voltage m will result in degradation of full speed performance. Also, if motor is not an SCR rated type, the a 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 co consideration must be given to the maximum torque requirements. The full load torque rati 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 a the motor to smoothly accelerate from 0-full speed over a time period of .2-10 seconds. The "AC 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 Se

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

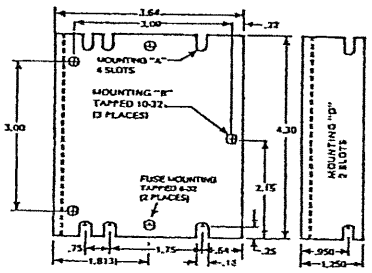
CAUTION: Be sure the KBMM™ is used within its max. ratings. Follow all installation instructions carefully. (Refer to Sectio

SECTION II. INSTALLATION INSTRUCTIONS

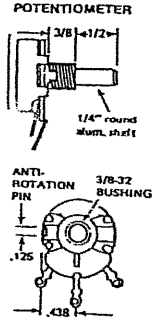
A. *Location and Mounting.* The KBMM™ controls should be mounted on a flat surface and located in an area where it will not be exposed to contaminants such as water, metal chips, solvents or excessive vibration.

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.

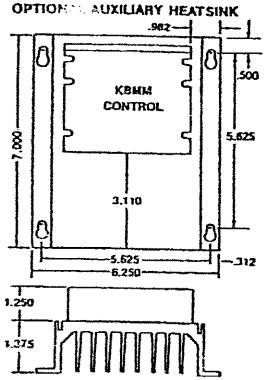
MECHANICAL SPECIFICATIONS



POTENTIOMETER



OPTIONAL AUXILIARY HEATSINK



B. *Initial Setup and Wiring*

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 AC input voltage corresponds to the control voltage rating and the motor rating (e.g. 90-130VDC motor on 120VAC and 180VDC 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.

TABLE 5. MINIMUM SUPPLY WIRE SIZE REQUIREMENTS

MAX. MOTOR AMPS (DC AMPS)	MAX. MOTOR HP 90V	MAX. MOTOR HP 180V	MINIMUM WIRE SIZE (AWG) Cu Only	
			MAX. 50 FOOT RUN	MAX. 100 FOOT RUN
6.0	½	1	16	14
12.0	1	2	14	12*
16.0	1½	3	12	12

*Maximum recommended wire size.

CONNECTION DIAGRAMS

Fig. 3a. Basic KBMM Connection Diagram

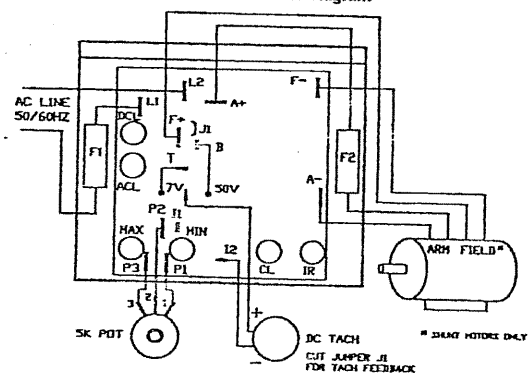
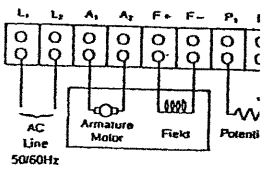


Fig. 3b. KBMM w/Barrier Termin



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

(1) For tach feedback, cut jumper J1 on Printed Circuit Board. (Note: On Model KBMM-225, J1 is an 82K resistor)

(2) Connect tach as follows:

(a) 7 volts/1000 RPM Connect (+) lead to Terminal "T"
Connect (–) lead to Terminal I_2 or F–

(b) 50 volts/1000 RPM Connect (+) lead to Terminal "B"
Connect (–) lead to Terminal I_2 or F–

Note: Set IR Comp to minimum for tach 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)	Modification Required
120	90	None—Factory wired
240	90	Remove one R17 resistor (8.2K)
240	180	Remove one R17 resistor (8.2K) and one R19A resistor (120K)*

*If tachometer feedback is used, do not remove resistor R19A (120K) and follow tachometer connection instructions.

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

Note: (Shunt motors only) For 90 Volt dc motors with 50VDC fields and 180 Volt dc motors with 100VDC fields use half voltag field connections F+ and L_1.

CAUTION: Do not bundle potentiometer connections (P_1, P_2, P_3) and Inhibit* connections (I_1, I_2) with AC line or motor wire

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

C. *Voltage Following.* All models can be controlled with an isolated analog reference voltage (0-9VI in lieu of the main speed potentiometer. The voltage is connected to P_2(+) and F–. The control outp voltage will linearily follow the input voltage. The source impedance of the input should be 10K oh or less. The Min trimpot can be used to provide an offset speed. If an offset is not required adj the Min to 0+ or 0– speed as desired. The Max trimpot is rendered inoperative in the voltage followi mode. Use auxiliary trimpot to limit the control range. If the input signal is not isolated, or is a curr signal (4-20ma), the KBSI-240D Signal Isolator must be used. It will allow direct connection to p cess controllers and microprocessors.

CAUTION: 1. The voltage feeding P_2 and F– must be isolated from the AC line. Do not ground P_2 or F– to set up a zer or ground reference.
2. Do not bundle signal wires to P_2 and F– with AC line or motor connections. If signal wires are over 18", us shielded cables.

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

1. *AC Line Fuse* is chosen according to the maximum rating of the control:
12 Amp fuse for all motors up to ¾ HP-90V and 1½ HP-180VDC.
25 Amp fuse for all motors 1 and 1½ HP-90V and 2 and 3 HP-180VDC.
(Use Buss ABC, Litt. 326 ceramic fuse or equivalent.)
2. *Armature Fuse* can be chosen in accordance with the fuse chart. Note: The 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 MOTOR	180VDC MOTOR	APPROX. DC MOTOR CURRENT (AMPS)	FUSE RATING (AC AMPS)
HORSEPOWER			
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	1/4	1.3	2
1/6	1/3	1.7	2-1/2
1/4	1/2	2.5	4
1/3	3/4	3.3	5
1/2	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.

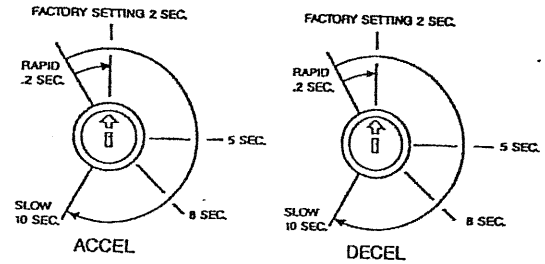
NOTE: In order for the IR comp and CL trimpot settings to be correct, the proper Plug-in Horsepower Resistor® must be installed for the particular motor and input voltage being used. Do not attempt to change the settings of the trimpots unless absolutely necessary since they are factory adjusted to near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

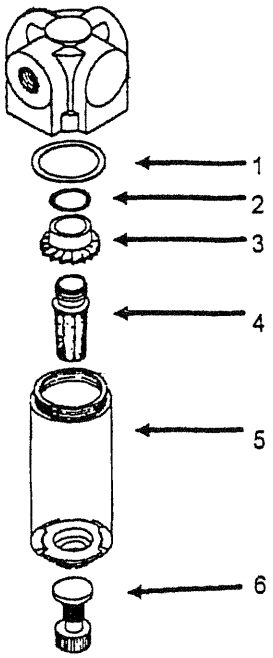
The following procedure, presented in order of adjustment sequence, should be used when readjusting all trimpot functions:

Fig. 4 ACCEL/DECEL TRIMPOT ADJUSTMENT

CAUTION!

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



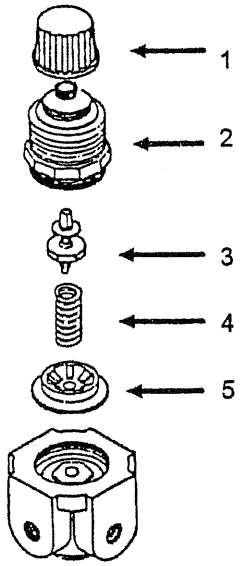


FILTERS — F300-01, F300-02

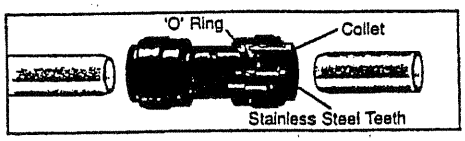
ID#	Kit Description	Part #	Contents
2, 3, 4	Element Kit	EKF300	Vane, O-Ring, 20 Micron Element
1, 5, 6	Bowl Kit	BKF300	Bowl Gasket, Plastic Bowl, Drain Valve
Not Shown		BKF300M	Bowl Gasket, Metal Bowl, Drain Valve
Not Shown		BKF300J	Bowl Gasket, Plastic Bowl, Overnight Drain
Not Shown	Piston Drain Kit	PKF300	Piston Drain, Drain Valve

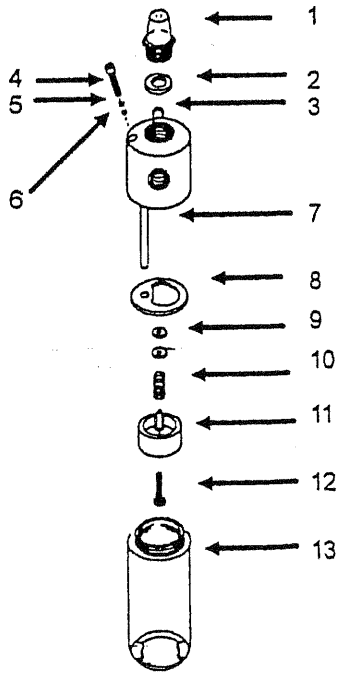
REGULATORS — 2612, R161, R162, R242, R261, R262, R342, R361, R362

ID#	Kit Description	Part #	Contents
1, 2, 3	Spring Cage Repair Kit	RB260	Cap, Spring Cage Adj. Screw Assembly
4	Adjust Spring Kit	SK260	Adj. Spring 2-125
		SK260L	Adj. Spring 2-60
		SK260I	Adj. Spring 2-20
5	Relieving Diaphragm Kit	RK260	Relieving Diaphragm
	Non-Relieving Diaphragm Kit	RK260N	Non-Relieving Diaphragm
	Water Service		



Cut the tube square. It is essential that the outside diameter be free of score marks and that burrs and sharp edges be removed before inserting into fitting.





LUBRICATORS — 1811, 1812

ID#	Kit Description	Part#	Contents
1, 2	Sightglass Repair Kit	SG1812	Sightglass, Gasket
3, 4, 5, 6, 7, 8, 9, 10, 11, 12	Lubricator Repair Kit	RK1812	Tube, Adj. Screw, O-Ring, Ball Check, Dip Tube, By-Pass Housing Gasket, Washers, Spring, By-Pass Housing, Screw
13	Bowl Assembly Kit	BK1811	Polycarbonate Bowl with Bowl Gasket
Not Shown		BK1811M	Metal Bowl with Bowl Gasket and Drain Valve

OPTI torque

MAYR CORPORATION
4 North Street • Waldwick, NJ 07463
Tel: (201) 445-7210 • Fax: (201) 445-8019

Installation

Mounting drive elements:

The drive element (sprocket, pulley, gear, etc.) is bolted to the output flange of the OPTI torque before installing on the shaft. The support required for the drive element is dependent upon which hub configuration is selected, and the drive element itself.

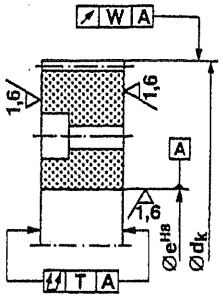
Standard hub (page 5): A narrow drive element, i.e.: an "A-plate" sprocket, is bolted to the output flange and supported directly on the hub. This arrangement is not recommended for applications with high radial loads or frequent overloads.

Extended hub (page 5): For wider drive elements, the drive element is bolted to the output flange. Support of the drive element is either by a customer provided bearing or bushing, or one that is integral to the OPTI torque, as in the models 460.---.2 and 460.---.5.

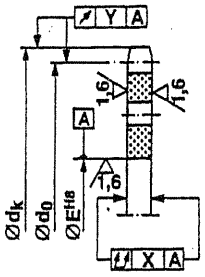
It is essential to ensure that no axial forces are applied to the output flange by the drive element, i.e. by misaligned belts or chains, or improper installation of the drive element.

Machining of drive elements

(surface finish given in µm; 1.6 µm = 63 µIN / 3.2 µm = 126 µIN)



for type 460.-1-.2



for type 460.-1-.0

Data for machining drive elements for OPTI torque

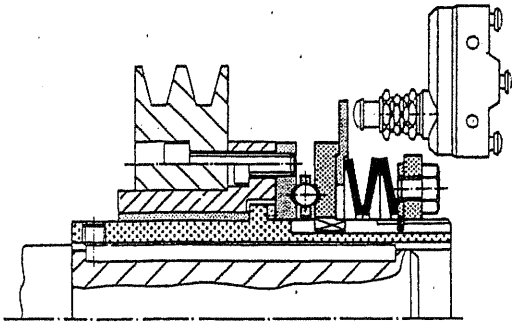
size	T		W		X		Y	
	in	mm	in	mm	in	mm	in	mm
0	.0019	0,05	.0019	0,05	.0039	0,1	.0059	0,15
1	.0019	0,05	.0019	0,05	.0039	0,1	.0059	0,15
2	.0019	0,05	.0019	0,05	.0039	0,1	.0059	0,15
3	.0031	0,08	.0031	0,08	.0059	0,15	.0078	0,2
4	.0031	0,08	.0031	0,08	.0059	0,15	.0078	0,2

single plate (A-plate) sprockets for OPTI torque

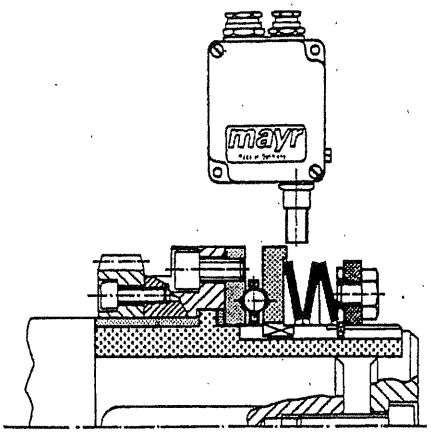
size of torque limiter	smallest possible number of teeth																								sprockets			
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	Pitch	RC #	width in	width mm
	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-2	0-2	0-2	0-2	3/8 "	35	.168	4,3
	-	-	-	-	-	0	0	0	0	0-1	0-1	0-1	0-1	0-1	0-2	0-2	0-2	0-2	0-2	0-2	0-3	0-3	0-3	0-3	0-4	1/2 "	40	.284	7,2
	-	-	0	0	0	0-1	0-1	0-1	0-1	0-2	0-2	0-2	0-2	0-2	0-3	0-3	0-3	0-3	0-4	0-4	0-4	0-4	0-4	0-4	0-4	5/8 "	50	.343	8,7
	0	0	0	0-1	0-1	0-1	0-2	0-2	0-2	0-2	0-3	0-3	0-3	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	3/4 "	60	.459	11,6
	0-1	0-1	0-1	0-2	0-2	0-2	0-3	0-3	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	1 "	80	.575	14,6
	0-2	0-2	0-2	0-3	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	0-4	1 1/4 "	100	.692	17,5

Installation on shaft

All OPTI torque hubs are bored and keyed through, and once installed on the shaft are typically held axially by means of a set screw, as shown in the figure below.



Preferably OPTI torque should be held on the shaft by means of a clamp plate, as shown in the figure below.

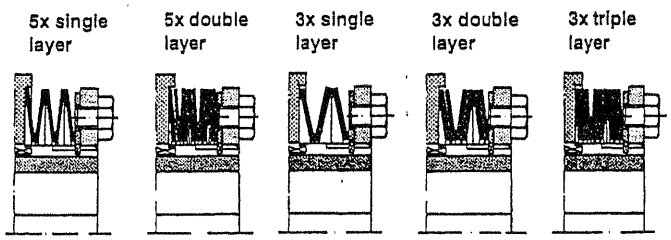


Disc spring layer configuration

Only the correct disc spring configuration guarantees that the torques mentioned in the catalogue can be achieved and that the torque can be adjusted without problems.
The disc spring configuration is different and depends on the size and type of the clutch.

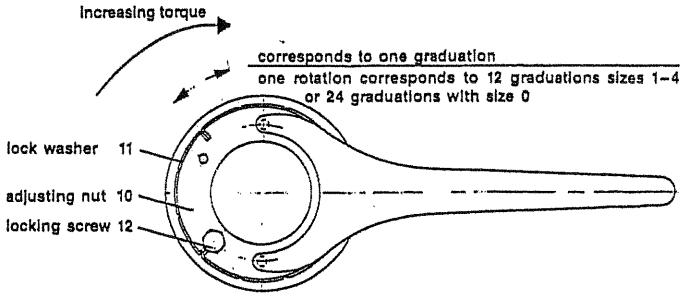
Size 0:
Type 46-.415.- 5x single layer
Type 46-.51-.- 5x single layer
Type 46-.61-.- 5x double layer
Type 46-.710.- 3x triple layer

Size 1- 4:
Type 46-.41-.- 3x single layer
Type 46-.51-.- 3x single layer
Type 46-.61-.- 3x single layer
Type 46-.710.- 3x double layer



Torque adjustment

The disengaging torque is set by turning the adjusting nut. Clockwise rotation of the adjusting nut (when viewed as shown) increases the torque setting, and counter- clockwise rotation decreases the torque setting.



Initial torque setting

Prior to initially setting the disengaging torque, check that the thread in the adjusting nut and hub, and contact surfaces of the adjusting nut and lockwasher have been greased. Then proceed as follows:

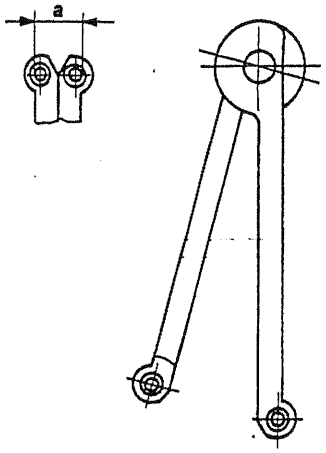
* Manually tighten the adjusting nut until it contacts the disc springs.
* Continue turning until the notches in lock washer are in line.
* Using a face wrench, tighten the adjusting nut the required number of graduations corresponding to the desired torque setting, as shown in the setting diagrams (see pages 10/11).
* When the notches in the adjusting nut and lock washer are again in line, the locking screw can then be installed.

Setting example

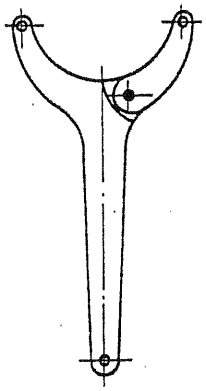
A size 3, type 4 _ _.610._ OPTI torque is to be set at 1500 lbs-in

From the setting diagram on page 10 the required number of graduations is 15. Following the above instructions, the adjusting nut is tightened 15 graduations.

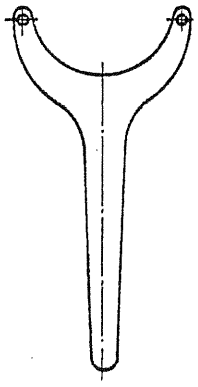
OPTI torque size	wrench Type
0	1
1	3
2	2
3	2
4	2



wrench 1 a = .386 [in]



wrench 2

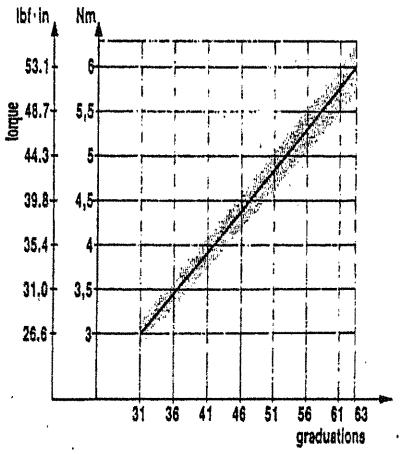


wrench 3

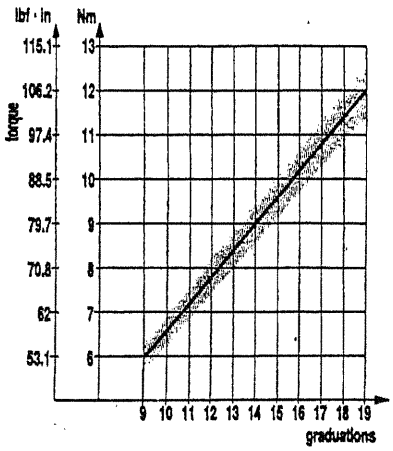
Torque setting diagrams for OPTI torque

multiple position clutches (setting tolerance ± 5%)

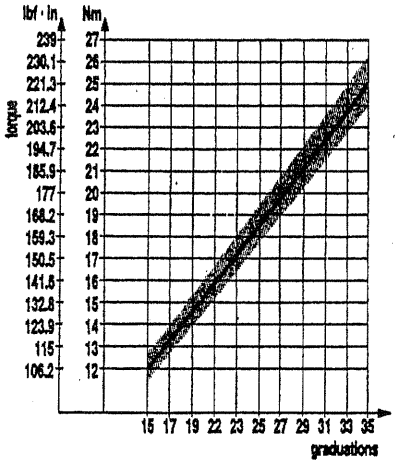
size 0 Type 46_.410._



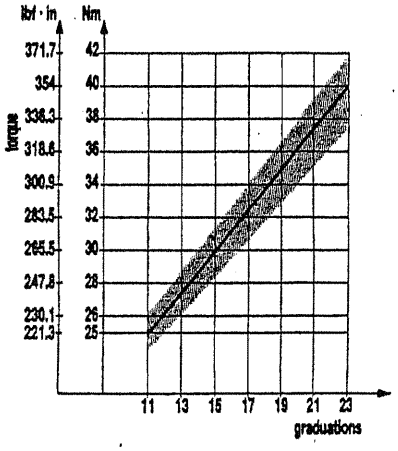
size 0 Type 46_.510._



size 0 Type 46_.610._

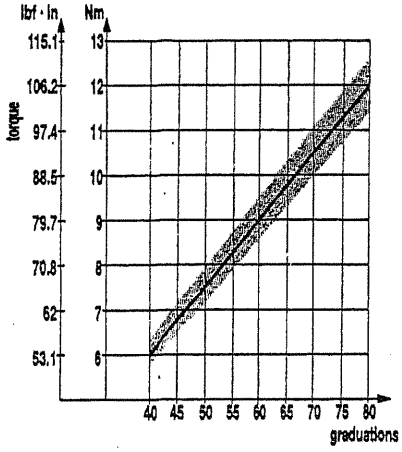


size 0 Type 46_.710._

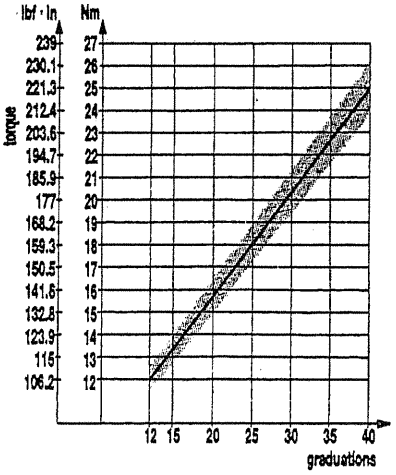


single position clutches (setting tolerance ± 5%)

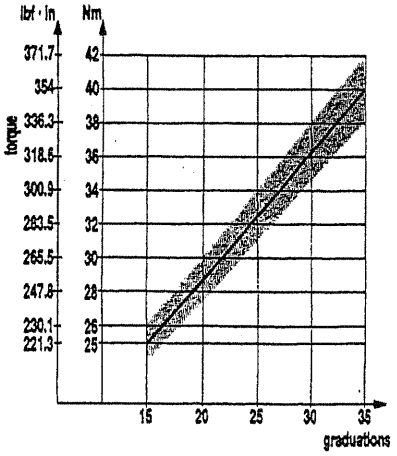
size 0 Type 46_.415._



size 0 Type 46_.515._



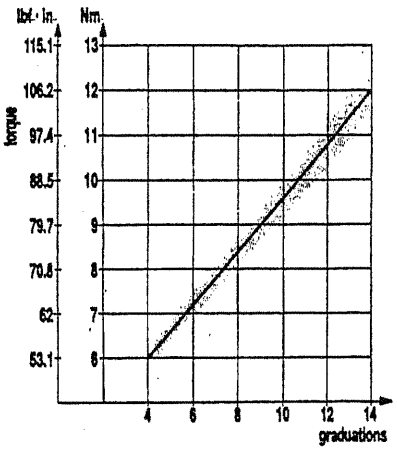
size 0 Type 46_.615._



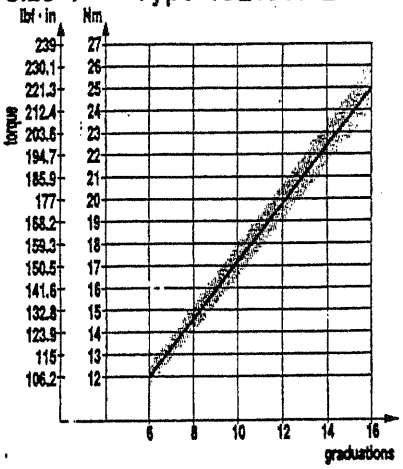
Torque setting diagrams for OPTI torque

multiple position clutches (setting tolerance ± 5%)

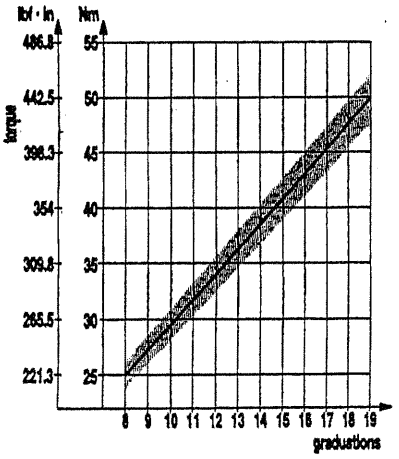
size 1 Type 46_.410._



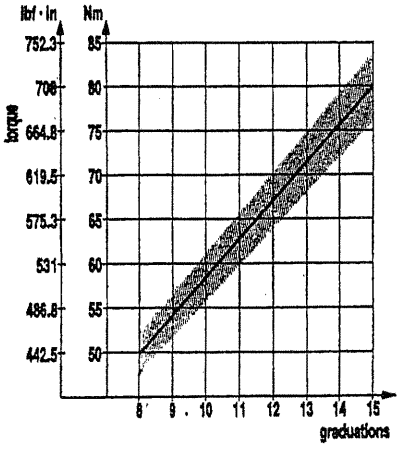
size 1 Type 46_.510._



size 1 Type 46_.610._

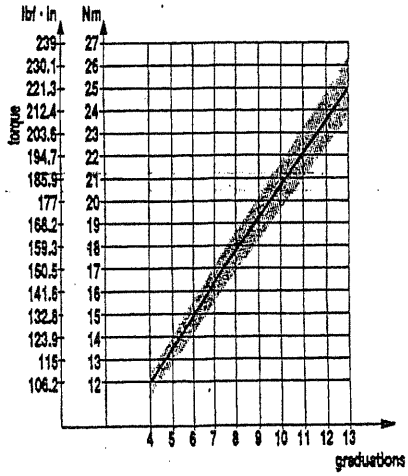


size 1 Type 46_.710._

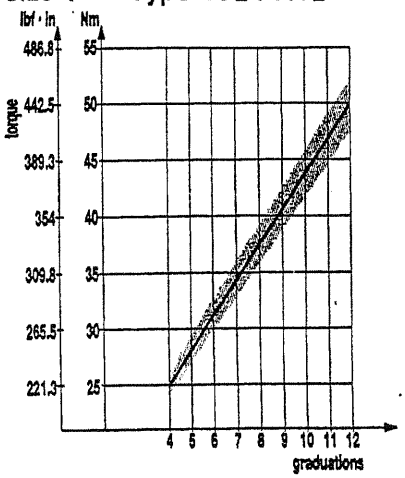


single position clutches (setting tolerance ± 5%)

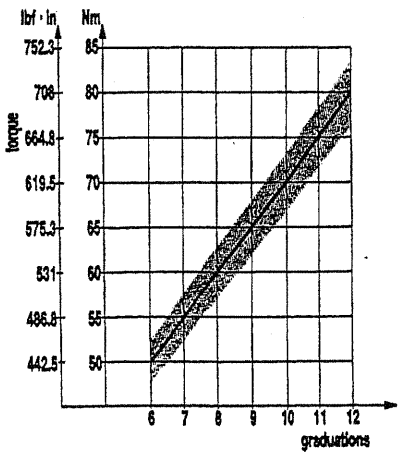
size 1 Type 46_.415._



size 1 Type 46_515._



size 1 Type 46_.615._

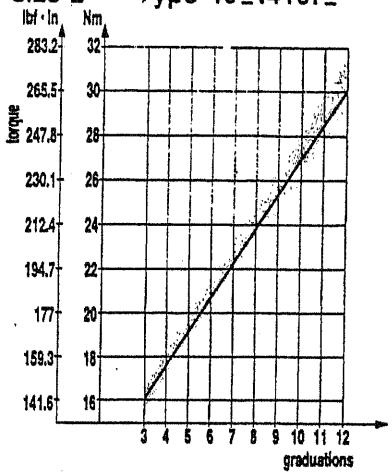


OPTI torque

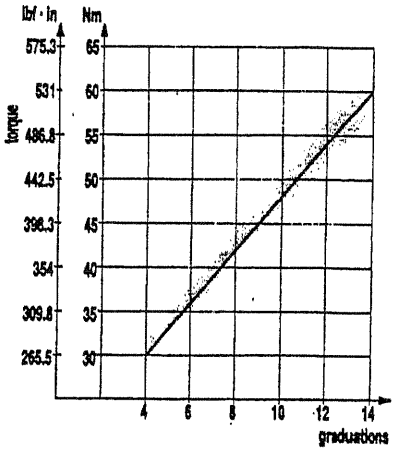
Torque setting diagrams for OPTI torque

multiple position clutches (setting tolerance ± 5%)

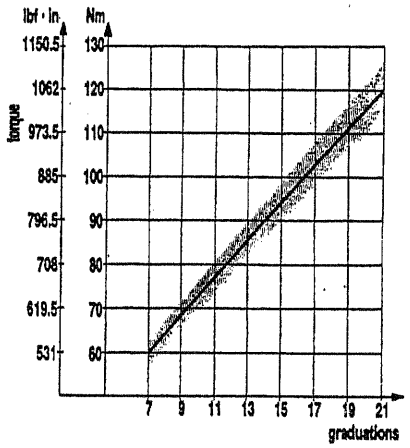
size 2 Type 46_.410._



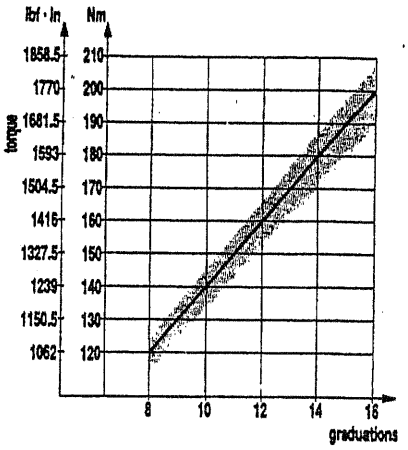
size 2 Type 46_.510._



size 2 Type 46_.610._

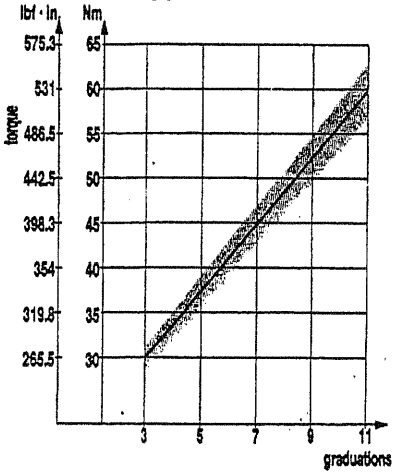


size 2 Type 46_.710._

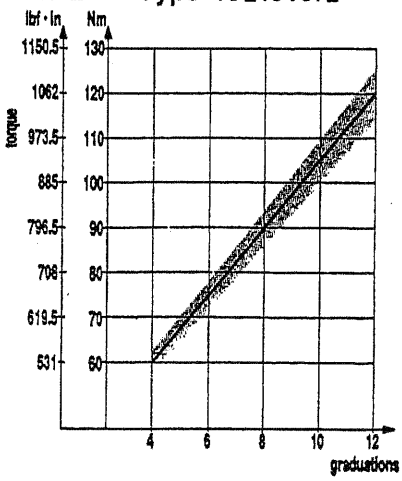


single position clutches (setting tolerance ± 5%)

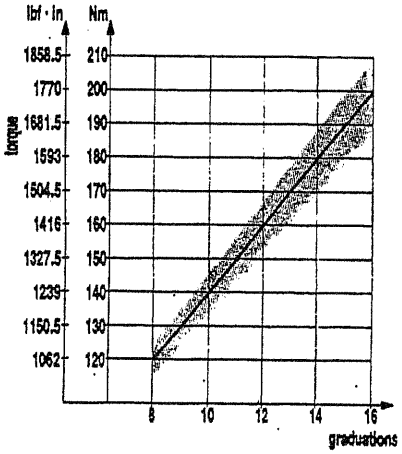
size 2 Type 46_.415._



size 2 Type 46_.515._



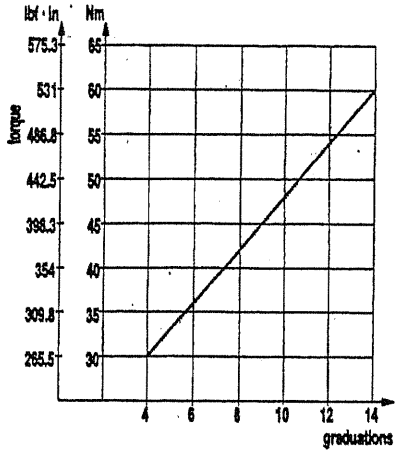
size 2 Type 46_.615._



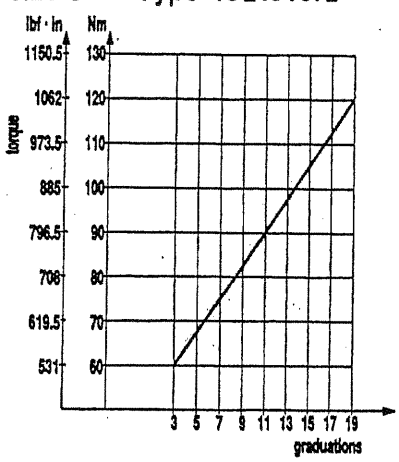
Torque setting diagrams for OPTI torque

multiple position clutches (setting tolerance ± 5%)

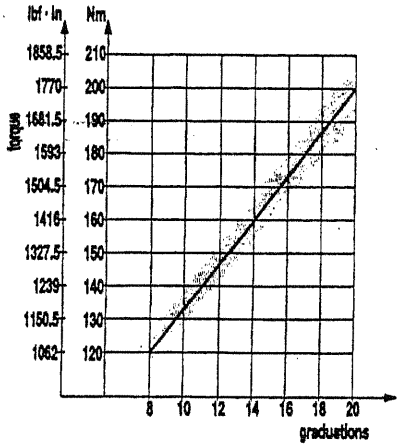
size 3 Type 46_.410._



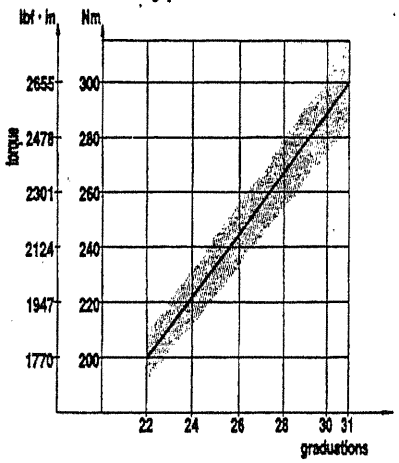
size 3 Type 46_.510._



size 3 Type 46_.610._

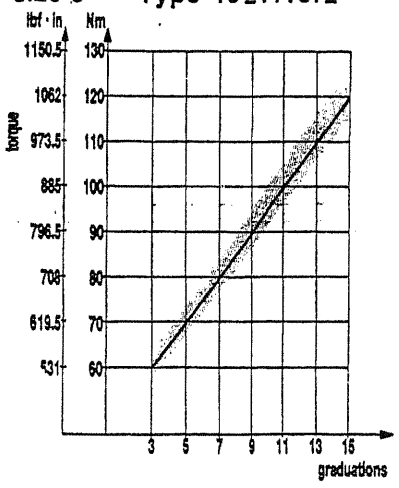


size 3 Type 46_.710._

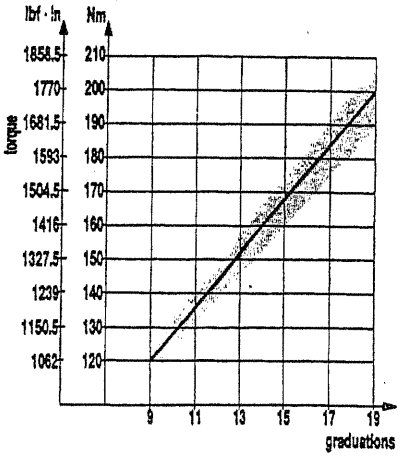


single position clutches (setting tolerance ± 5%)

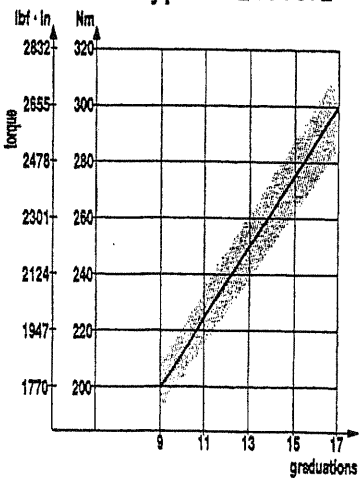
size 3 Type 46_.415._



size 3 Type 46_.515._



size 3 Type 46_.615._

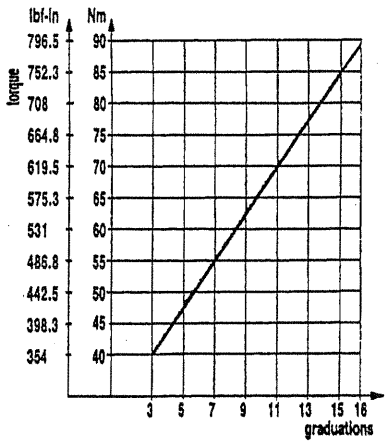


OPTI torque

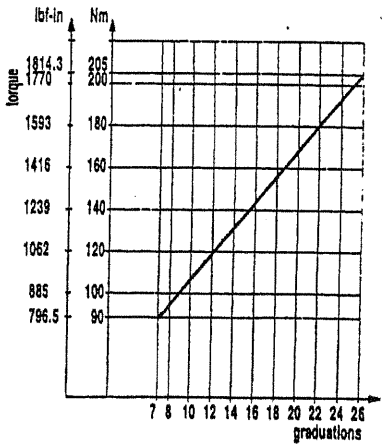
Torque setting diagrams for OPTI torque

multiple position clutches (setting tolerance ± 5%)

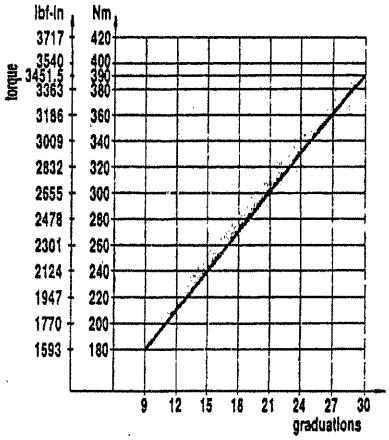
size 4 Type 46_.410._



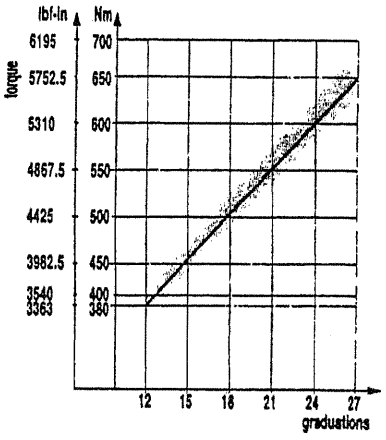
size 4 Type 46_.510._



size 4 Type 46_.610._

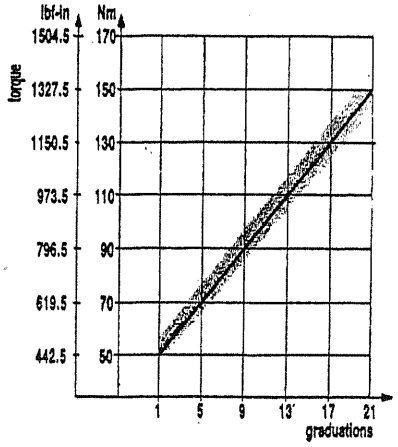


size 4 Type 46_.710._

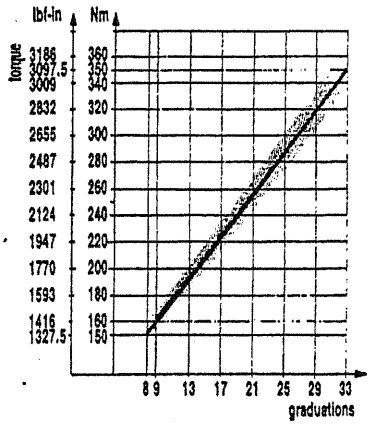


single position clutches (setting tolerance ± 5%)

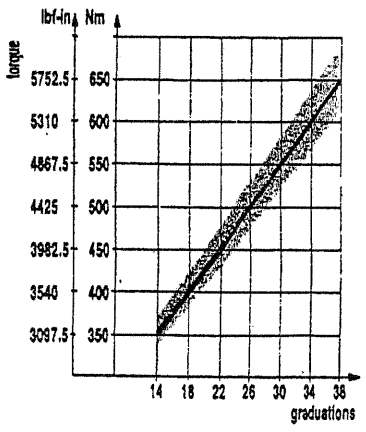
size 4 Type 46_.415._



size 4 Type 46_.515._

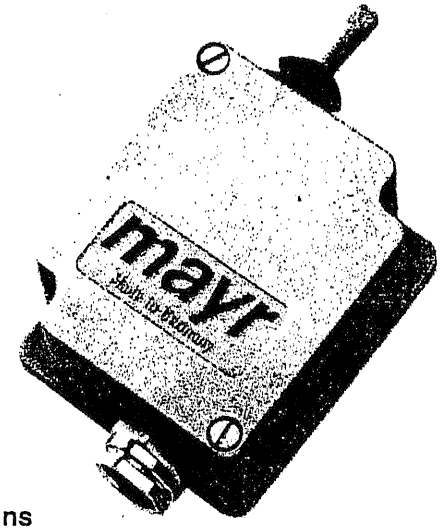


size 4 Type 46_.615._



Limit switch

- Potential free contact outputs
- Mechanical or contactless reading
- Enclosed designs
- Simple over point setting



Application

- Monitoring of mechanical movements and final positions.
- Control switch for electronical and mechanical sequences.
- In connection with EAS®-products:
  In the event of an overload the axial disengaging movement of the control element of the EAS®-clutch is monitored fast and precisely.
  The limit switch gives a signal to switch off the drive or for any other control function.

Designs

– Aluminium housing	Type 055.000.5
– Sea-water resistant version	Type 055.000.9
– Flameproof limit switch	Type 055.000.8
– Contactless limit switch internal transmitter external transmitter	 Type 055.002.5 Type 055.001.5

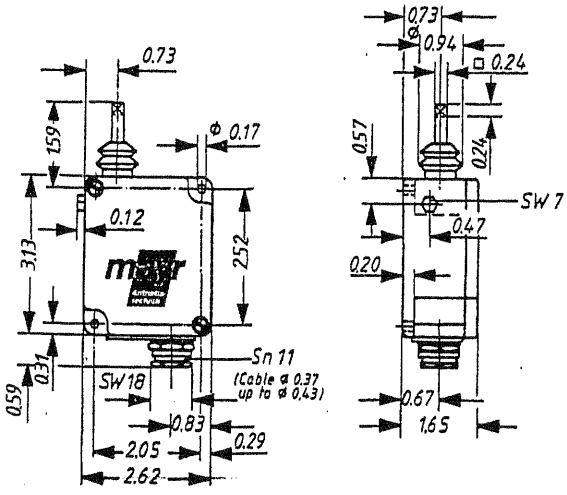
imit switch Type 055.000.5 - mechanical contact

Aluminium housing

Design

The micro switch fitted into an aluminium housing is actuated by a control lever.
Operation is only possible in one direction. The housing is mounted via two fastening brackets arranged diagonally with cap screws M4.

Dimensions (in in)



Function

By actuating the control lever the pre-tensioned micro switch is unloaded.

Zero shift

Possible zero shift to right and left max. 0.197 in. each by the hexagon head cap screw arranged laterally, wrench width 0.276 in.

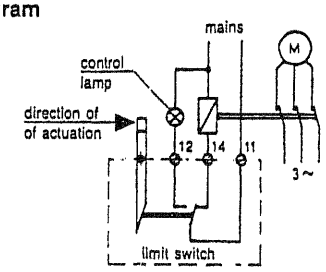
Switch lead 0.020 in
Switch lag 0.197–0.394 in., depending on the zero shift.

Technical data

1 x change over contact potential free

Contact load – resistive load –	max. 250 VAC/15A max. 24 VDC/6A max. 60 VDC/1,5A max. 250 VDC/0,2A
Protection	IP 54
Temperature range	– 10° C bis + 85° C
max. switching frequency	200 switchings/min.

Wiring diagram



Special Types (on request)

- Micro switch with 2 change over contacts
- Switch contacts, capable of bearing higher loads
- different switch lever lengths

LUBE USA — WARRANTY REGISTRATION

Please help us serve you better by taking a few moments to complete and return this registration. If you have any questions, require assistance installing or using this product, call 800-326-3765 or 864-297-3950

Date of Purchase_____ Model Purchased_____ Serial Number_____

Company Name_____
Street Address_____
City_____ State_____ Zip Code_____
Name of Person to Contact_____
Phone_____ Title_____

Check ( ) one item which best describes your primary business activity or service at this location.

___Machine Tool ___General Industrial ___Pulp & Paper
___Automotive ___Metal Stamping ___Woodworking
___Textile ___Food Processing ___Printing
___Packaging ___Mining ___Other_____

How many employees are there at this location?

___ Under 10 ___ 10-50 ___50-100 ___100 or more

In which department will this product be used?

___ Production ___ Maintenance ___Other_____

Check the title of the person most responsible for the purchase of this product.

___ Buyer/Purchasing ___ Design Engineer ___Other_____
___ Chief Engineer ___ Maintenance Manager Name_____
___Consultant ___ Plant Manager Title _____

From whom did you buy this product?

___ Direct from Lube USA ___ Other_____
Firm Name City

Which of the following influenced your decision to buy this product? (Check all that apply)

___ Quality ___Features ___ Other_____
___ Reputation ___Technical Support ___ Distributor Recommendation

What is the main use for which this product was purchased? _____

_____

We welcome your comments:_____

_____

USE THIS SECTION TO REQUEST FREE INFORMATION ON OTHER LUBE USA PRODUCTS

Literature will be mailed to the name and address above.

___ Chassis Lubrication Systems ___ Industrial Cross Reference List
___ Stock Lube Systems ___ Textile Machine Lubrication Equip.
___ Grease Systems ___ Spindle Lubrication
___ Tubing & Accessories ___ Central Monitoring Systems

Mail to: LUBE USA, INC. , 781 CONGAREE ROAD, GREENVILLE, SC 29607.

CAMCO®

The Driving Force in Automation

SERVICE MANUAL
TORQ-GARD T.M.
OVERLOAD CLUTCH

ISO 9001
REGISTERED

"WARNING"

This is a controlled document. It is your responsibility to deliver this information to the end user of the CAMCO motion control component. Failure to deliver this, could result in your liability for injury to the user or damage to the machine.

For copies of this manual call your CAMCO Customer Service Representative. 800/645-5207

CAMCO®

torq/gard™

mechanical torque-limiting overload clutch

Installation—Operation and Maintenance Instructions

Safety Instructions

1. Read your Torq/Gard Installation-Operation Instructions thoroughly before operating the unit, for your safety and the protection of your equipment.
2. Double check to be sure the power is off and cannot be turned on while working on the equipment.
3. Electrical power should be disconnected at the fuse box, circuit breaker or motor starter.
4. The Torq/Gard Clutch is designed to protect your machine and will not protect against bodily injury.
5. Keep all objects such as hands, clothing, tools, etc. away from rotating or moving parts.
6. Use safety glasses or equivalent to protect your eyes.
7. Do not manually re-engage the Torq/Gard Clutch. (Refer to "Automatic Reset" instruction.)
8. Do not adjust the torque while the clutch is disengaged. (Refer to "Torque Setting" instruction.)
9. Do not exceed the recommended maximum RPM. (Refer to Torq/Gard Rating Chart.)
10. The detector mechanism must electrically disconnect the prime mover at the recommended RPM settings. (Refer to "Overload Detection" instruction.)
11. Shaft mounting set screws must clear the mounting bosses or the clutch will not release upon overload. (Refer to "Mounting the Torq/Gard" instruction.)
12. Shaft and detector mounting set screws must be tight and the recommended number used. (Refer to "Mounting the Torq/Gard" instruction.)

The above list includes major safety points to be observed, but should not be considered as limiting in safety precautions to be followed.

Operating Principle

Torq/Gard Overload Clutches help protect the entire drive train of your machinery from damage due to excessive torque generated by overloads and jamming. The torque is adjusted by turning the single hex-socket head control which adjusts the Torq/Gard Clutch precisely to any setting within its load range.

A spring-loaded cam follower seated in a single hub cam detent causes the hub and clutch body to rotate as a unit. The two point contact of the follower produces equal forces within the cam detent, minimizing the effect of "breathing", found in conventional clutches. When the pre-set torque limit is exceeded by an overload condition, the follower is instantly released from the cam detent, disconnecting the hub from the body. Either the hub or the body may be used as the input or output.

NOTE: During overload, the Torq/Gard produces a loud audible report, which is a normal operating characteristic of the clutch.

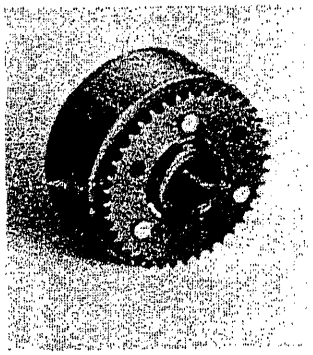
In direct coupled applications, the modular designed Torq/Gard can be used with Browning Ever-Flex Couplings or Chain Coupling Kits, without modification to the clutch or couplings. Split taper bushings are available for the coupling output.

Browning Torq/Gard single strand sprockets, for No. 40, 60, 80, and 100 ANSI Standard Roller Chain Drives, mount directly to the clutch.

Browning Torq/Gard Gearbelt Pulleys are also available for ½" Pitch Belts.

Before mounting the clutch on the driving or driven shaft, your choice of coupling or sprocket should be attached to the Torq/Gard Clutch.

Sprocket Installation



Browning Torq/Gard Single Strand Sprockets register with the drilled and tapped mounting lugs on the adapter end of clutch. Torq/Gard Chain Drives can be used as the driving or driven member. See page 6 for sprocket availability.

1. Place the sprocket on the registered mounting lugs.
2. Select the correct length Hex. Head Cap Screws (3 required) from Table A.

Warning: Short Screws may strip the mounting lug threads.

3. For maximum locking effect, (medium) spring lock washers should be used under the Hex. Head Cap Screws.

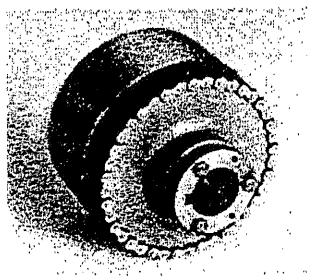
Table A—Sprocket Mounting Hardware

TGC60	.250—20 x .75 Long	Hex. Head Cap Screw
TGC200	.375—16 x 1.12 Long	Hex. Head Cap Screw
TGC400 & 800	.500—13 x 1.50 Long	Hex. Head Cap Screw

Gear Belt Pulley Installation

Follow the above mounting instructions for the Browning Torq/Gard Gear Belt Pulleys, using the longer Hex. Head Cap Screws supplied with the pulleys.

Chain Coupling Installation



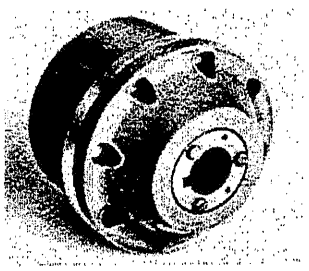
1. Select the Browning Chain Coupling components from page 6 for the applicable Torq/Gard Model.
2. Mount the single strand sprocket per the above "Sprocket Installation" instructions.
3. Place the Split Taper Bushing Sprocket over the Single Sprocket, with the corresponding teeth in alignment.
4. Secure the two sprockets by wrapping the double strand roller chain around the sprockets, insuring that the sprocket teeth fully engage the chain.

torq/gard®

5. Insert the chain connecting link in the chain ends and lock with the spring clip (supplied with the connecting link).

When assembled correctly, the Split Taper Bushing Sprocket will "float", for maximum misalignment capability.

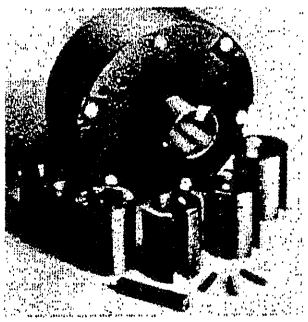
Ever-Flex Coupling Installation



1. Select the correct Ever-Flex Coupling and Adapter Plate from page 6.
2. Attach the Adapter Plate to the Torq/Gard mounting lugs with the three (3) Allen Flat Head Cap Screws supplied with the adapter.
3. Mount the Ever-Flex half coupling on the Adapter Plate with the eight (8) Hex. Head Cap Screws supplied with the Adapter Plate.

(Quantity 10 Hex. Head Cap Screws are supplied with Adapter Plate 400CAP9 and 800CAP10.)

Mounting The Torq/Gard



The Torq/Gard Clutch hub is machined to its maximum bore diameter. Shafts smaller than the maximum diameter are accommodated with standard Browning Torq/Gard Bushing Kits as shown on page 6. The bushing kits are complete with bushing, key and shaft set screws.

Note: Six (6) set screws are supplied in four (4) lengths.

Warning: The correct length set screws must be used as the clutch will not release if the set screws extend beyond the hub and hit the adapter mounting lugs.

The Torq/Gard Clutch can be shaft mounted from the adapter or detector end of the hub. The required shaft set screw lengths vary depending on the bushing selected. They will also vary in length if used on the detector end in conjunction with the detector mechanism.

Tables B, C and D include all set screw combinations for any bushing or mounting option.

Example 1:
A TGC 60 Clutch requires a .750 inch diameter shaft mounted on the adapter end.

Selection: A Browning 60BU012 Bushing Kit is chosen from page 6.

The correct set screws from Table B (adapter end):

Qty. 2 .190-32UNF-2A x .50 Long
Qty. 1 .190-32UNF-2A x .19 Long (over key)

Example 2:
A TGC 60 Clutch requires a .750 inch diameter shaft mounted on the detector end with the detector mechanism.

Selection: A Browning 60BU012 Bushing Kit.

The correct set screws from Table B (detector end):

Qty. 2 .190-32UNF-2A x .75 Long
Qty. 1 .190-32UNF-2A x .38 Long (over key)

NOTE: If the Bushing was used on the detector end without the detector, the selection would be the same as Example 1.

Table B—TGC60 Clutch

Detector End

Shaft Dia.	Set Scr. Length (2) Reqd. to Retain Detector Cam	Set Scr. Length (1) Reqd. to Retain Detector Cam Over Key
.750 Dia.	.190-32UNF-2A x .75 Lg.	.190-32UNF-2A x .38
.9375 Dia./1.125 Dia.	.190-32UNF-2A x .62 Lg.	.190-32UNF-2A x .38
1.250 Dia.	.190-32UNF-2A x .50 Lg.	.190-32UNF-2A x .38 Lg.

Adapter End

Shaft Dia.	Set Scr. Length (1) Reqd. @ Adapter End of Clutch	Set Scr. Length (1) Reqd. Over Key @ Adapter End of Clutch
.750 Dia.	.190-32UNF-2A x .50 Lg.	.190-32UNF-2A x .19 Lg.
.9375 Dia./1.125 Dia.	.190-32UNF-2A x .38 Lg.	.190-32UNF-2A x .19 Lg.
1.250 Dia.	.190-32UNF-2A x .25 Lg.	.190-32UNF-2A x .19 Lg.

Table C—TGC200 Clutch

Detector End

Shaft Dia.	Set Scr. Length (2) Reqd. to Retain Detector Cam	Set Scr. Length (1) Reqd. to Retain Detector Cam Over Key
.9375 Dia./1.250 Dia.	.250-20UNC-2A x 1.0 Lg.	.250-20UNC-2A x .50 Lg.
1.250 Dia./1.500 Dia.	.250-20UNC-2A x .88 Lg.	.250-20UNC-2A x .50 Lg.
1.500 Dia./1.750 Dia.	.250-20UNC-2A x .75 Lg.	.250-20UNC-2A x .50 Lg.
1.750 Dia./1.9375 Dia.	.250-20UNC-2A x .62 Lg.	.250-20UNC-2A x .50 Lg.

Adapter End

Shaft Dia.	Set Scr. Length (2) Reqd. @ Adapter End of Clutch	Set Scr. Length (1) Reqd. Over Key @ Adapter End of Clutch
.9375 Dia./1.250 Dia.	.250-20UNC-2A x .75 Lg.	.250-20UNC-2A x .25 Lg.
1.250 Dia./1.500 Dia.	.250-20UNC-2A x .62 Lg.	.250-20UNC-2A x .25 Lg.
1.500 Dia./1.750 Dia.	.250-20UNC-2A x .50 Lg.	.250-20UNC-2A x .25 Lg.
1.750 Dia./1.9375 Dia.	.250-20UNC-2A x .38 Lg.	.250-20UNC-2A x .25 Lg.

Table D—TGC400 and TGC800 Clutch

Detector End

Shaft Dia.	Set Scr. Length (2) Reqd. to Retain Detector Cam	Set Scr. Length (1) Reqd. to Retain Detector Cam Over Key
1.375 Dia./1.688 Dia.	.375-16UNC-2A x 1.25 Lg.	.375-16UNC-2A x .62 Lg.
1.750 Dia./2.125 Dia.	.375-16UNC-2A x 1.00 Lg.	.375-16UNC-2A x .62 Lg.
2.125 Dia./2.4375 Dia.	.375-16UNC-2A x .88 Lg.	.375-16UNC-2A x .62 Lg.

Adapter End

Shaft Dia.	Set Scr. Length (2) Reqd. @ Adapter End of Clutch	Set Scr. Length (1) Reqd. Over Key @ Adapter End of Clutch
1.375 Dia./1.688 Dia.	.375-16UNC-2A x .88 Lg.	.375-16UNC-2A x .38 Lg.
1.750 Dia./2.125 Dia.	.375-16UNC-2A x .62 Lg.	.375-16UNC-2A x .38 Lg.
2.125 Dia./2.4375 Dia.	.375-16UNC-2A x .50 Lg.	.375-16UNC-2A x .38 Lg.

1. Select the Browning Torq/Gard Bushing Kit from page 6.
2. Refer to tables B, C or D for the correct shaft set screws. (3 required)
3. Slide the bushing with the mating key on the shaft.
   Note: The use of NEVER-SEEZ® Compound is recommended to ease assembly of the bushing to the shaf and the Clutch to the bushing.
4. The shaft length must be at least equal to the bushing length to insure engagement of the Torq/Gard bearings.
   Limited shaft lengths or high overhung load applications require additional outboard bearing support.
   Browning Bushings are manufactured specifically to fit the entire length of the hub which provides add al support. Again, check Tables B, C or D to insure the correct length set screws are used and that they wi engage the shaft.
5. Apply LOCTITE® 242 to the set screws and mating tappec holes in the Clutch hub.

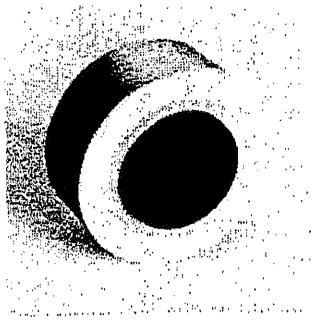
Warning: High inertia loads, reversing loads, excessive vibration or continual tripping may require the use of LOCTITE® 290.

6. Tighten set screws against shaft and key.

   Warning: Check to insure that the set screws do not extend beyond the hub on the adapter end.

   When used on the detector end the set screws must also engage the detector cam, but must not extend beyond the detector cam.

Overload Detection



The axial movement of the Detector Mechanism, when used in conjunction with a limit switch, electrically disconnects the prime mover (motor) from the load.

The Detector Mechanism consists of a spring loaded plate mounted on the clutch cover and retained by the detector plate cam. When an overload occurs, the cam releases the detector plate a sufficient distance to actuate a limit switch.

When the overload has been cleared, the re-engagement of the clutch automatically resets the detector mechanism.

Warning: Detector systems are recommended on all applications and mandatory on the following:

TGC60/TGC200 —At speeds over 100 RPM.
TGC400/TGC800—At all speeds.

Infinitely high shock loads can occur, depending on the type of jam or overload. The detector system further protects your equipment under these conditions. On high inertia applications, braking the prime mover may have to be considered.

1. The limit switch must have a rigid mounting.
2. Locate the limit switch so the detector plate travel will actuate the limit switch roller arm.

   Note: Refer to Figure 1 and Figure 2 for typical installations. Figure 1 mounting is preferred for reasons of rigidity.

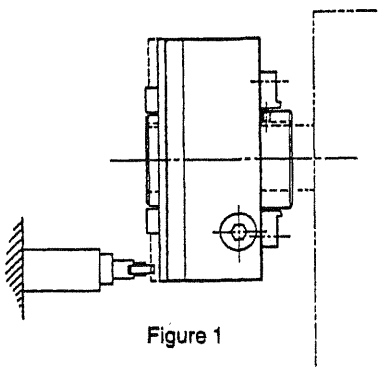


Figure 1

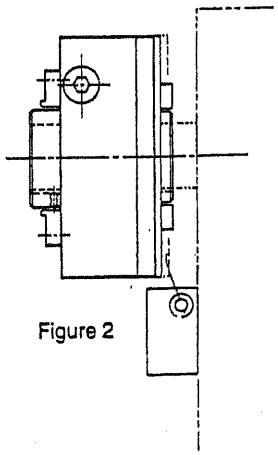


Figure 2

3. Refer to the Torq/Gard dimension prints on page 5 for the detector plate "travel".
4. When mounting the limit switch, consult the manufacturer's specifications for pre-travel and overtravel.
5. Wire the limit switch in parallel with the "start" contactor to permit motor starting after the overload has been cleared.

   Note: Refer to Figure 3 "Typical Wiring Diagram". Limit Switches are available with additional contacts to further actuate warning alarm systems.

Typical Wiring Diagram

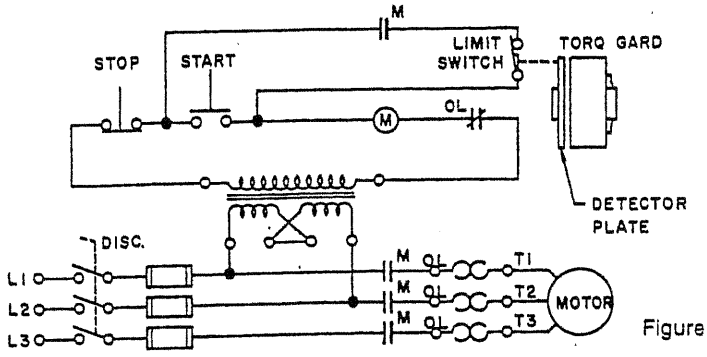


Figure 3

6. The detector mechanism can be installed in the field.
   A. Place the three (3) detector springs in the three shallow holes in the Torq/Gard cover.
   B. Place the "white" detector plate guide pins in the three deep holes in the cover.
      Note: The pins are registered to fit in one position only.
   C. Place the "black" detector cam on the clutch hub with flat side up.
   D. Rotate the cam until each cam lobe is directly over the detector plate ears and the set screw holes are aligned with the set screw holes in the hub.
      Note: The clutch must be in its engaged position for proper alignment of the detector mechanism.
   E. Secure the detector cam to the clutch hub with the correct length set screws, using LOCTITE® 242. (Refer to Tables B, C or D for the correct shaft set screws.)

Warning: Factory mounted detector mechanisms utilize set screws for shipping purposes only. The correct length of the set screws is determined by the shaft diameter used.

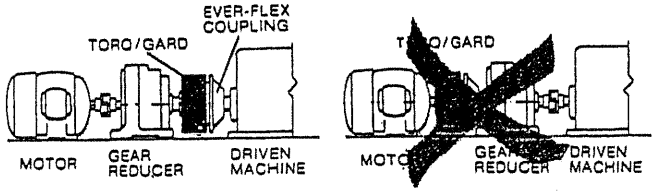
Torque Setting

The torque is infinitely adjustable within the nameplated torque limits of the clutch.

Determine the operating and tripping torque required to drive your machine.

A. Operating torque is the normal full load torque required by the application.
B. Tripping torque, which is usually higher than operating torque, depends on the starting torque requirements of the application and the location of the Torq/Gard Clutch.
C. Mounting the clutch away from the motor tends to absorb peak starting torques through power transmission and machine components. (Refer to Fig. 4.)
D. Tripping torque should be set higher than the point at which the clutch will "nuisance trip" on starting, but below the maximum torque value the machine can safely absorb.

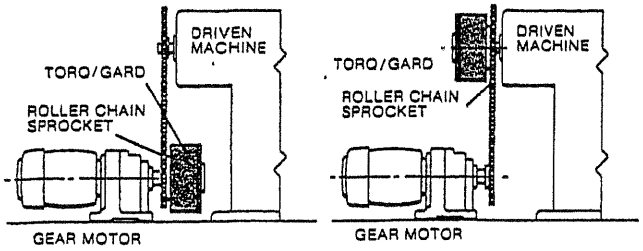
Figure 4



Direct Drive application with the Torq/Gard mounted on the low speed output shaft of the reducer. The Torq/Gard is shown with a Browning Ever-Flex half coupling which mounts on the clutch adapter without modification. Browning Chain Coupling Kits are also available for the Torq/Gard when greater misalignment capabilities are required. Either side of the Torq/Gard can be used as the input.

The Torq/Gard should not be used on the high speed input side of the reducer. Clutch sensitivity becomes a function of the reducer's gear ratio. As an example, when used with a 100 to 1 reducer, a 100 inch-pound torque variation on the output side will reflect only a 1 inch-pound change on the input side. Do not exceed the maximum RPM shown in the Torq/Gard selection table.

Figure 4



Mounting the clutch on the output of the gear motor or reducer provides the most economical clutch assembly. The Torq/Gard is designed to protect the weakest link in the drive system.

The Torq/Gard is mounted on the driven machine and powered through a chain and sprocket drive. Mounting the clutch in this position tends to absorb peak starting torques.

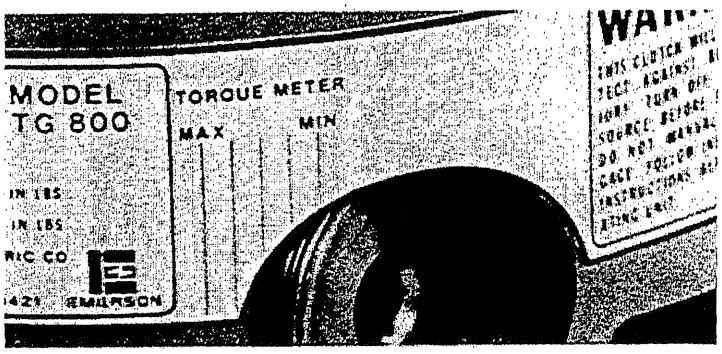
The Torq/Gard Clutch is delivered with the torque set at the low end of its torque range.

1. Turn the single Hex.-Socket Head adjusting nut clockwise to increase the Torque Setting. (Refer to Table E.)
   Note: ½ inch Hex-Keyed (Allen) Wrench is required.

Table E

MODEL	APPROXIMATE TORQUE (IN.-LBS.) PER TURN	MAXIMUM TURNS
TGC60	50	8
TGC200	100	11
TGC400	225	9
TGC800	450	9

2. Sighting the front face of the adjusting nut with the Torque Meter Lines on the nameplate indicates the approximate torque setting.



3. The "Min." line on the nameplate is the point at which the adjusting nut is threaded. Before setting the torque, LOCTITE® 242 should be applied to the exposed threads.
4. The first line on the Torque Meter beyond "Min." represents the low torque setting.
   Warning: The clutch should not be operated at torque settings below this "line".
5. Do not set the torque if the clutch is disengaged as an erroneous torque setting will result.
   Warning: Do not remove the adjusting nut. Extremely fine threads are used to reduce the possibility of the adjusting nut losing its setting. If the adjusting nut is removed, upon replacing, hand thread the first few turns or cross threading may occur.

Tripping torque can be established by progressively increasing the torque setting until the clutch no longer trips under starting loads.

If the tripping torque value is known, the clutch may be pre-set with a torque wrench or a torque arm and calibrated spring scale.

The Torq/Gard may also be sized by applying one of the following formulas:

$$\text{Torque (In.-lbs.)} = \frac{\text{Horsepower (HP)} \times 63025}{\text{RPM}}$$

$$\text{OR Horsepower} = \frac{\text{Torque (In.-lbs.)} \times \text{RPM}}{63025}$$

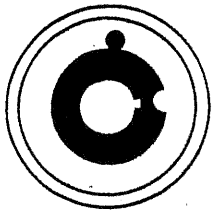
Tripping Torque = Operating Torque x Service Factor

Note: The nameplate contains a sensitized "rectangle" on which the torque setting may be recorded with ball point pen or a numbering die.

Warning: The Torq/Gard Clutch is not a "FAIL SAFE" device and cannot be used on "overhauling" or "holding" load applications.

TORQ/GARD RATINGS

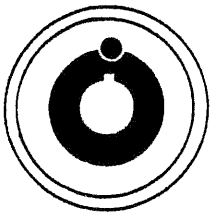
Models	Torque (In.-lbs.) Min.	Torque (In.-lbs.) Max.	HP Max.	RPM Max.	Weight (lbs.)	Inertia (WK^2)	Bore Dia. Max. (inches)
TGC 60	200	600	8.5	900	5.5	10	1¼
TGC 200	600	2000	21.5	680	12	46	1 15/16
TGC 400	2000	4000	22.2	350	38	455	2 7/16
TGC 800	4000	8000	44.4	350	38	455	2 7/16



Automatic Reset

The Torq/Gard Clutch is automatically reset by "jogging" the motor after the overload has been corrected. At speeds under 50 RPM the Torq/Gard will re-engage, without jogging, upon starting the motor. The clutch will not re-engage the overload exceeds the torque setting.

Warning: Do not re-engage the Torq/Gard manually. When the clutch snaps into engagement, injury could occur if the operator's hand is near a chain and sprocket or belt drive.



Single Position

The Torq/Gard always resets in the same position when tripped. It is an excellent choice in applications that must remain registered or timed. All Torq/Gard Clutches are fully reversible.

Lubrication

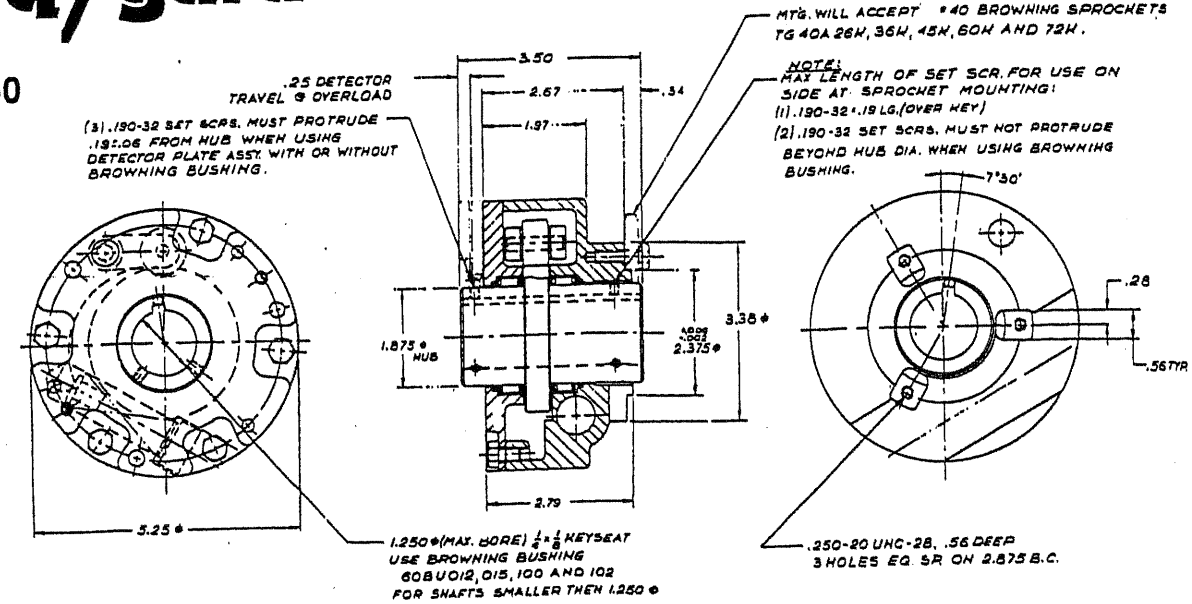
The Torq/Gard is factory lubricated with Mobilux 2 and does not require additional lubrication for many years, under normal operating conditions.

It can be lubricated by removing the cover and filling the body cavity to 75% capacity with Mobilux 2 or an equivalent grease.

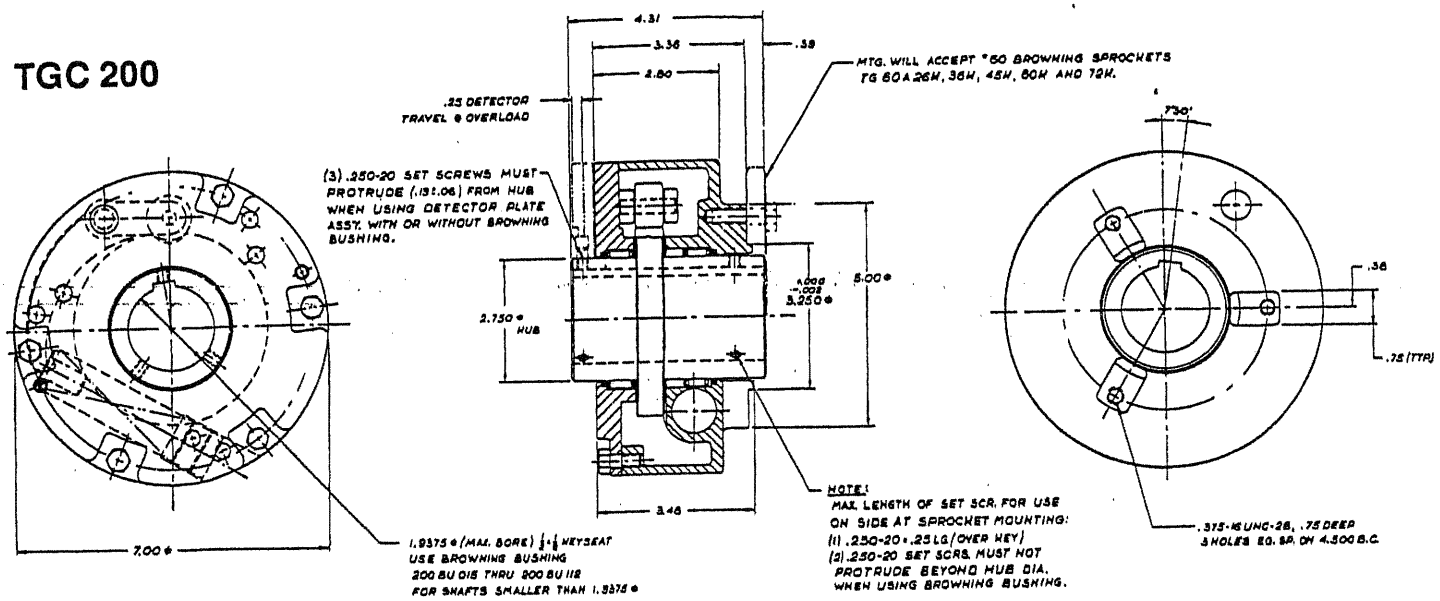
CAMCO®
COMMERCIAL CAM CO., INC.
SUBSIDIARY OF EMERSON ELECTRIC CO.
1444 SOUTH WOLF ROAD
WHEELING, IL 60090 U.S.A.
(708) 459-5200 FAX: (708) 459-3064

torq/gard

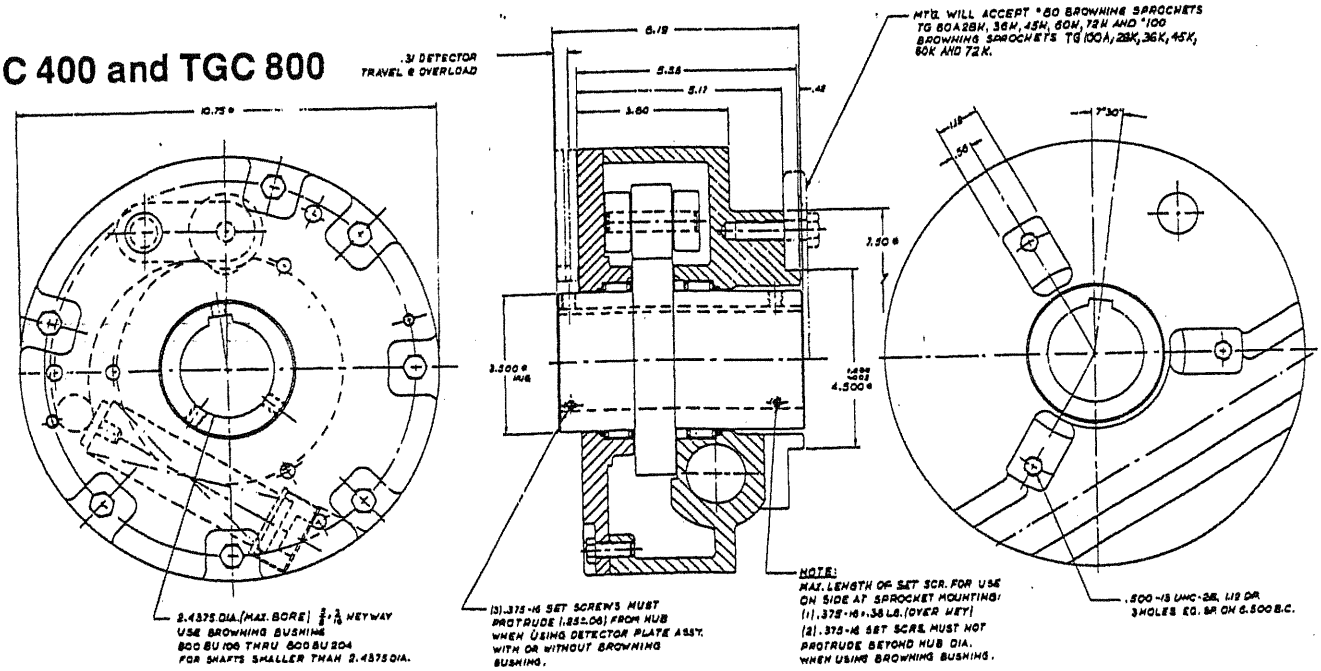
TGC 60



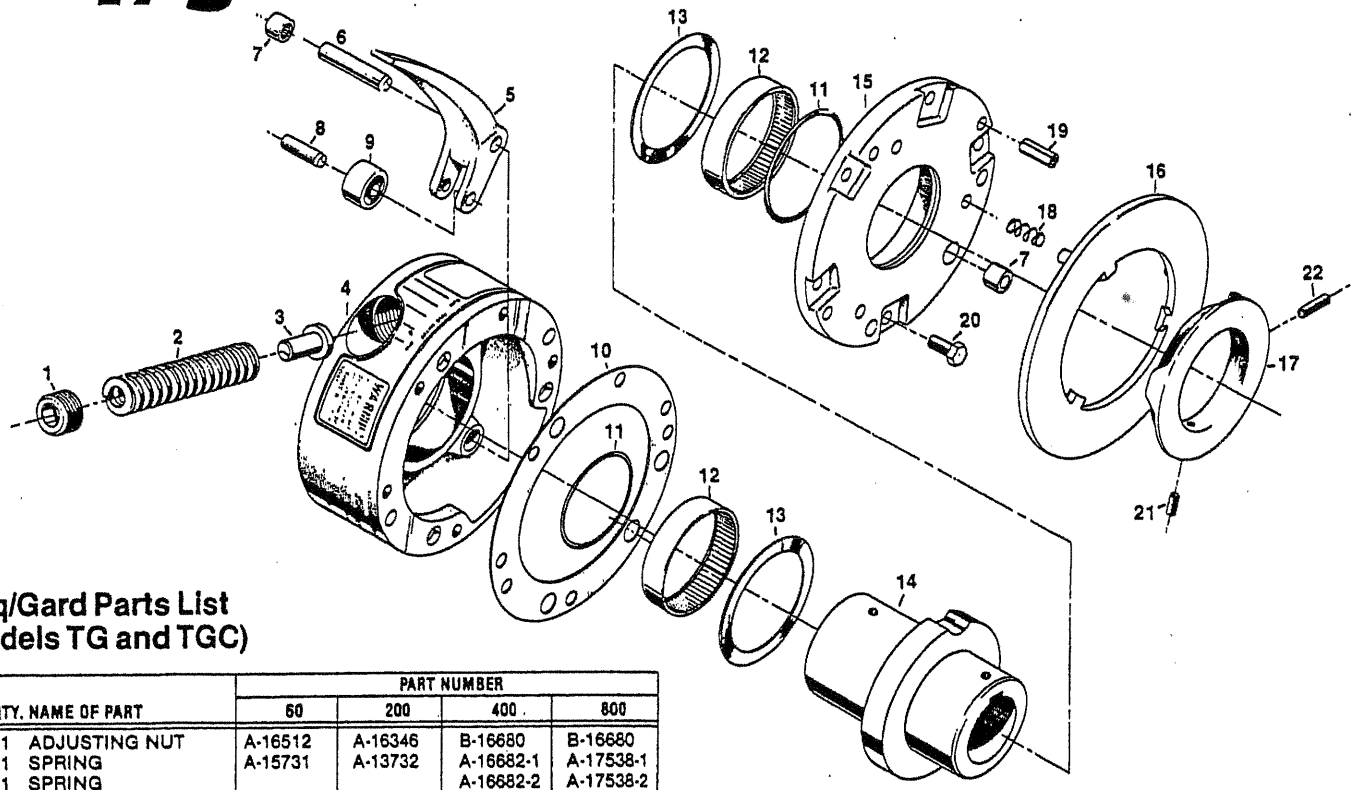
TGC 200



TGC 400 and TGC 800



torq/gard



Torq/Gard Parts List (Models TG and TGC)

ITEM NO.	QTY.	NAME OF PART	PART NUMBER 60	200	400	800
1	1	ADJUSTING NUT	A-16512	A-16346	B-16680	B-16680
2	1	SPRING	A-15731	A-13732	A-16682-1	A-17538-1
2	1	SPRING			A-16682-2	A-17538-2
3	1	BUTTON	A-15727	A-13407	A-16685	A-16685
4	1	BODY	D-18717	D-18716	D-18715	D-18715
5	1	LEVER	B-16510	C-13401	C-16677	C-16677
6	1	DOWEL PIN	A-17647	A-17648	A-18876-4	A-18876-4
7	2	BEARING	B-15732-1	A-14407	B-15732-4	B-15732-4
8	1	DOWEL PIN	A-17650	A-18875-3	A-18876-3	A-18876-3
9	1	BEARING	A-15730-1	A-14409	A-16683	A-16683
10	1	GASKET	B-16516	C-15824	C-16679	C-16679
11	2	O-RING	A-15729-2	A-14399	A-15729-3	A-15729-3
12	2	BEARING	B-15732-3	A-14408	B-15732-5	B-15732-5
13	2	THRUST WASHER	A-16511	B-13406	B-16681	B-16681
14	1	DRIVE HUB	B-16506	C-15649	D-18719	D-18719

ITEM NO.	QTY.	NAME OF PART	PART NUMBER 60	200	400	800
15	1	COVER	C-16505	C-15830	D-16675	D-16675
16	1	DETECTOR PLATE	B-17056	C-16927	C-17076	C-17076
17	1	CAM-DETECT. PLATE	B-17055	B-16926	C-17077	C-1707
18	3	SPRING	A-17059	A-16989	A-17788	A-177
19	2	ROLL PIN	A-18874-1	A-18875-1	A-18876-1	A-1887
20	5	HEX. HD. CAP SCR.	A-18874-2	A-18875-2		
20	7	HEX. HD. CAP SCR.			A-18876-2	A-18876-2
21	1	SOC. HD. SET SCR.	A-18874-4	A-18875-5	A-18876-6	A-18876-6
22	2	SOC. HD. SET SCR.	A-18874-3	A-18875-4	A-18876-5	A-18876-5

SINGLE STRAND SPROCKETS

ANSI Standard Roller Chain

FOR NO. 40, ½" PITCH

Model	Sprocket Part No.	No. Teeth
TGC60	TG40A26K	26
	TG40A36K	36
	TG40A45K	45
	TG40A60K	60
	TG40A72K	72

FOR NO. 60, ¾" PITCH

TGC200	TG60A26K	26
	TG60A36K	36
	TG60A45K	45
	TG60A60K	60
	TG60A72K	72

FOR NO. 80, 1" PITCH

TGC400	TG80A28K	28
	TG80A36K	36
	TG80A45K	45
	TG80A60K	60
	TG80A72K	72

FOR NO. 100, 1¼" PITCH

TGC800	TG100A28K	28
	TG100A36K	36
	TG100A45K	45
	TG100A60K	60
	TG100A72K	72

TORQ/GARD BUSHING KITS

Model	Shaft Dia.	Bushing Kit No.
TGC 60	¾	60BU012
	15/16	60BU015
	1	60BU100
	1⅛	60BU102
	1¼	NONE
TGC 200	15/16	200BU015
	1	200BU100
	1 1/16	200BU101
	1⅛	200BU102
	1 3/16	200BU103
	1¼	200BU104
	1 5/16	200BU105
	1⅜	200BU106
	1 7/16	200BU107
	1½	200BU108
	1⅝	200BU110
	1 11/16	200BU111
	1¾	200BU112
	1 15/16	NONE
TGC 400 AND TGC 800	1⅜	800BU106
	1 7/16	800BU107
	1½	800BU108
	1⅝	800BU110
	1 11/16	800BU111
	1¾	800BU112
	1⅞	800BU114
	1 15/16	800BU115
	2	800BU200
	2⅛	800BU202
	2 3/16	800BU203
	2¼	800BU204
	2 7/16	NONE

TORQ/GARD CHAIN COUPLING KITS

Model	Single Strand Sprocket Part No.	Single Sprocket For Split Taper Bushing Part No.	Coupling Chain w/Link Part No.
TGC60	TG40A26K	40P26	C4026 Chain
TGC200	TG60A26K	60P26	C6026 Chain
TGC400 TGC800	TG80A28K	80Q28	C8028 Chain

TORQ/GARD GEARBELT PULLEYS

FOR ½" PITCH BELTS

Model	Part No.	Pitch Dia.	No. of Grooves	Belt Width
TGC60	TG60H100K	9.549	60	1"
TGC200	TG72H300K	11.459	72	3"

EVER-FLEX COUPLINGS

Model	Coupling Half Part No.	Adapter Plate Part No.	Split Taper Bushing
TGC60	CHCFR5H	60CAP5	H
TGC200	CHCFR8P	200CAP8	P1
TGC400	CHCFR9Q	400CAP9	Q1
TGC800	CHCFR10Q	800CAP10	Q1

CAMCO®
The Driving Force In Automation

Commercial Cam Co., Inc. (CAMCO)
1444 South Wolf Rd.
Wheeling, IL 60090 U.S.A.
ISO 9001 REGISTERED

Phone: (847) 459-5200 Fax: (847) 459-3064
BBS: (847) 459-1054 or (847) 459-4182
E-Mail: mktg@camcoindex.com
Internet: http://www.camcoindex.com

EMERSON.

CAMCO MICHIGAN
550 Forest Avenue
Unit #14
Plymouth, MI 48170
TEL: (734) 459-8080
FAX: (734) 459-8110

CAMCO U.K.
432 Perth Avenue
Slough Trading Estate
Slough Berkshire, England
SL14TS
Tel: 44-1-753-786100
Fax: 44-1-753-786101

3/99 0082

ARROW PNEUMATICS, INC.

INSTRUCTION SHEET;
F300; 2612, R160, R242, R260, R342, R360; 1811 and 1812
MINIATURE FILTERS, REGULATORS, LUBRICATORS AND WATER SERVICE REGULATORS

WARNING! For compressed air service only (R360 series for water service). Not to be used on life support systems or breathing air systems. Never use polycarbonate plastic bowls on air supplied by a compressor lubricated with synthetic oils or oils containing phosphate esters or chlorinated hydrocarbons. They can carry over into the air distribution systems and chemically attack and possibly rupture the bowls. On these applications use a metal bowl. Also, do not expose these polycarbonate plastic bowls to materials such as trichlorethylene, acetone or paint thinner. Cleaning fluids or other harmful materials, will craze and/or rupture the bowl. If materials harmful to polycarbonate are present either outside or inside the bowl, use a metal bowl.

MAINTENANCE AND OPERATION

Install units so the air flow is in the direction "IN-OUT" as indicated on the head of all units. Filters should be installed upstream of regulators. Lubricators should be downstream of regulators. Units should be installed as close as possible to the pneumatic tools or appliances being serviced.

Model	Max. Pressure	Temp. Range
Polycarbonate Bowl	150 PSI	40°F to 125° F
Metal Bowl-Filter	250 PSI	40°F to 200° F
Metal Bowl-Lube	250 PSI	40°F to 175° F
Piston Drain	150 PSI	40°F to 125° F
Regulators-STD	250 PSI	40°F to 120° F
Regulators-Water	5 GPM	40°F to 120° F

FILTER

Filtering of liquid, water and dirt particles is automatic with air flow. There are no moving parts and no adjustments are required.

Accumulated sludge and moisture should be drained off. Water, dirt or sediment should not be permitted to fill above the filter element.

Wash or replace element at regular intervals to prevent excessive pressure drop. To clean element, depressurize system, unscrew bowl and remove element from head. Wash element with cleaning solvent and allow to dry before reassembling. Inspect gasket and replace if damaged or distorted. Avoid stripping threads on bowl when rebuilding.

LUBRICATOR

Lubricator automatically varies oil mist delivery with air flow variation at any adjustment. The oil flow rate can be observed through the sight dome. All the oil drops that are seen in the dome go into the air stream. The oil flow rate setting depends on the air flow and on the equipment being lubricated. For general purpose applications, the recommended oil flow range is 1 to 3 drops per minute.

To fill lubricator, depressurize system and remove bowl. Fill lubricator bowl with SAE 10 oil or lighter. *The oil should be clean.* Remove and clean bowl periodically to remove any collected sediment. Increased oil mist delivery is obtained by rotating the adjustment screw counterclockwise. Do not turn screw out beyond surface of body.

REGULATOR

Install the regulator so the supply pressure enters the "IN" port. Any "OUT" port may be used for either gauge or regulated pressure. After regulator is installed, back off pressure adjusting knob before air is turned on. Turn on air supply and regulate the adjusting knob until the pressure gauge shows desired pressure. Push knob down to lock, remove knob to assure tamper resistance.

Reduced Pressure Ranges

2 -125 STD
2-60 L
2-20 I

Air Service mini regulator will accurately control the secondary pressure between 2-125 PSI on standard units. The self-bleed venting feature permits use on dead end applications.

Water Service Specifically engineered where deionized water is the media or other applications where liquid is present or corrosion is a problem. The R360 is equipped with 316 stainless steel internals and a non-relieving diaphragm.

Special Service Viton and EPDM seals are available for applications with chemicals that are incompatible with Buna-N.

IMPORTANT: Care must be taken to avoid screwing fittings too far into body of units, as it may close internal ports. Normally finger tight plus one turn will seal.

TAMPER-PROOF OPTION

The optional cap (P/N 91806) has been provided in the plastic bag to ensure that the reduced pressure setting cannot be tampered with. To make the unit "tamper-proof", proceed as follows;

Turn the adjustment knob until the desired reduced pressure is reached. Remove the adjustment knob by pulling upward. Install the tamper-proof cap in its place.

NOTE: To make permanently tamper-proof, LOCTITE the cap in place.

CAUTION: By permanently loctiting the tamper-proof cap into place, the pressure adjustment cannot be changed.

NOTE: When using push the push to connect regulators R242, R262 follow the instructions on reverse side

2111 WEST 21ST STREET • BROADVIEW, IL 60153 • (708) 343-6176 Fax (708) 343-1907

9 NOTES

10 WARRANTY AND SERVICE

WARRANTY

Warranty: Kirk-Rudy, Inc., 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 ANY IMPLIED WARRANTY OF MERCHANTABLITIY 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.

USE ONLY GENUINE KIRK-RUDY REPLACEMENT PARTS

KIRK-RUDY, INC
125 LORRAINE PARKWAY
WOODSTOCK, GA 30188
770-427-4203
FX 770-427-4036
WWW.KIRKRUDY.COM