



Zimmerman Metals Inc.

MODEL SS1500

Z-PANEL FORM MACHINE

OPERATING MANUAL

Zimmerman Metals Inc.

Quality Workmanship and Service Since 1936

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SECTION 2

HYDRAULIC / TECHNICAL INFORMATION

WARRANTY

ZIMMERMAN METALS, INC. WARRANTS TO THE ORIGINAL PURCHASER THAT ALL PARTS MANUFACTURED BY ZIMMERMAN METALS, INC. WILL REMAIN FREE OF DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF TWELVE MONTHS FROM THE DATE OF PURCHASE. THIS WARRANTY DOES NOT COVER MISUSE, ABUSE, OR WEAR AND TEAR CAUSED BY NEGLIGENCE.

ALL PARTS NOT MANUFACTURED BY ZIMMERMAN METALS, INC. ARE COVERED BY THEIR OWN MANUFACTURER'S WARRANTY.

ZIMMERMAN'S OBLIGATION IS TO REPAIR OR REPLACE, AT OUR OPTION, ANY PARTS MANUFACTURED BY ZIMMERMAN METALS, INC. FOUND TO BE DEFECTIVE BY OUR INSPECTION AT NO COST TO THE ORIGINAL PURCHASER. ALL PARTS RETURNED UNDER WARRANTY MUST BE APPROVED AND MUST ARRIVE AT ZIMMERMAN METALS, INC. FREIGHT PREPAID. REPLACEMENT OR REPAIRED PARTS WILL BE RETURNED TO THE PURCHASER VIA NORMAL GROUND SERVICE FREIGHT PREPAID.

ZIMMERMAN METALS, INC. SHALL NOT BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, PUNITIVE DAMAGES OR OTHER LOSSES.

THE ABOVE WARRANTY IS EXCLUSIVE AND ZIMMERMAN METALS, INC. DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

MACHINE SPECIFICATIONS

PANEL MACHINE

LENGTH 94"

HEIGHT 22"

WIDTH 40"

WEIGHT- 2000 LBS

POWER – 110VAC 1 ½ HP 1 PH ELECTRIC MOTOR

OPTIONAL POWER-13 HP GASOLINE ENGINE

DRIVE-HYDRAULIC / GEAR & CHAIN

SHEAR-HYDRAULIC

SPEED-APPROX. 60 FT. PER MINUTE

MATERIAL WIDTH-16"-28"

MATERIAL WIDTH FOR NS1000 PANEL 16" OR 20"

MATERIAL TYPES-STEEL, 28GA.- 24GA.
ALUMINUM TO .030
COPPER TO 20 OZ.

UNCOILER

SPOOL & STAND W/ BRAKE, 4000 LB. CAPACITY

TRAILER

LENGTH-17 FT

HEIGHT-48" WITH MACHINE, SPOOL & STAND

WIDTH-91"

AXLES-2 @ 3500 LB. W/ ELECTRIC BRAKE

HITCH-2 5/16" BALL

TONGUE WEIGHT-APPROX. 450 LB

TOTAL WEIGHT-4000 LB

GENERAL SAFETY PRECAUTIONS

1. BEFORE ATTEMPTING OPERATE THE MACHINE, READ THIS MANUAL COMPLETELY. THIS MANUAL IS PREPARED FOR YOUR SAFETY AND EASE OF OPERATION. FAILURE TO FOLLOW SAFE PROCEDURES AND OPERATING INSTRUCTIONS MAY RESULT IN INJURY OR DAMAGE TO THE MACHINE.

2. NEVER ATTEMPT TO ADJUST, CLEAN, OR REPAIR THIS EQUIPMENT WITH THE ENGINE RUNNING OR THE POWER SOURCE CONNECTED. USE CARE THAT NO ONE ATTEMPTS TO START THE MACHINE WHILE IT IS BEING WORKED ON.

3. USE CARE WHEN HANDLING COIL STOCK AND PANELS. EDGES MAY BE VERY SHARP AND PROPER HAND PROTECTION IS ADVISED.

4. DO NOT WEAR LOOSE CLOTHING, JEWELRY, ECT., WHILE OPERATING THIS MACHINE OR SEAMING MACHINES.

5. NEVER ATTEMPT TO FORM OR INSTALL PANELS IN HIGH WIND CONDITIONS.

6. WHEN LIFTING MACHINE, COILS, OPTIONAL TRAILER, OR ANY RELATED EQUIPMENT, DO NOT EXCEED THE RATED LIMITS OF ANY LIFTING DEVICE.

7. BE AWARE THIS EQUIPMENT IS A VIRTUAL CONVEYOR AND MAY CAUSE INJURY OR DAMAGE TO THE MACHINE BY ALLOWING FOREIGN OBJECTS TO TRAVEL ON THE COIL INTO THE MACHINE.

8. DO NOT ALLOW ANYONE TO OPERATE THIS EQUIPMENT WITHOUT PROPER INSTRUCTION OR TRAINING.

9. ALWAYS FOLLOW AND ADHERE TO ALL LOCAL AND NATIONAL SAFETY CODES CONCERNING OPERATION OF THIS AND ALL RELATED EQUIPMENT.

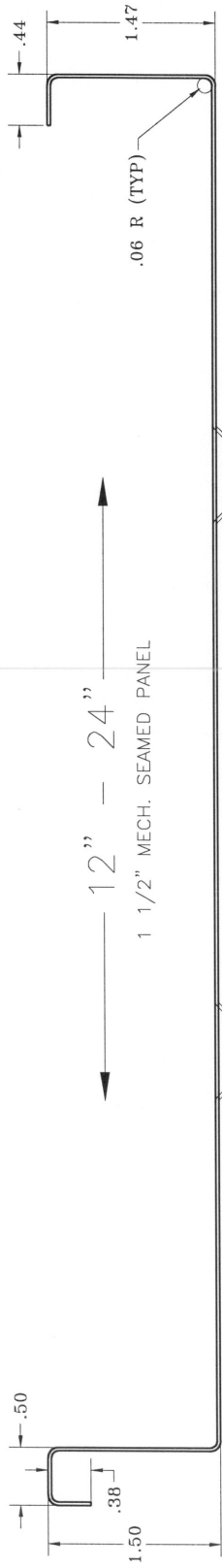
10. NEVER OPERATE THIS MACHINE WITHOUT GUARDS AND SAFETY COVERS IN PLACE.

SAFETY IS COMMON SENSE-PLEASE BE CAREFUL

MAINTENANCE AND GENERAL INFORMATION

1. ALWAYS KEEP LIDS AND SAFETY COVERS ON DURING OPERATION AND STORAGE.
2. AVOID STORAGE OF THE MACHINE OUTDOORS FOR LONG PERIODS OF TIME. IF YOU COVER YOUR MACHINE WITH A TARP FOR OUTSIDE STORAGE, BE SURE TO PROVIDE GOOD VENTILATION TO PREVENT CONDENSATION.
3. ALWAYS KEEP THE MACHINE CLEAN. THIS WILL INSURE CONSISTENT QUALITY OF THE PRODUCT AND INCREASE THE LIFE OF THE MACHINE.
4. THE MAIN DRIVE CHAIN ON THE HYDRAULIC MOTOR SHOULD BE CHECKED PERIODICALLY FOR TENSION AND WEAR. TO ADJUST THE TENSION, LOOSEN THE 4 BOLTS IN THE MOTOR MOUNT AND USE THE JACK BOLTS TO TAKE UP THE SLACK. **DO NOT OVER TIGHTEN.**
5. ALL BEARINGS IN THE MACHINE ARE LIFETIME SEALED AND REQUIRE NO MAINTENANCE.
6. THE SHEAR BLADE AND DIES SHOULD BE LUBRICATED ON A REGULAR BASIS. USE A LIGHT- WEIGHT OIL OR SPRAY LUBRICANT. DO NOT USE A SILICONE BASE LUBRICANT. SILICONE HAS A TENDENCY TO BUILD UP AND CAUSE BINDING IN THE SHEAR.
7. THE CHAINS AND GEARS IN THE MACHINE WILL REQUIRE OCCASIONAL LUBRICATION. DO NOT APPLY TOO MUCH LUBRICANT AS IT WILL ATTRACT DIRT WHICH COULD BE TRANSFERRED TO THE PANEL. A LIGHT SYNTHETIC GREASE IS RECOMMENDED.
8. DO NOT USE SOLVENTS TO CLEAN THE POLYURETHANE COATED DRIVE ROLLERS. USE ONLY MINERAL SPIRITS.
9. A LIGHT OIL APPLIED TO THE SPOOL SHAFT WILL KEEP SPOOL SECTIONS EASY TO MOVE TO THE PROPER LOCATION.
10. GALVANIZE OR GALVALUME MATERIAL MUST BE PRE-OILED TO PREVENT BUILD-UP ON THE FORMING ROLLERS. SPECIFY LIGHT OIL ON COIL WHEN ORDERING. APPLICATION OF MINERAL OIL ON THE TOP AND BOTTOM FORMING ROLLERS, BEFORE RUNNING EACH COIL, WILL HELP PREVENT BUILD-UP. IF BUILD-UP OCCURS USE "GALV-OFF" OR SIMILAR PRODUCT TO REMOVE.
11. INSPECT MACHINE FOR FOREIGN OBJECTS AND LOOSE BOLTS EACH TIME THE MACHINE IS TRANSPORTED.
12. CHECK THE LEVEL OF THE HYDRAULIC OIL AT THE SIGHT GAUGE LOCATED ON THE RIGHT SIDE OF THE MACHINE. IF IT IS LOW, ADD MOBILE DTE25 OR EQUIVALENT. THE HYDRAULIC OIL SHOULD BE CHANGED AFTER 2000 HOURS OF OPERATION.
13. CHECK WHEEL LUGS, TIRE PRESSURE, BRAKES AND ALL LIGHTS BEFORE TRANSPORTING TRAILER TO JOB SITE.
14. REFER TO HONDA ENGINE OWNERS MANUAL FOR MAINTENANCE AND INFORMATION ON THE ENGINE.

Z PANEL FORM SS1500 PROFILE



NOTE: PANEL MAY BE RUN WITH OR WITHOUT STIFFENING RIBS

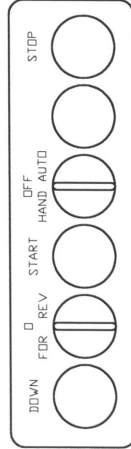
OPERATING THE MACHINE (ELECTRIC POWERED)

1. PLUG THE TWIST LOCK POWER CORD SUPPLIED WITH THE MACHINE INTO THE CONTROL BOX ON THE LEFT SIDE OF THE MACHINE AND CONNECT TO 110VAC POWER SOURCE. (NOTE: MINIMUM 20 AMP SERVICE IS REQUIRED)
2. PLUG HAND HELD REMOTE CONTROL INTO THE 12 PIN CONNECTOR ON THE CONTROL PANEL.
3. CHECK THE THREE EMERGENCY STOP SWITCHES, ENTRY END OF THE MACHINE-CONTROL PANEL-HAND HELD REMOTE CONTROL, TO BE SURE THEY ARE ALL PULLED OUT.
4. TURN MAIN POWER TOGGLE SWITCH TO THE ON POSITION.
5. FOR MANUAL OPERATION PLACE THE HAND-OFF-AUTO SWITCH IN THE HAND POSITION. YOU MAY NOW JOG THE MACHINE FORWARD OR REVERSE USING THE FOR-O-REV SWITCH. THE SHEAR WILL OPERATE USING THE DOWN BUTTON.
6. FOR AUTOMATIC OPERATION PLACE THE HAND-OFF-AUTO SWITCH IN THE AUTO POSITION. PLUG YOUR EXTENSION CORD INTO THE END STOP LIMIT SWITCH OUTLET AND PLUG THE END STOP LIMIT SWITCH INTO THE CORD. DEPRESS THE START BUTTON. A PANEL WILL RUN OUT UNTIL IT HITS THE END STOP LIMIT SWITCH. DEPRESS THE DOWN BUTTON TO ACTIVATE THE SHEAR CYCLE. WHEN THE PANEL IS REMOVED FROM THE END STOP LIMIT SWITCH, THE MACHINE WILL AUTOMATICALLY RUN ANOTHER PANEL.
7. **DEPRESSING ANY ONE OF THE THREE RED EMERGENCY STOP BUTTONS WILL STOP ALL OPERATIONS OF THE MACHINE.**
8. **POWER CORD REQUIREMENTS – UP TO 25' – 12 GAUGE MIN
25' TO 50' – 10 GAUGE MIN
50' TO 100' – 7 GAUGE MIN**
FAILURE TO USE THE PROPER SIZE EXTENSION CORD WILL CAUSE FUSES TO BLOW AND MAY DAMAGE THE ELECTRIC MOTOR.

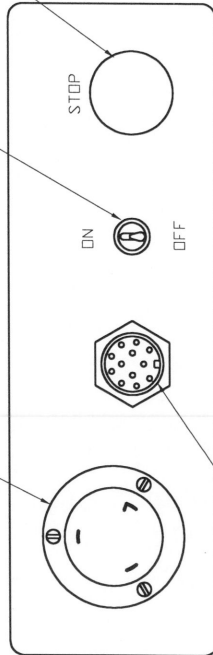
REFER TO CONTROLS DIAGRAM NEXT PAGE

ELECTRIC POWERED

HAND HELD
REMOTE CONTROL



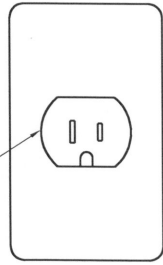
MAIN POWER SWITCH
EMERGENCY STOP SWITCH



POWER INLET



END STOP LIMIT
SWITCH OUTLET

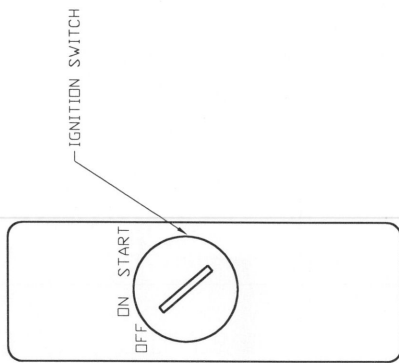


OPERATING THE MACHINE (GASOLINE ENGINE POWERED)

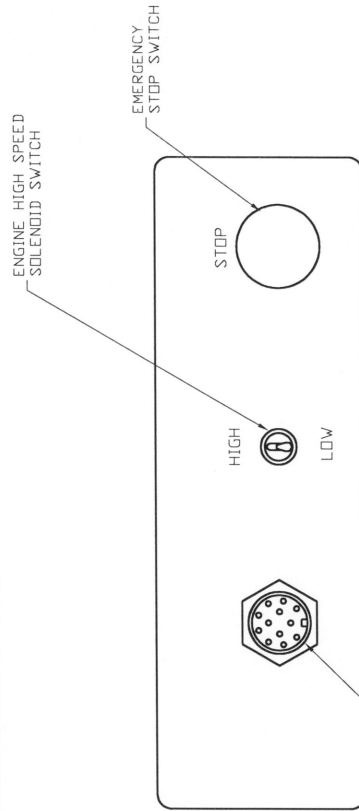
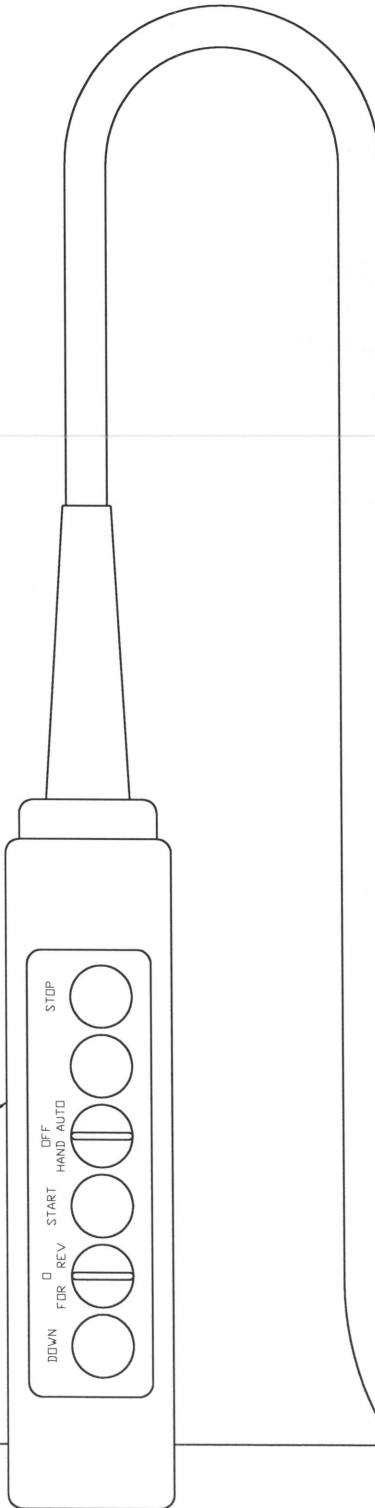
1. PLUG HAND HELD REMOTE CONTROL INTO THE 12 PIN CONNECTOR ON THE CONTROL PANEL.
2. CHECK THE THREE EMERGENCY STOP SWITCHES, ENTRY END OF THE MACHINE-CONTROL PANEL-HAND HELD REMOTE CONTROL, TO BE SURE THEY ARE ALL PULLED OUT.
3. MOVE THE FUEL VALVE LEVER TO THE ON POSITION. FOR COLD START, MOVE THE CHOKE LEVER TO THE CLOSED POSITION. (TO RE-START A WARM ENGINE, LEAVE THE CHOKE IN THE OPEN POSITION.) TURN THE KEY TO THE START POSITION AND HOLD UNTIL THE ENGINE STARTS. WHEN THE ENGINE STARTS, RELEASE THE KEY, ALLOWING IT TO RETURN TO THE ON POSITION. MOVE THE CHOKE LEVER TO THE OPEN POSITION AS THE ENGINE WARMS UP. (***READ HONDA ENGINES OWNER'S MANUAL BEFORE ATTEMPTING TO START.***)
4. TURN THE ENGINE HIGH SPEED SOLENOID SWITCH TO THE HIGH POSITION.
5. FOR MANUAL OPERATION PLACE THE HAND-OFF-AUTO SWITCH IN THE HAND POSITION. YOU MAY NOW JOG THE MACHINE FORWARD OR REVERSE USING THE FOR-O-REV SWITCH. THE SHEAR WILL OPERATE USING THE DOWN BUTTON.
6. FOR AUTOMATIC OPERATION, PLACE THE HAND-OFF-AUTO SWITCH IN THE AUTO POSITION. PLUG YOUR EXTENSION CORD INTO THE END STOP LIMIT SWITCH OUTLET AND PLUG THE END STOP LIMIT SWITCH INTO THE CORD. DEPRESS THE START BUTTON. A PANEL WILL RUN OUT UNTIL IT HITS THE END STOP LIMIT SWITCH. DEPRESS THE DOWN BUTTON TO ACTIVATE THE SHEAR CYCLE. WHEN THE PANEL IS REMOVED FROM THE END STOP LIMIT SWITCH, THE MACHINE WILL AUTOMATICALLY RUN ANOTHER PANEL.
7. **DEPRESSING ANY ONE OF THE THREE RED EMERGENCY STOP BUTTONS WILL STOP ALL OPERATIONS OF THE MACHINE.**
8. THE ENGINE MAY BE STOPPED BY TURNING THE KEY TO THE OFF POSITION.
9. IN THE EVENT OF A BATTERY FAILURE, THE ENGINE MAY BE STARTED USING THE RECOIL STARTER.

REFER TO CONTROLS DIAGRAM NEXT PAGE.

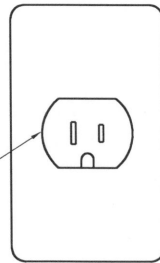
GASOLINE POWERED



HAND HELD
REMOTE CONTROL



END STOP LIMIT
SWITCH OUTLET

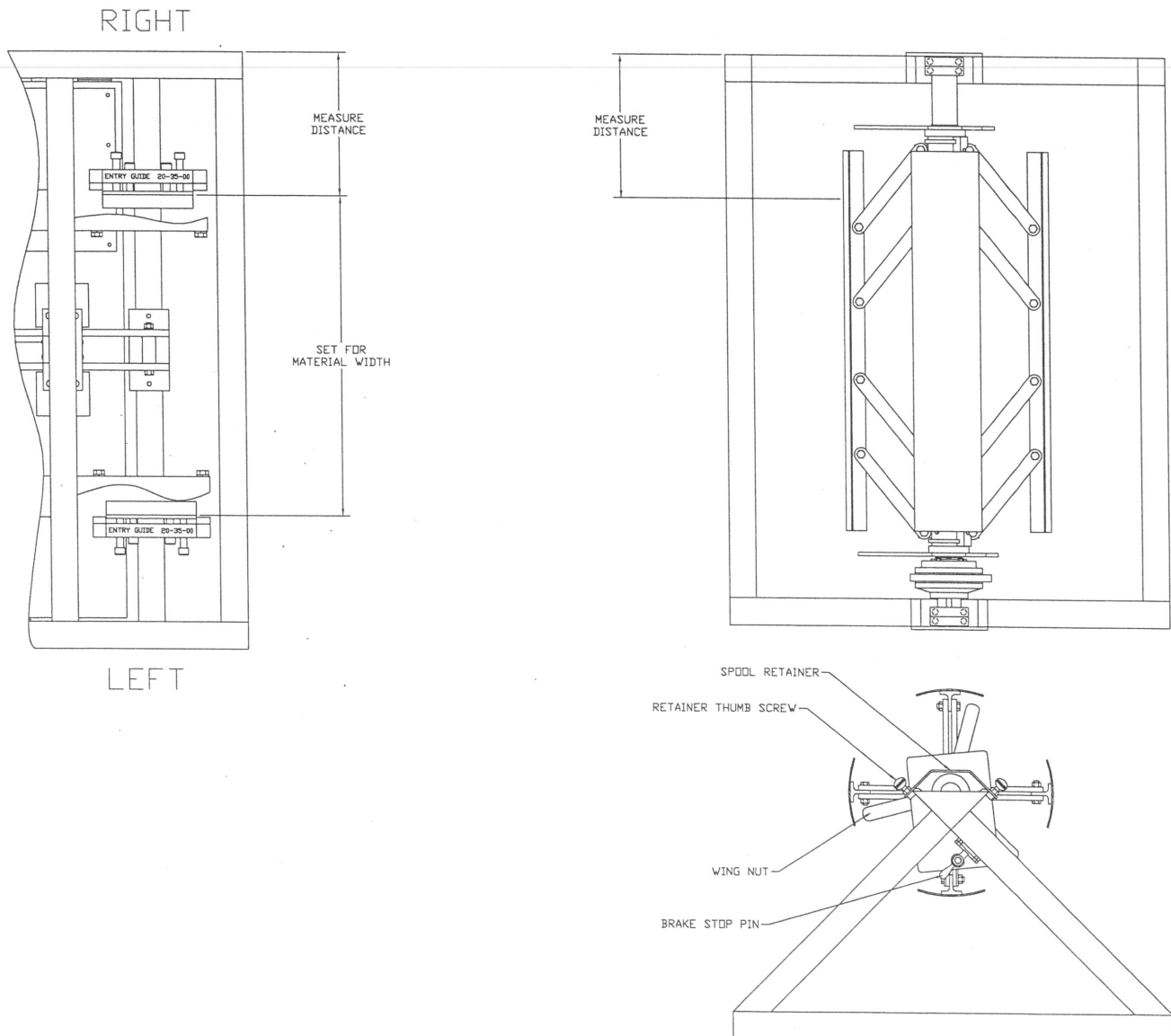


ALIGNMENT OF THE SPOOL

ALIGNMENT OF THE COIL FEEDING INTO THE ENTRY GUIDES IS FAIRLY CRITICAL. THE RIGHT SIDE OF THE EXPANDABLE SPOOL IS ALIGNED WITH THE RIGHT SIDE OF THE MACHINE.

TO OBTAIN PROPER ALIGNMENT, MEASURE THE DISTANCE FROM THE INSIDE OF THE RIGHT ENTRY GUIDE TO THE OUTSIDE OF THE MACHINE. (NOTE: THIS MEASUREMENT WILL ONLY BE ACCURATE AFTER THE MACHINE HAS BEEN SET FOR THE WIDTH OF MATERIAL TO BE RUN.)

MEASURE THE SAME DISTANCE FROM THE RIGHT SIDE OF THE SPOOL STAND AND PLACE A MARK ON THE EXPANDABLE SPOOL. AFTER RELEASING THE BRAKE STOP PIN, REMOVE THE EXPANDABLE SPOOL FROM THE STAND. INSERT THE EXPANDABLE SPOOL THROUGH THE EYE OF THE COIL AND ALIGN THE MARK WITH THE RIGHT SIDE OF THE COIL. ROTATE THE WING NUT CLOCKWISE TO TIGHTEN THE EXPANDABLE SPOOL IN THE I.D. OF THE COIL UNTIL TIGHT. BE SURE TO TIGHTEN BOTH SIDES OF THE EXPANDABLE SPOOL EVENLY.



LOADING THE COIL

AFTER MEASURING THE POSITION OF THE RIGHT ENTRY GUIDE AND MARKING THAT SAME DIMENSION ON THE EXPANDABLE SPOOL, **RELEASE THE SPOOL STOP PIN** AND REMOVE THE EXPANDABLE SPOOL FROM THE STAND.

LOCATE THE END OF THE COIL TO BE SURE THE MATERIAL IS COMING OFF THE ROLL IN THE PROPER DIRECTION FOR FEEDING INTO THE MACHINE.

AT TIMES THROUGH HANDLING OR TURNING THE COIL THE COIL BECOMES SLIGHTLY EGG SHAPED. IF THIS OCCURS, PLACE A STRAP AROUND THE COIL AND LIFT IT JUST ENOUGH TO CAUSE IT TO BECOME ROUND.

ROTATE THE WING NUTS ON THE EXPANDABLE SPOOL COUNTER CLOCKWISE UNTIL THE SPOOL WILL SLIDE INTO THE EYE OF THE COIL. ALIGN THE MARK ON THE EXPANDABLE SPOOL WITH THE RIGHT SIDE OF THE COIL. ROTATE THE WING NUTS CLOCKWISE ON BOTH ENDS OF THE EXPANDABLE SPOOL EVENLY UNTIL TIGHT.

PLACE A NYLON STRAP OR CHAIN THROUGH THE CENTER OF THE COIL AS SHOWN ON THE DIAGRAM NEXT PAGE TO LIFT THE COIL TO PLACE IT IN THE STAND.

WHEN PLACING THE COIL INTO THE SPOOL STAND, BE SURE THE BEARINGS ON THE END OF THE SPOOL SHAFT ARE IN PLACE. ALSO BE SURE THE BRAKE STOP PIN IS RELEASED SO IT WILL NOT INTERFERE AS THE COIL IS LOWERED.

AFTER THE COIL IS LOADED INTO THE SPOOL STAND, ENGAGE THE BRAKE STOP PIN INTO THE HOLE IN THE BRAKE PLATE.

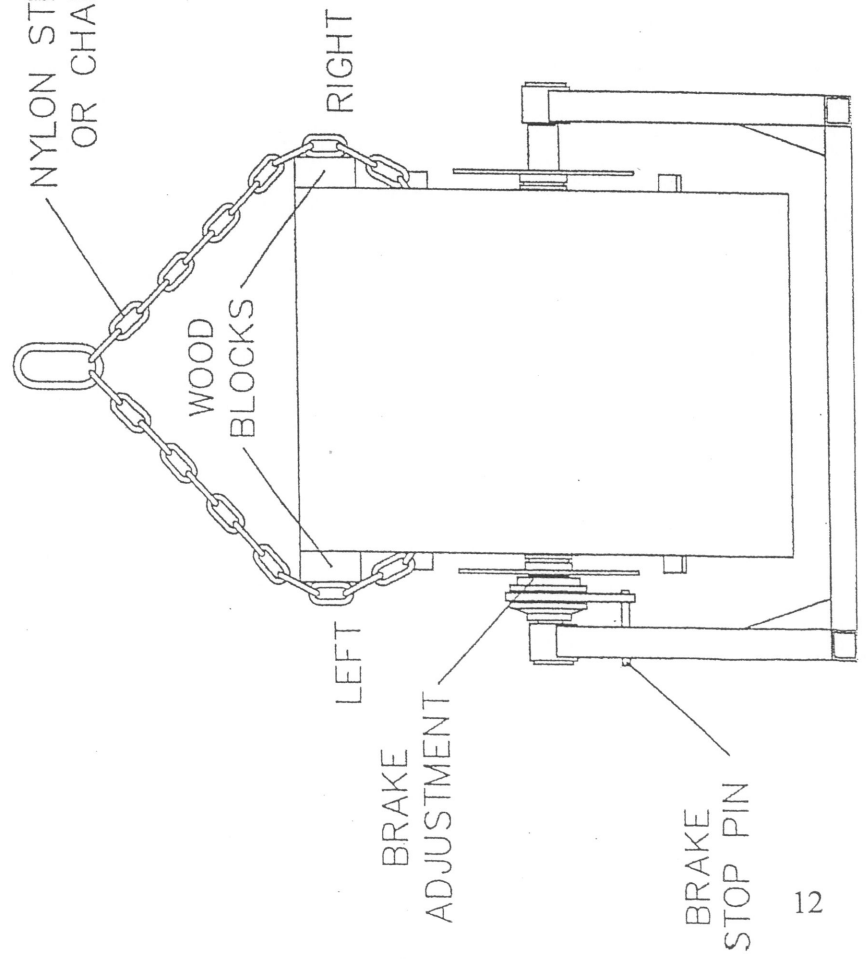
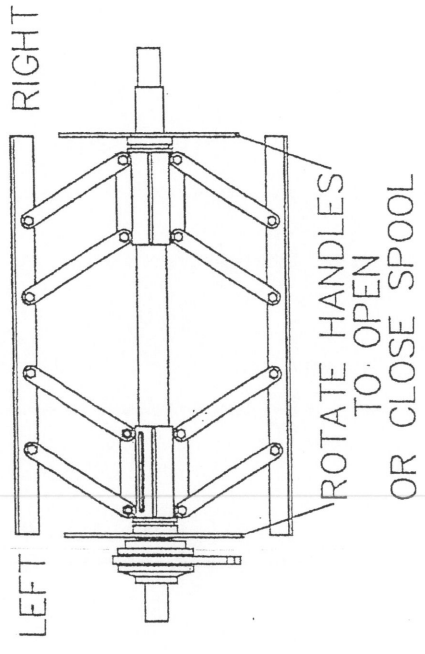
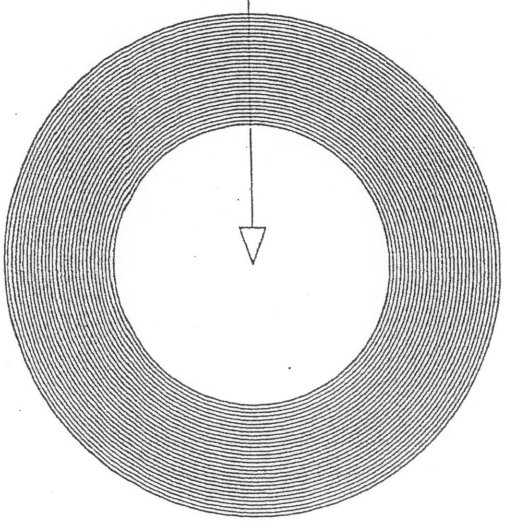
THE BRAKE ASSEMBLY IS ADJUSTABLE TO MAINTAIN THE PROPER AMOUNT OF TENSION ON THE COIL AS IT FEEDS THROUGH THE MACHINE. THERE SHOULD BE ENOUGH TENSION ON THE BRAKE TO KEEP THE COIL FROM UNWINDING AFTER THE MACHINE HAS STOPPED.

TO ADJUST THE BRAKE, USE THE THREE ADJUSTMENT SCREWS. TIGHTEN THE SCREWS FOR MORE TENSION AND LOOSEN THEM FOR LESS TENSION.

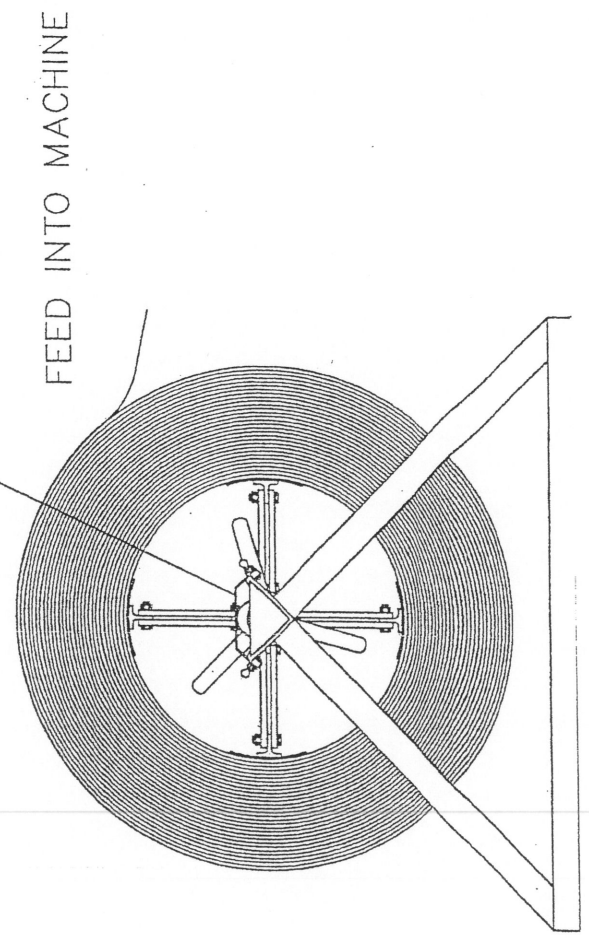
THE EXPANDABLE SPOOL AND STAND HAS 4000 LB. MAXIMUM CAPACITY. ALWAYS USE LIFTING EQUIPMENT PROPERLY RATED TO HANDLE THE LOAD YOU ARE LIFTING.

REFER TO DIAGRAMS NEXT PAGE

LOADING THE COIL



RETAINING STRAPS
2 PLACES



SETTING THE WIDTH OF THE MACHINE

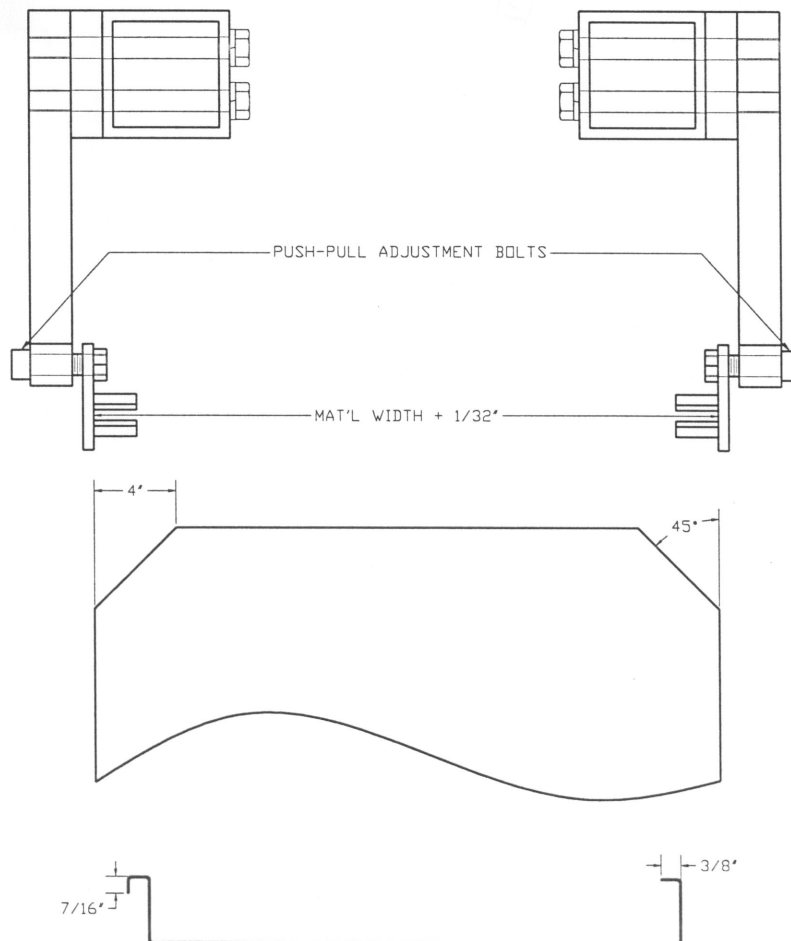
THE MACHINE IS DESIGNED TO RUN FROM 16" TO 28" WIDE MATERIAL. THE SUPPLIED CRANK HANDLE INSERTED INTO THE LEFT SIDE OF THE MACHINE AND ROTATED WILL CHANGE THE WIDTH OF THE MACHINE.

INSERT A SHORT PIECE OF COIL INTO THE ENTRY GUIDES AND ROTATE THE CRANK HANDLE TO SET THE MACHINE AS SHOWN.

USE THE PUSH-PULL ADJUSTMENT BOLTS TO ACHIEVE THE NOTED DIMENSIONS SHOWN ON THE PANEL. MOVING THE ENTRY GUIDES OUT WILL INCREASE THE LENGTH OF THE LEG AND MOVING THE ENTRY GUIDES IN WILL SHORTEN THE LEG. ANY ADJUSTMENT OF THE ENTRY GUIDES WILL REQUIRE RESETTING THE WIDTH OF THE MACHINE.

BE AWARE THAT DIFFERENT COIL TYPES AND GAUGES MAY REQUIRE A SMALL ADJUSTMENT TO MAINTAIN THE DIMENSIONS NOTED ON THE PANEL. BE SURE TO RUN OUT SOME SHORT SAMPLES AND CHECK FOR PANEL QUALITY AND A GOOD FIT WHEN PANELS ARE LAPPED TOGETHER.

TRIM THE LEADING CORNERS OF THE COIL AS SHOWN BEFORE FEEDING MATERIAL INTO THE MACHINE.



STIFFENING RIBS

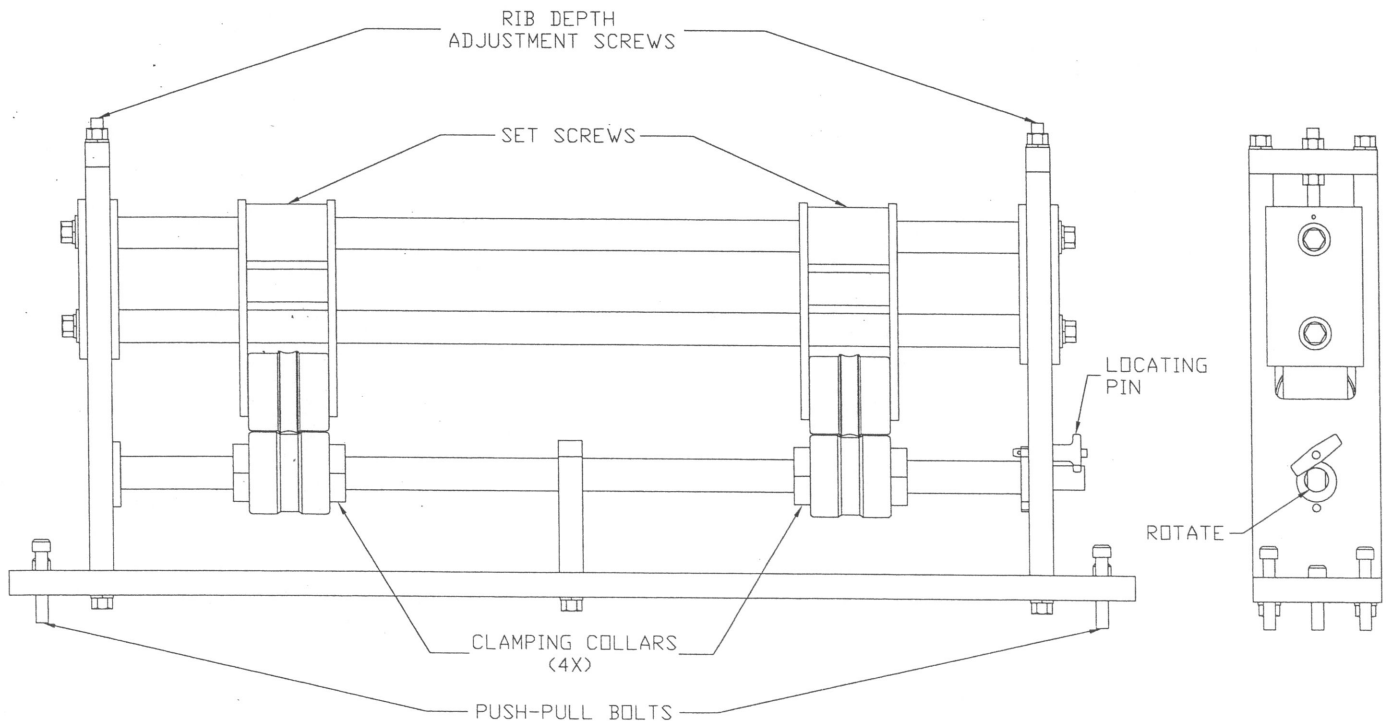
A STIFFENING RIB UNIT IS STANDARD EQUIPMENT ON THIS MACHINE. THE RIB ROLLER ASSEMBLY IS LOCATED AT THE EXIT END OF THE MACHINE BETWEEN THE LAST FORMING ROLLERS AND THE SHEAR ASSEMBLY.

THE PANEL MAY BE RUN WITH OR WITHOUT RIBS. TO ENGAGE RIB ROLLERS REMOVE THE LOCATING PIN IN LEFT SIDE OF THE RIB ROLLER ASSEMBLY. USE A 9/16" OPEN END WRENCH TO ROTATE THE BOTTOM SHAFT 180 DEGREES. REPLACE THE LOCATING PIN TO LOCK THE BOTTOM SHAFT IN PLACE. TO DISENGAGE THE RIBS, REVERSE THIS PROCEDURE.

THE RIB ROLLERS ARE ADJUSTABLE FROM LEFT TO RIGHT FOR THE DESIRED PLACEMENT IN DIFFERENT PANEL WIDTHS. TO LOCATE THE RIB ROLLERS IN THE DESIRED POSITION ON THE PANEL, DISENGAGE THE RIBS. LOOSEN THE ALLEN HEAD SCREW IN THE CLAMPING COLLARS ON EITHER SIDE OF THE ROLLERS ON THE BOTTOM SHAFT. SLIDE THE ROLLERS TO THE DESIRED LOCATION AND TIGHTEN THE CLAMPING COLLARS. LOOSEN THE SET SCREWS IN THE TOP RIB ROLLER UNITS AND LOCATE IN POSITION DIRECTLY ABOVE THE BOTTOM RIB ROLLER AND TIGHTEN THE SET SCREWS. ENGAGE THE RIB ROLLERS AND CHECK TO BE SURE THERE IS NO INTERFERENCE BETWEEN THE TOP AND BOTTOM RIB ROLLERS. BE AWARE IF THE TOP AND BOTTOM RIB ROLLERS ARE IMPROPERLY ALIGNED AND THEN ENGAGED, DAMAGE MAY OCCUR TO THE ROLLERS.

THE RIB ROLLER ASSEMBLY IS ADJUSTABLE TO MATCH THE PASS LINE OF THE PANEL. USE THE PUSH-PULL BOLTS TO ADJUST TO THE PROPER LOCATION. THE HEIGHT SHOULD BE SET WHERE THE BOTTOM RIB ROLLER JUST TOUCHES THE PANEL WHEN THE RIB ROLLER ARE DISENGAGED.

THE DEPTH OF THE RIB MAY BE ADJUSTED USING THE ADJUSTMENT SCREWS ON THE TOP OF THE UNIT. DO NOT OVER TIGHTEN. ATTEMPTING TO PUT THE RIBS IN TOO DEEP MAY CAUSE DISTORTION IN THE PANEL.



SETTING THE SHEAR

DO NOT ATTEMPT TO MAKE ANY ADJUSTMENTS WITH THE ENGINE RUNNING OR THE POWER SOURCE CONNECTED!

THE SHEAR DIE INSERTS NEED TO BE SET WHEN CHANGING WIDTH OF COIL OR ANYTIME A CHANGE IS MADE IN THE WIDTH ADJUSTMENT ASSEMBLY.

TO SET THE SHEAR DIE INSERTS, REMOVE THE 3/8" MOUNTING BOLTS (8 TOTAL) ON THE ENTRY AND EXIT SIDES OF THE SHEAR. SLIDE THE DIE INSERTS TO THE OUTSIDE OF THE MACHINE. CAREFULLY JOG THE PANEL UP TO THE SHEAR ASSEMBLY. ALIGN THE SHEAR DIE INSERTS WITH THE PANEL AND REPLACE THE MOUNTING BOLTS FINGER TIGHT. JOG THE PANEL THROUGH THE SHEAR ASSEMBLY. FINE ADJUST THE SHEAR DIE INSERTS AS CLOSE TO THE PANEL AS POSSIBLE WITHOUT TOUCHING. TIGHTEN ALL 8 MOUNTING BOLTS.

JOG A SHORT PANEL OUT OF THE MACHINE AND ACTIVATE THE SHEAR CYCLE. INSPECT THE PANEL FOR ANY MARKING OR DEFORMATION AND MAKE THE NECESSARY ADJUSTMENTS.

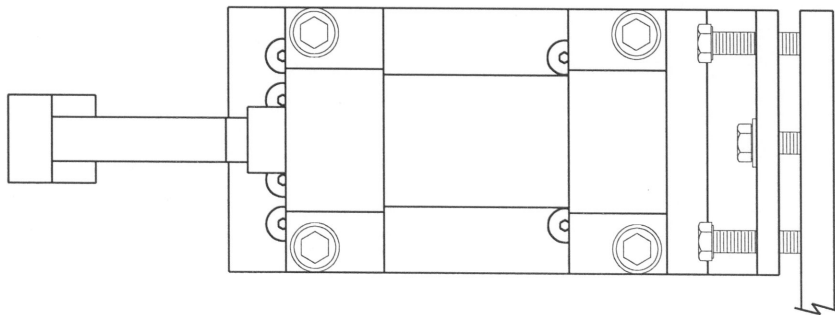
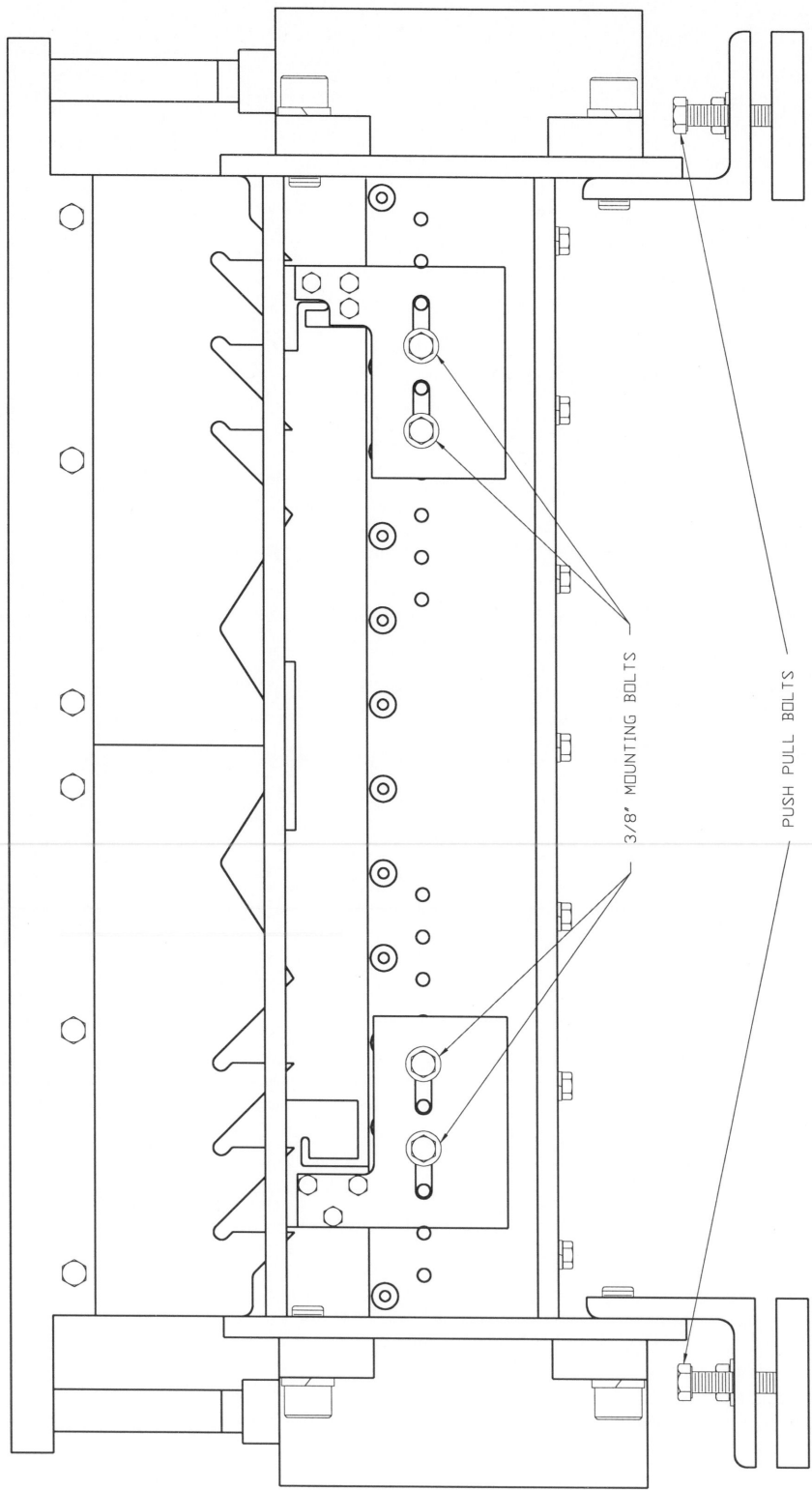
IF THE WIDTH OF THE MATERIAL YOU ARE USING CAUSES THE POINT OF THE SHEAR BLADE TO HIT DIRECTLY ON TOP OF ONE OF THE PANEL LEGS, THE SHEAR ASSEMBLY MAY NEED TO BE ADJUSTED Laterally. TO DO THIS, LOOSEN THE CENTER BOLTS IN THE SHEAR MOUNTING ANGLE. MOVE THE SHEAR TO THE LEFT OR RIGHT TO POSITION THE POINT OF THE BLADE OFF THE LEG OF THE PANEL AND TIGHTEN THE BOLTS. THE SHEAR CANNOT BE MOVED LEFT OR RIGHT WITHOUT RESETTING THE SHEAR DIE INSERTS.

THE HEIGHT OF THE SHEAR ASSEMBLY IS ADJUSTABLE BY USE OF THE PUSH-PULL BOLTS IN THE SHEAR MOUNTING ANGLES. TO RAISE THE SHEAR ASSEMBLY, LOOSEN THE CENTER BOLT AND TIGHTEN THE TWO OUTSIDE BOLTS. REVERSE THIS PROCEDURE TO LOWER THE SHEAR ASSEMBLY. SET THE HEIGHT OF THE SHEAR TO JUST CLEAR THE BOTTOM OF THE PANEL.

A SHEAR ASSEMBLY ADJUSTED IMPROPERLY WILL AFFECT THE STRAIGHTNESS AND QUALITY OF THE PANEL.

REFER TO SHEAR ASSEMBLY DIAGRAM NEXT PAGE

VIEW FROM EXIT END

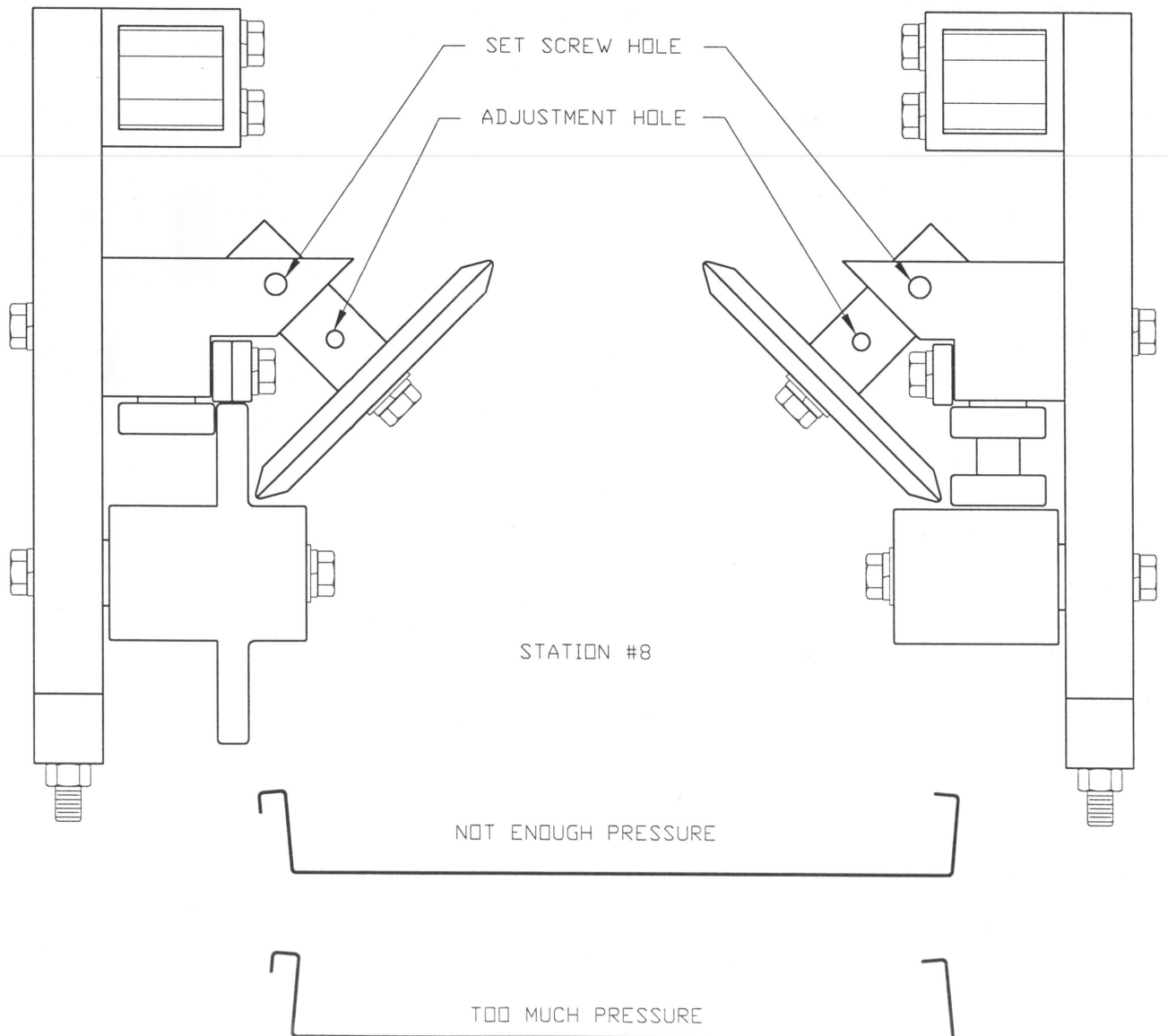


PROFILE ADJUSTMENTS

STATION #8, LEFT AND RIGHT, HAVE TOP ROLLERS MOUNTED ON AN ECCENTRIC SHAFT AT AN ANGLE TO THE BOTTOM OF THE PANEL. THESE STATIONS ARE USED TO HELP MAINTAIN 90 DEGREES ON THE VERTICAL LEGS OF THE PANEL.

TO ADJUST LOOSEN THE SET SCREW IN THE ANGLE BLOCK AND INSERT THE 3/16" ALLEN WRENCH IN THE DRILLED HOLE IN THE ECCENTRIC SHAFT AND ROTATE THE SHAFT. MAKE THIS ADJUSTMENT WITH MATERIAL IN THE MACHINE TO INSURE THE ANGLE ROLLER IS SET IN THE CORNER OF THE PANEL.

MAKE THIS AND ALL ADJUSTMENTS IN SMALL INCREMENTS. BE AWARE THAT OVER ADJUSTING MAY HAVE A NEGATIVE EFFECT ON THE PANEL OR MAY CAUSE DAMAGE TO THE MACHINE.



CURVATURE ADJUSTMENTS

STATION #7 AND STATION #9 IN THE MACHINE ARE ADJUSTABLE TO INSURE THE PANEL WILL RUN WITHOUT UPHILL OR DOWNHILL CURVATURE.

UPHILL CURVATURE IS WHEN BOTH ENDS OF A PANEL RISE UP FROM A FLAT SURFACE WHILE THE CENTER TOUCHES. DOWNHILL CURVATURE IS WHEN BOTH ENDS OF A PANEL TOUCH A FLAT SURFACE AND THE CENTER IS RAISED UP.

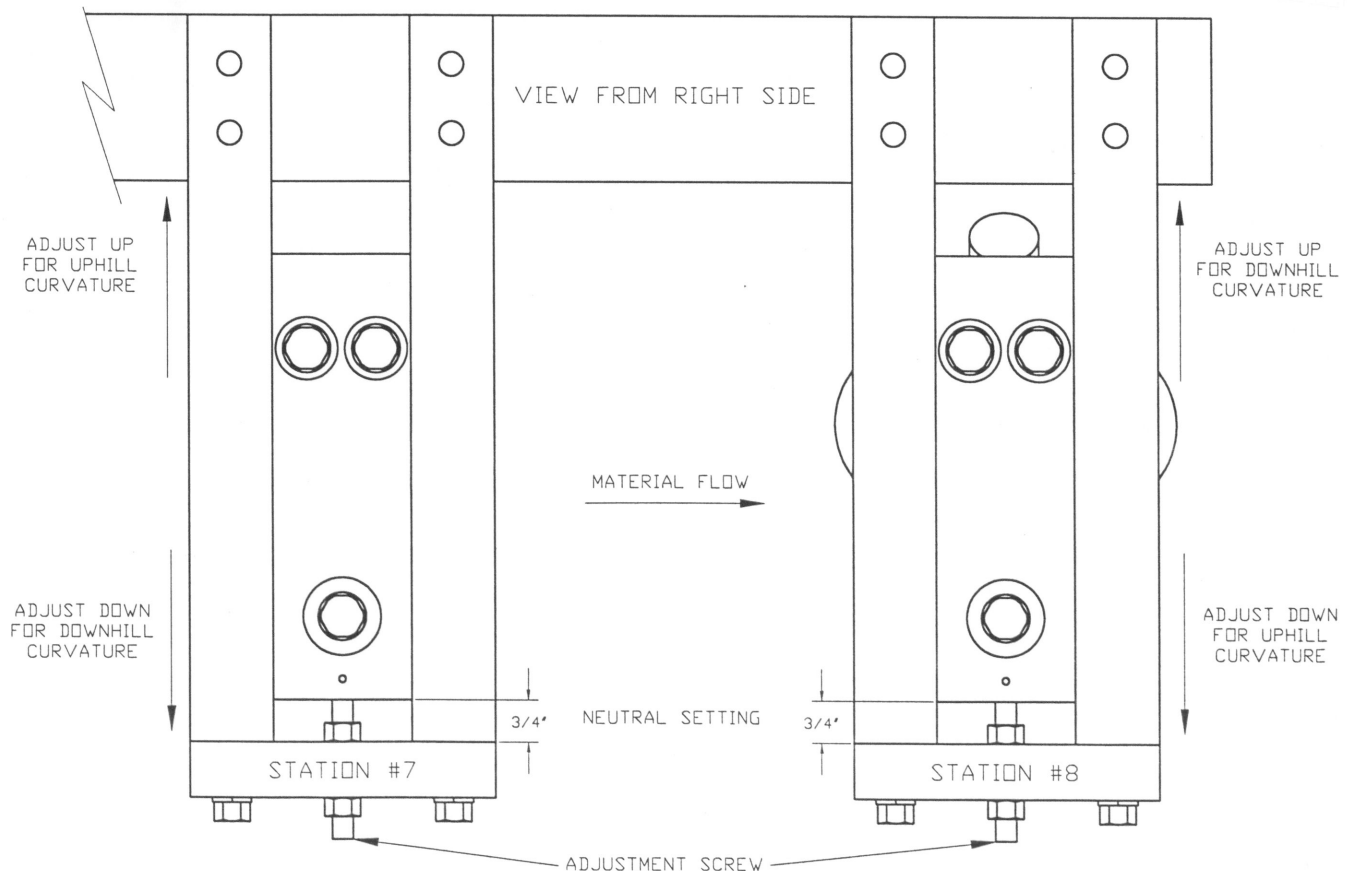
IF A PANEL HAS UPHILL CURVATURE, ADJUST STATION #9 UP. THE PANEL SHOULD REACT TO A SMALL AMOUNT OF ADJUSTMENT. MAKE THE ADJUSTMENTS IN $\frac{1}{4}$ TO $\frac{1}{2}$ TURN INCREMENTS. JOG THE MACHINE FORWARD PAST THE ADJUSTMENT AND CUT. RUN A PANEL LONG ENOUGH TO SEE IF THE DESIRED RESULT WAS ACHIEVED. IF THE PANEL STILL HAS UPHILL CURVATURE, ADJUST STATION #10 DOWN. AT NO TIME SHOULD MORE THAN $1 \frac{1}{2}$ TURNS OF EACH ADJUSTMENT SCREW BE REQUIRED.

IF ADJUSTMENTS ARE MADE AND THE RESULTS ARE NOT SATISFACTORY, RESET STATION #7 AND STATION #8 AT THE NEUTRAL POSITION, AND ATTEMPT THE PROCEDURE AGAIN.

IF THE PANEL HAS DOWNHILL CURVATURE REVERSE THE ABOVE ADJUSTMENT PROCEDURE.

THE SAME ADJUSTMENT PROCEDURE IS USED FOR BOTH THE MALE AND FEMALE LEGS OF THE PANEL.

IF ADJUSTMENTS ARE MADE TO STATION #8, THE HEIGHT OF THE SHEAR MAY NEED TO BE RESET.



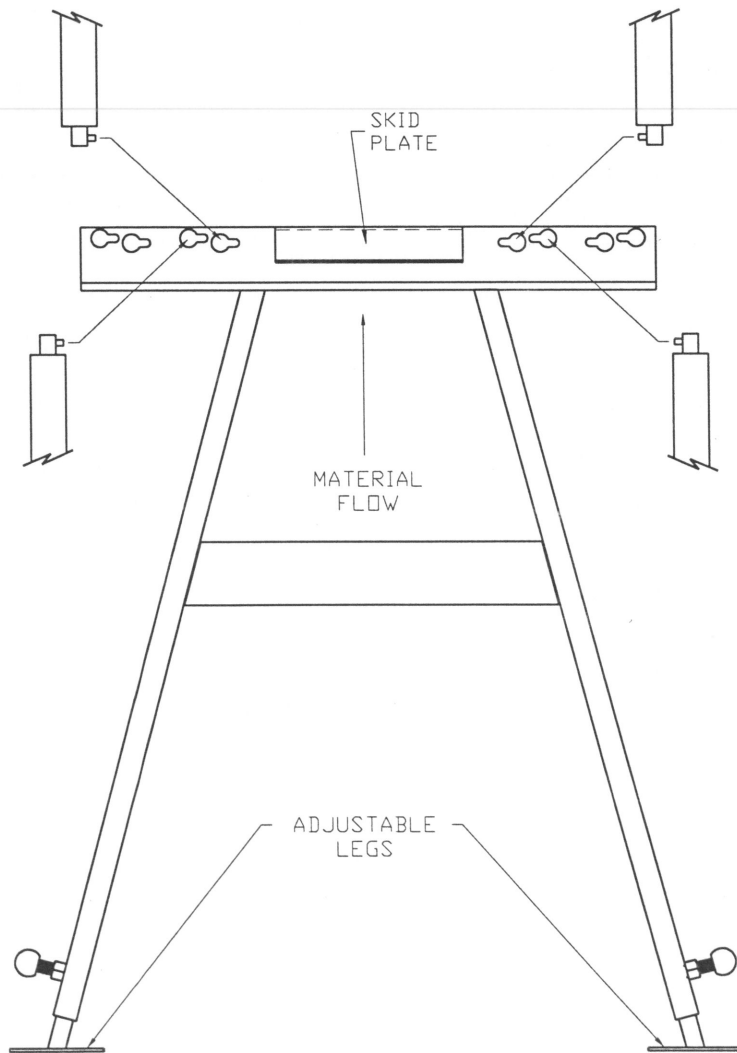
THE RUN-OUT STANDS

THE RUN-OUT STANDS HAVE KEYED HOLES FOR MOUNTING THE RUN-OUT POLES. THESE KEYED HOLES HAVE TWO DIFFERENT HEIGHTS.

TO PROPERLY SET UP THE RUN-OUT STANDS THE RUN-OUT POLES MUST BE MOUNTED IN THE HIGHEST HOLES ON THE ENTRY SIDE OF THE RUN-OUT STAND AND IN THE LOWEST HOLES ON THE EXIT SIDE OF THE RUN-OUT STAND. THE STAND MUST ALSO BE PLACED WITH THE SKID PLATE TOWARD THE ENTRY END. IF THE STANDS ARE SET UP IN THIS MANNER, THE PANEL WILL RUN OUT WITH OUT CATCHING ON THE STANDS.

THE END STOP LIMIT SWITCH IS MOUNTED BY SLIDING IT ON THE RUN-OUT POLE AND LOCKING IT IN THE DESIRED LOCATION WITH THE THUMB SCREW.

USE THE ADJUSTABLE LEGS TO MAKE SURE THE STANDS ARE LEVEL WITH THE MACHINE.



TROUBLE SHOOTING INSTRUCTIONS

When trouble shooting remove power by unplugging unit from main power source.

- A. Motor doesn't run or starter doesn't pull in when the E-Stops are pulled out
1. Using a volt/ohm meter - pull fuses from fuse holder and check condition of fuses - should be (0 ohms). Replace bad fuses.
 - a. Fuses good - re-install
 1. Check overload (OL) for a tripped state - Depress reset
 - a. Using a volt/ohm meter - check for continuity from wire #4 and white wire on overload relay - should be 0 ohms

CHECK WITH POWER OFF AND POWER CORD UNPLUGGED

- B. Starter pulls in, but motor doesn't run
1. Bad Motor - replace
- C. Starter pulls in, motor tries to run - (makes a grunting noise)
1. Bad Motor - replace
 2. Incoming voltage to low - Check voltage and extension cord for proper size
- D. Unit tripping breaker (Power feed from source)
1. Bad breaker or too small of rating - Must be 30 Amps.
 2. Check extension cord for proper size and condition - See instruction manual
 3. Motor bad
- E. Unit doesn't run in Hand or Automatic Mode, but motor is running
1. Check Run on light on PLC - Light must be on when motor is running
 2. Check for any lights on PLC - Motor must be running
 - a. No lights -- Pull fuse from fuse holder and use a volt/ohm meter check condition of fuses - should be (0 ohms). Replace bad fuse
REPLACE WITH SAME STYLE OF FUSE (ATMR-2) or equal
CHECK WITH POWER OFF AND POWER CORD UNPLUGGED
 - b. If fuse continues to blow - a short exists
possible problems -
 1. solenoid coils bad
 2. short in limit switches, material end stop switch, pendant, PLC
 3. Check Error light on PLC should be off
- F. Unit doesn't run in Hand either direction - Motor must be running
1. Check PLC input 7 wire #23 - should be on -- Blade up limit switch
 2. Check PLC input 2 wire #7 - should be on -- Pendant in hand mode and stop button pulled out

3. Check PLC input 0 wire #8 - should be on -- When Pendant momentary selector switch is made in the Forward selection
 - Check PLC output 0 wire #24 - should be on (forward power to solenoid)
4. Check PLC input 1 wire #10 - should be on -- When Pendant momentary selector switch is made in the Reverse selection
 - Check PLC output 1 wire #25 - should be on (reverse power to solenoid)
5. Check "E" above
6. Bad pendant - cord can be checked for continuity - see schematic

When trouble shooting remove power by unplugging unit from main power source.

- G. Unit doesn't (shear down) in Hand - Motor must be running
 1. Check PLC input 2 wire #7 - Must be on before going down -- Pendant in Hand mode and Stop button pulled out
 2. Check PLC input 5 wire #17 - should be on - When Pendant Down is depressed
 - Check PLC output 2 wire #26 - should be on
 4. Check "E" above
 5. Prior to going down - PLC input 6 wire #16 and input 7 wire #23 should be on - Indicating blade is in the up position
 6. When going down - PLC input 6 wire #16 should be on and input 7 wire #23 should be off
 7. Bad pendant - cord can be checked for continuity - see schematic
- H. Unit does down shear in Hand - but shear doesn't return up
 1. Check PLC input 2 wire #7 - should be off in the down position
 2. At the Down position - PLC input 6 wire #16 and input 7 wire #23 should be off
 3. At the Mid position - PLC input 6 wire #16 should be on and input 7 wire #23 should be off
 4. At the Top position - PLC input 6 wire #16 and input 7 wire #23 should be on

If these items check good - unit should be able to run in the Hand control using the momentary selector switch for forward and reverse direction and a shear down cycle should operate.

- I. Unit won't run in Auto mode but will run in the Hand mode
 1. Check PLC input 8 wire #11 - should be on -- Material limit switch is made (no material)
 2. Check PLC input 7 wire #23 - should be on -- Blade up limit switch
 - Check PLC input 6 wire #16 - should be on -- Blade up limit switch
 3. Check PLC input 3 wire #12 - should be on -- Pendant in auto mode and stop button pulled out

4. Check PLC input 4 wire #14 - should be on -- When Pendant is in auto mode, stop button pulled out, the motor is running, and start button is depressed

J. If no material end limit switch is used -- set Pot 1 to 0%

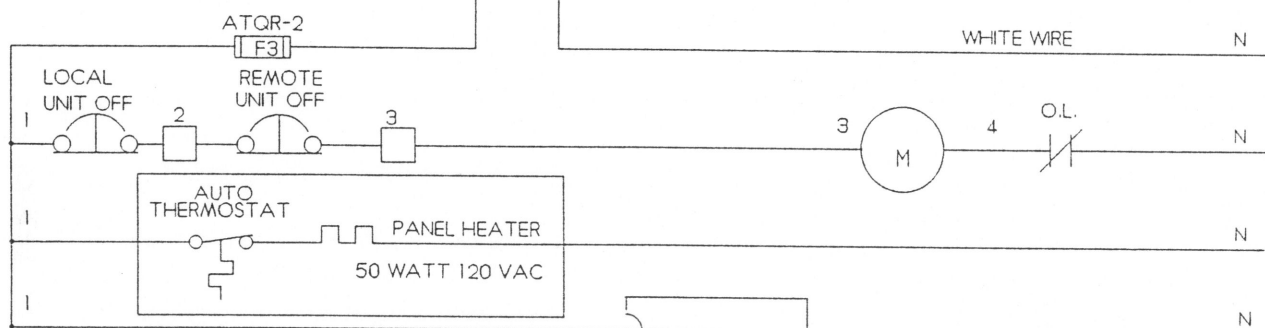
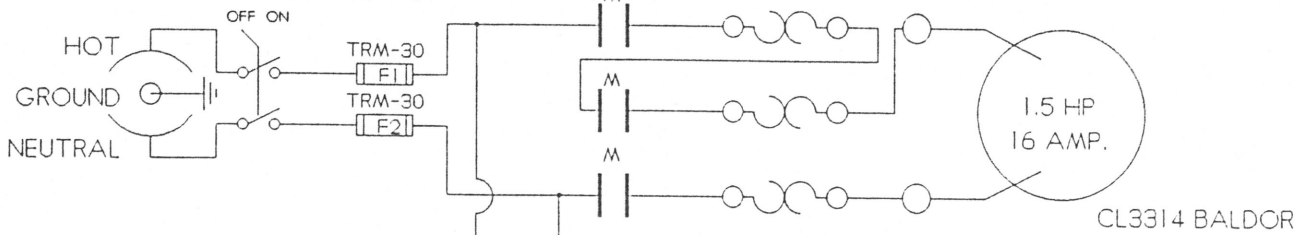
If material end limit switch is used -- set Pot 1 to 100%

K. Unit works improperly

1. Extension cord supplying power to unit too small

2. Check AC voltage at unit while running - should be 120 VAC. (+ / - 5%)

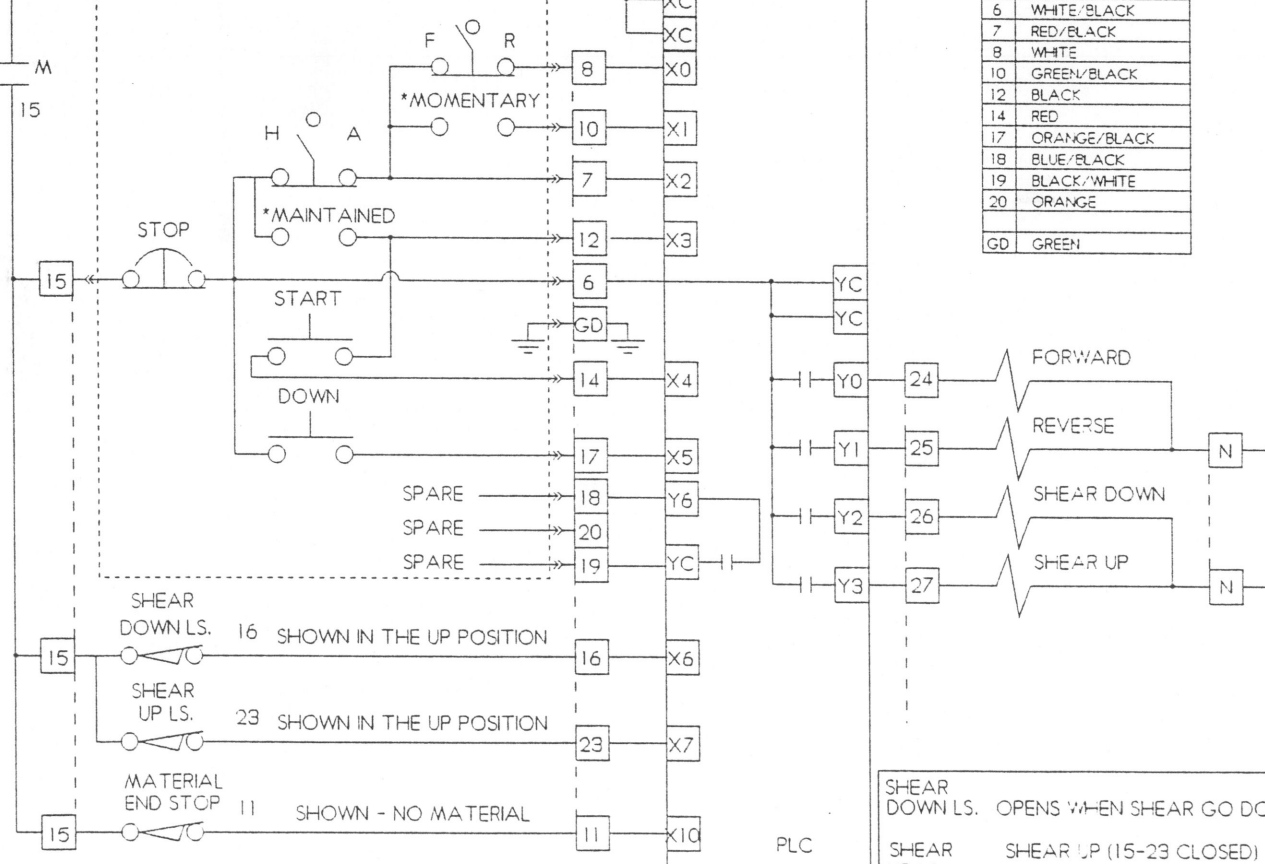
30 AMP 120 VAC. 50/60 HERTZ



12 PIN PENDANT STATION

PENDANT COLOR CODE

#	COLOR
15	BLUE
6	WHITE/BLACK
7	RED/BLACK
8	WHITE
10	GREEN/BLACK
12	BLACK
14	RED
17	ORANGE/BLACK
18	BLUE/BLACK
19	BLACK/WHITE
20	ORANGE
GD	GREEN

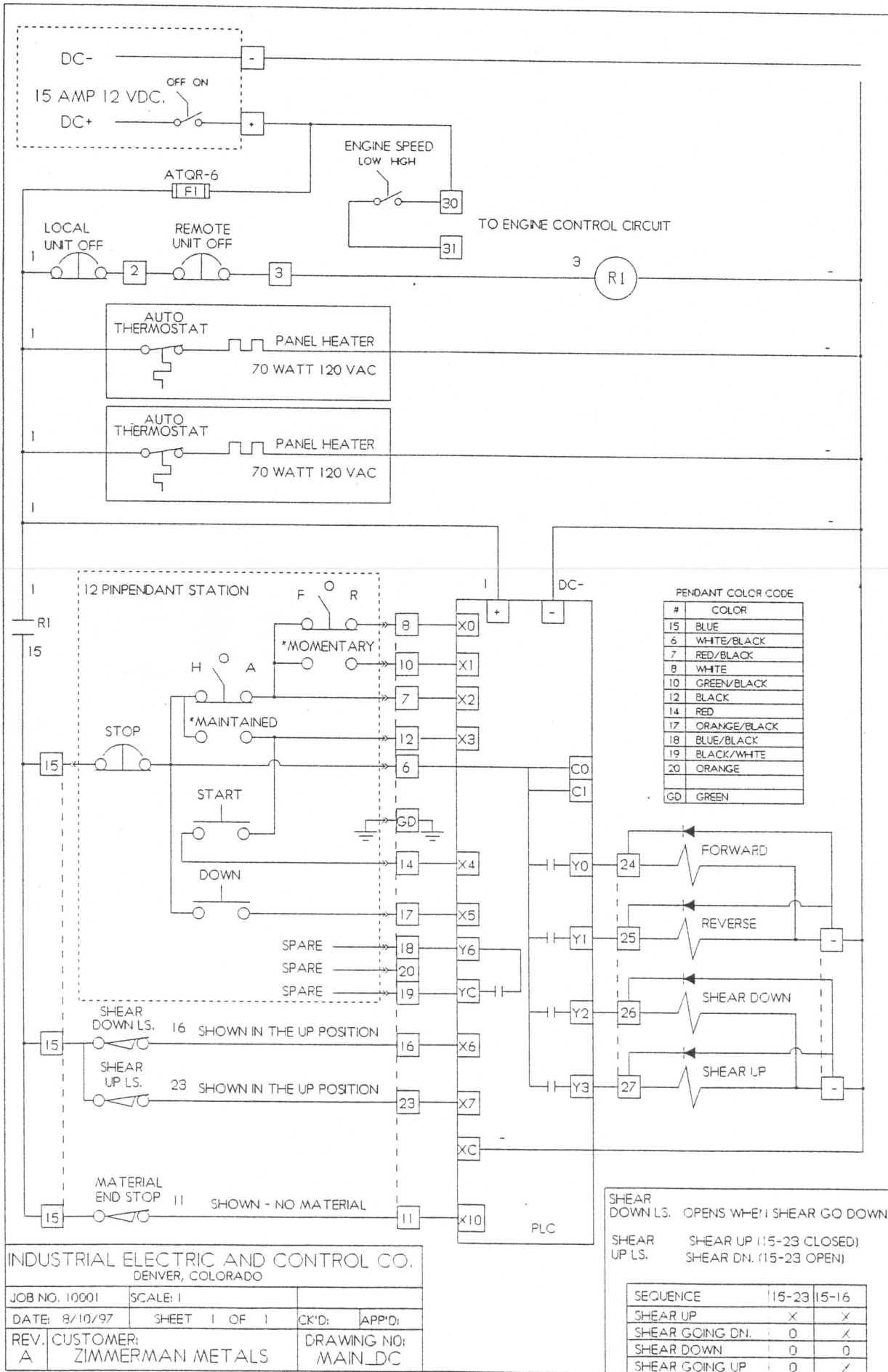


SHEAR DOWN LS. OPENS WHEN SHEAR GO DOWN
 SHEAR UP LS. SHEAR UP (15-23 CLOSED) SHEAR DN. (15-23 OPEN)

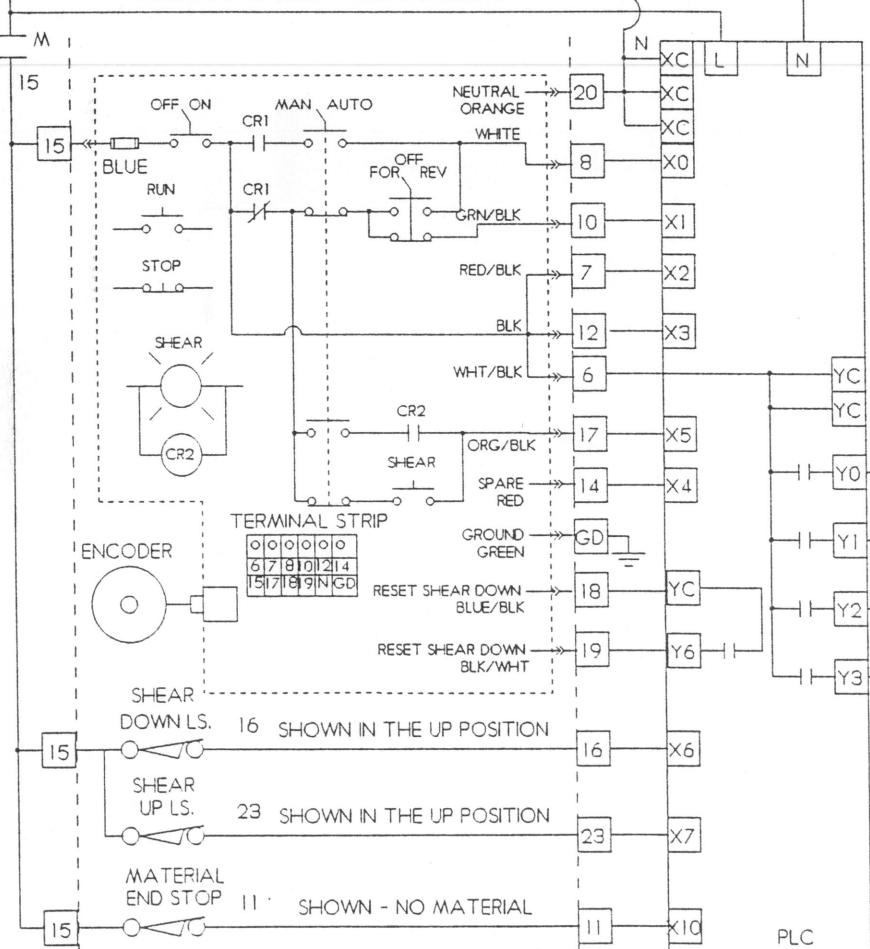
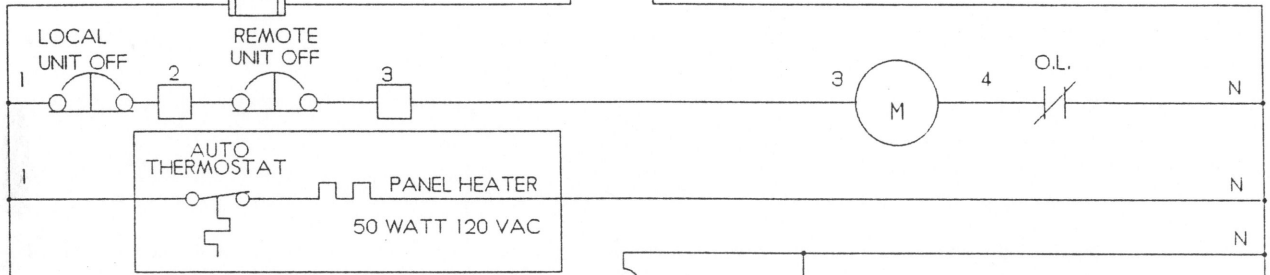
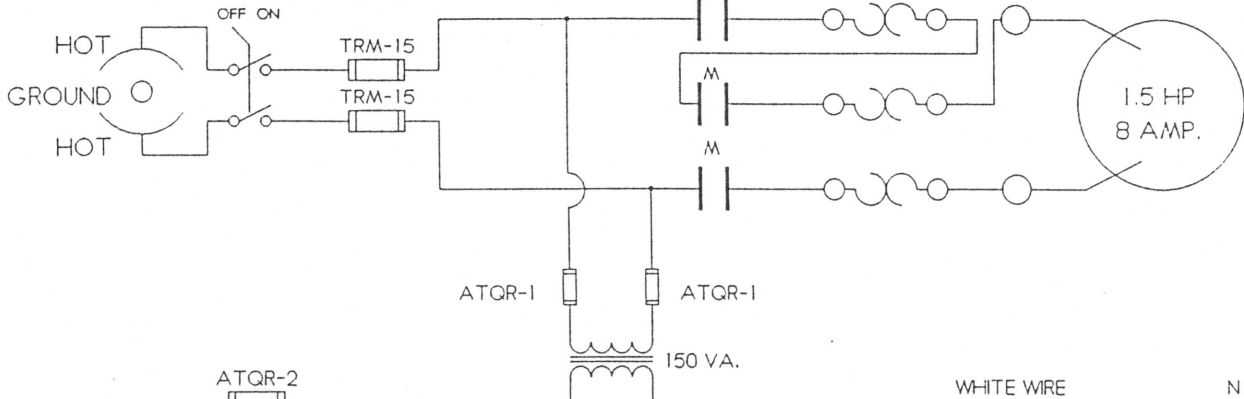
SEQUENCE	15-23	15-16
SHEAR UP	X	✓
SHEAR GOING DN.	0	✓
SHEAR DOWN	0	0
SHEAR GOING UP	0	✓

INDUSTRIAL ELECTRIC AND CONTROL CO.
 DENVER, COLORADO

JOB NO. 10001	SCALE: 1	
DATE: 4/10/97	SHEET 1 OF 1	CK'D: APP'D:
REV. E	CUSTOMER: ZIMMERMAN METALS	DRAWING NO: 120/KOTO

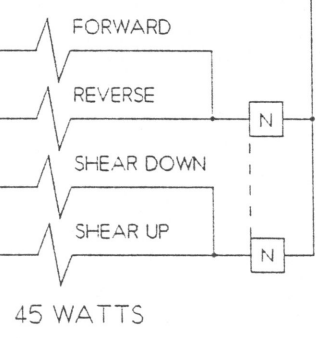


15 AMP 240 VAC, 50/60 HERTZ



PENDANT COLOR CODE

#	COLOR
15	BLUE
6	WHITE/BLACK
7	RED/BLACK
8	WHITE
10	GREEN/BLACK
12	BLACK
14	RED
17	ORANGE/BLACK
18	BLUE/BLACK
19	BLACK/WHITE
20	ORANGE
GD	GREEN

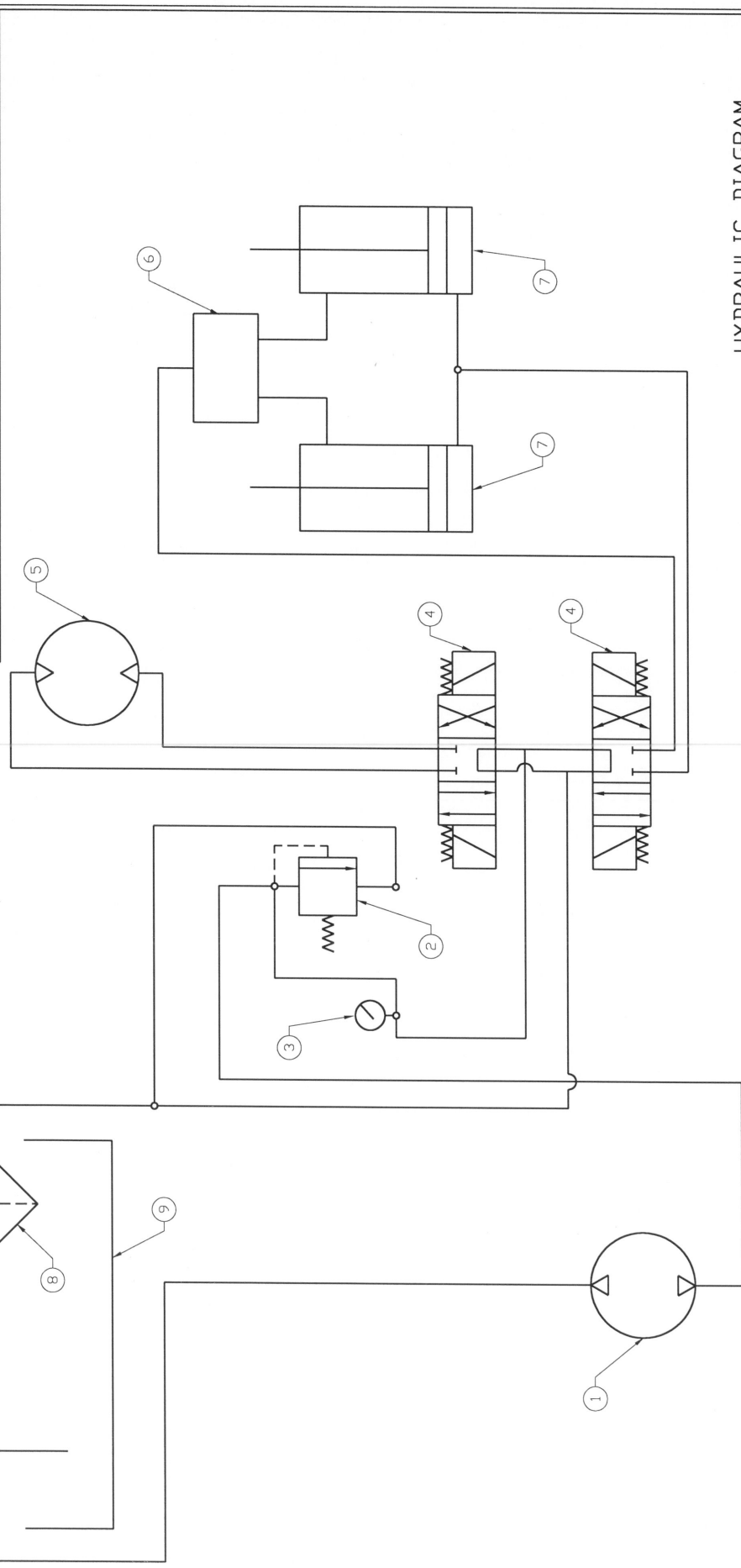


SHEAR DOWN LS. OPENS WHEN SHEAR GO DOWN
 SHEAR UP LS. SHEAR UP (15-23 CLOSED) SHEAR DN. (15-23 OPEN)

SEQUENCE	15-23	15-16
SHEAR UP	X	✓
SHEAR GOING DN.	0	✓
SHEAR DOWN	0	0
SHEAR GOING UP	0	✓

INDUSTRIAL ELECTRIC AND CONTROL CO.
 DENVER, COLORADO
 JOB NO. 10001 SCALE: 1
 DATE: 3/10/98 SHEET 1 OF 1 CK'D: APP'D:
 REV. E CUSTOMER: ZIMMERMAN METALS DRAWING NO: 240-MP400

ITEM	QTY	PART NO.	DESCRIPTION
1	1	1300098 (ELEC MOTOR)	BARNES *S* SERIES PUMP
1A	1	1300635 (GAS ENGINE)	BARNES *S* SERIES PUMP
2	1	RV-4L	PRINCE RELIEF VALVE
3	1	CFIP-210A	PDI PRESSURE GAUGE
4	2	V55M-3L-GB-60-J (120VAC)	CONTINENTAL SLENOID VALVE
4A	2	V55M-3L-GB-75-J (12VDC)	CONTINENTAL SLENOID VALVE
5	1	103-1013-010	CHAR-LYNN HYD MOTOR
6	1	1300634	BARNES FLOW DIVIDER
7	2	H-025-SL-0100-1-NC-S-B-4.00	ATLAS HYD CYLINDER
8	1	FRA21-N-04-B-N-CC-01-W	UFI RETURN LINE FILTER
9	1	E24-36-00	HYDRAULIC TANK



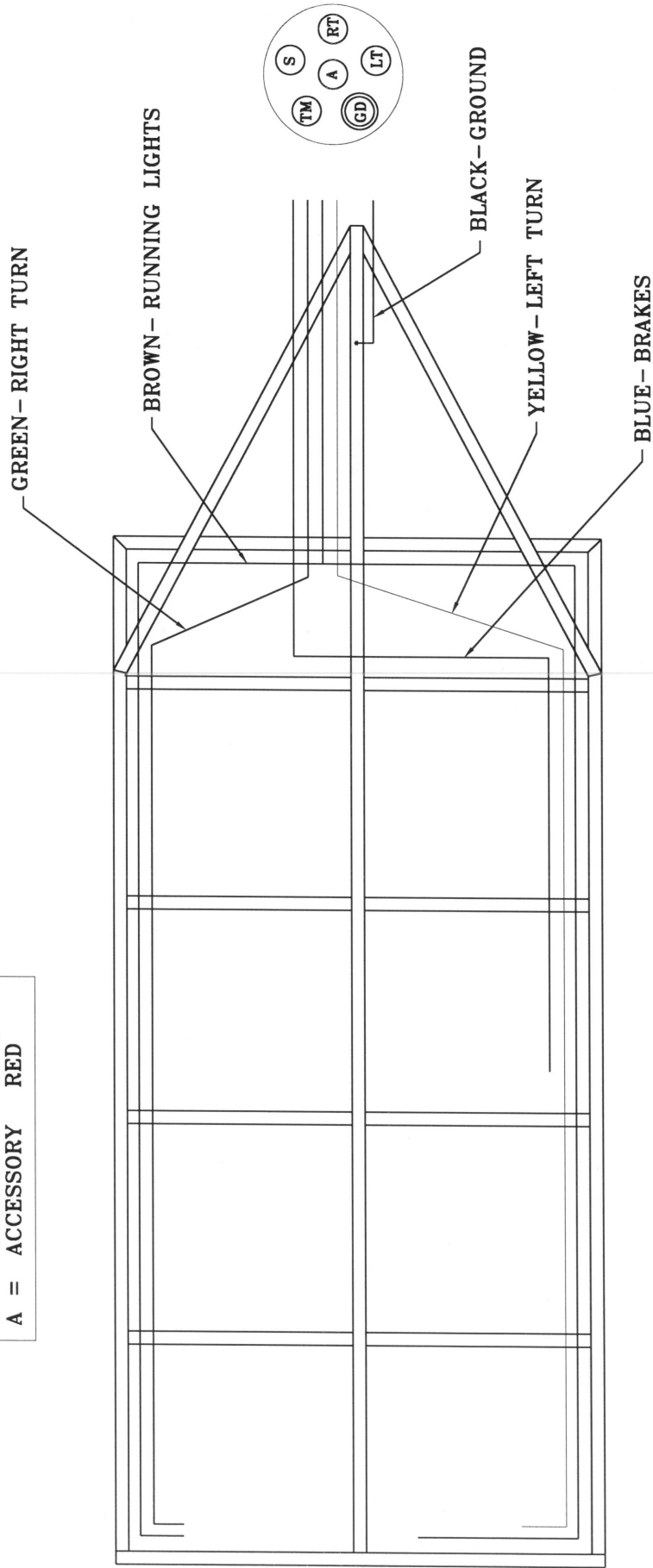
HYDRAULIC DIAGRAM

PART NO.	24-00-36
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	

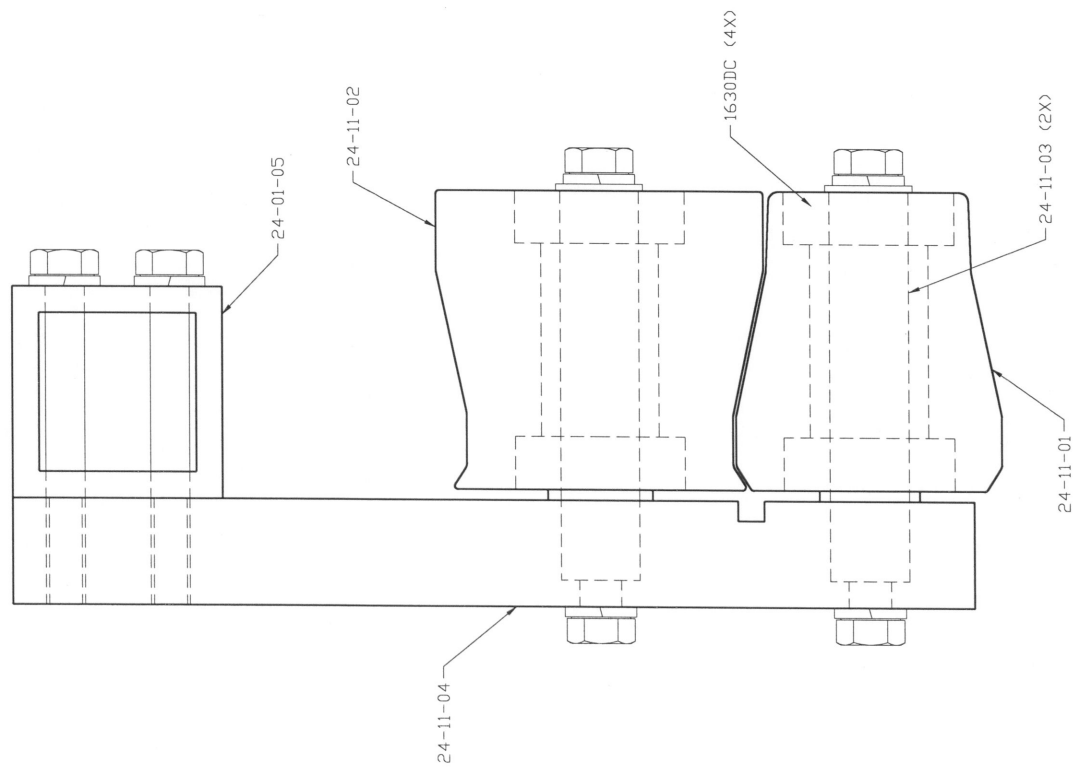
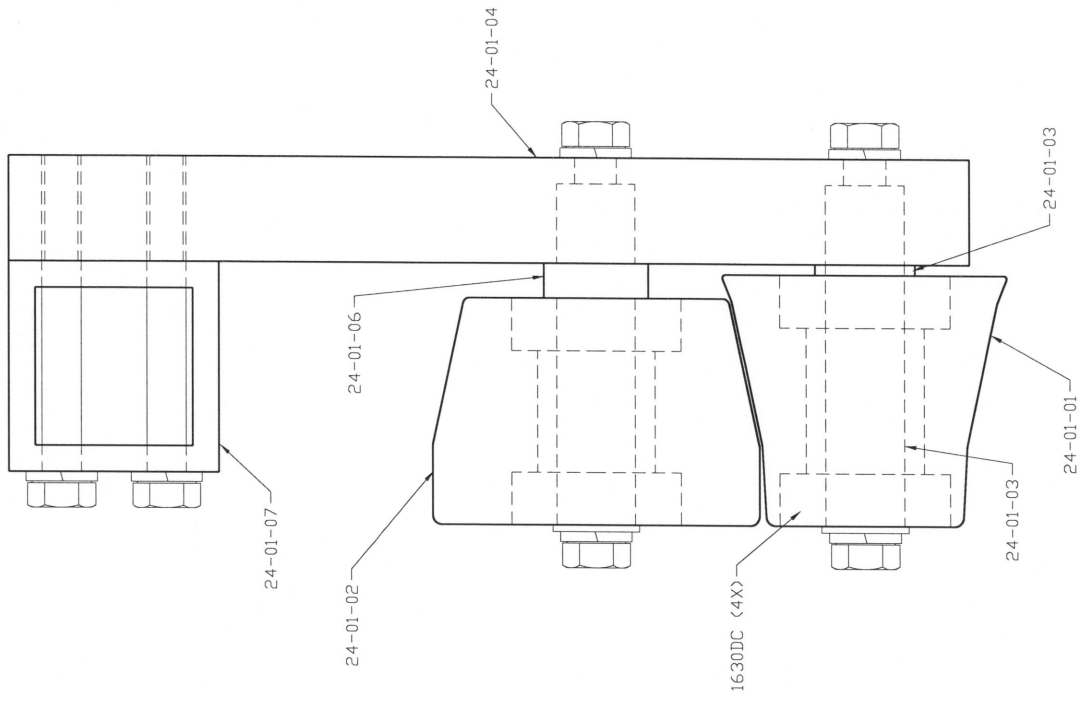
24-90-WD

TRAILER
WIRING DIAGRAM

TM=	TAIL LIGHTS	BROWN
GD=	GROUND	BLACK
LT=	LEFT TURN	YELLOW
RT=	RIGHT TURN	GREEN
S =	BRAKES	BLUE
A =	ACCESSORY	RED

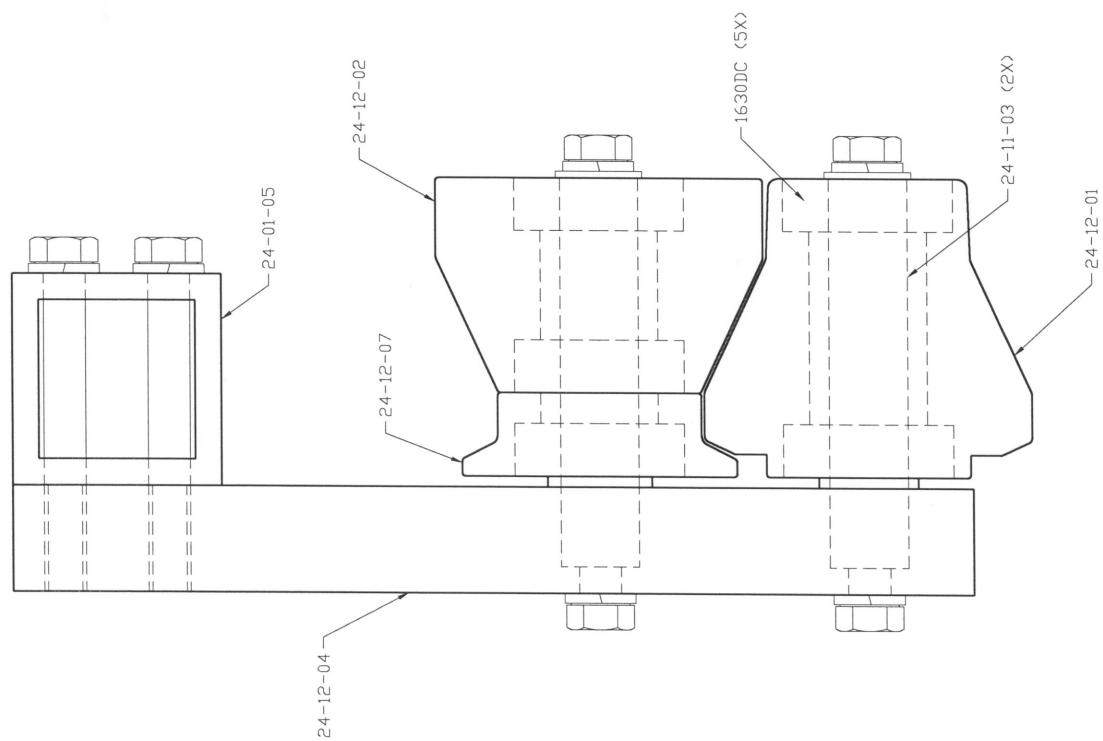
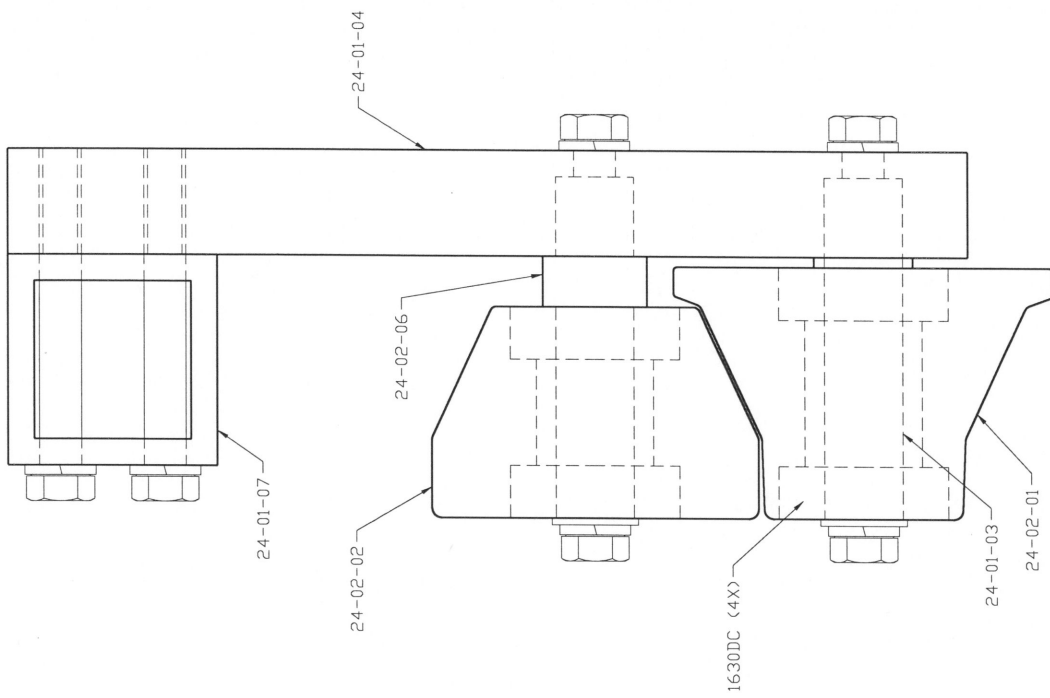


TRAILER VIEWED FROM BOTTOM



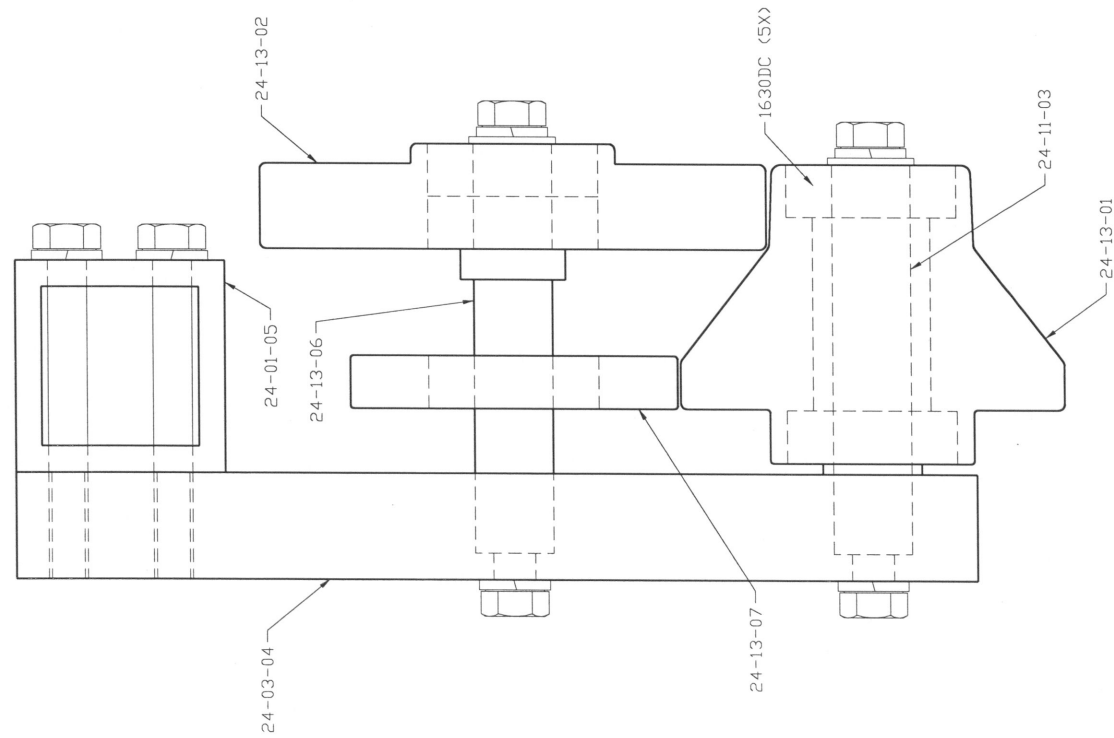
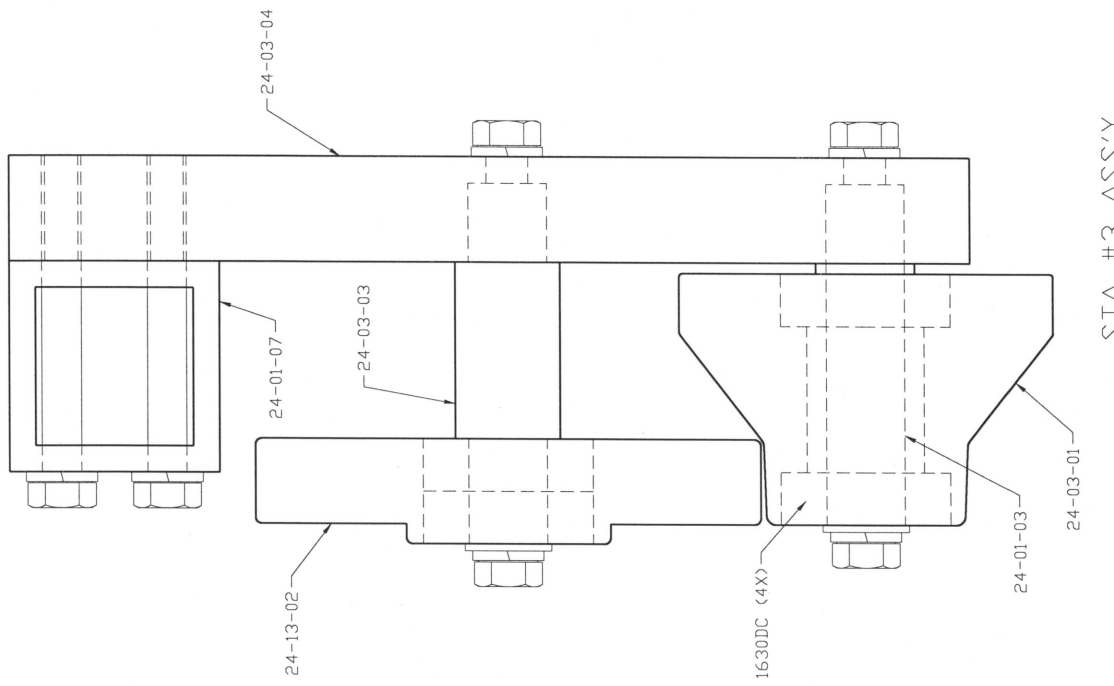
STA #1 ASS'Y

PART NO.	24-00-01
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



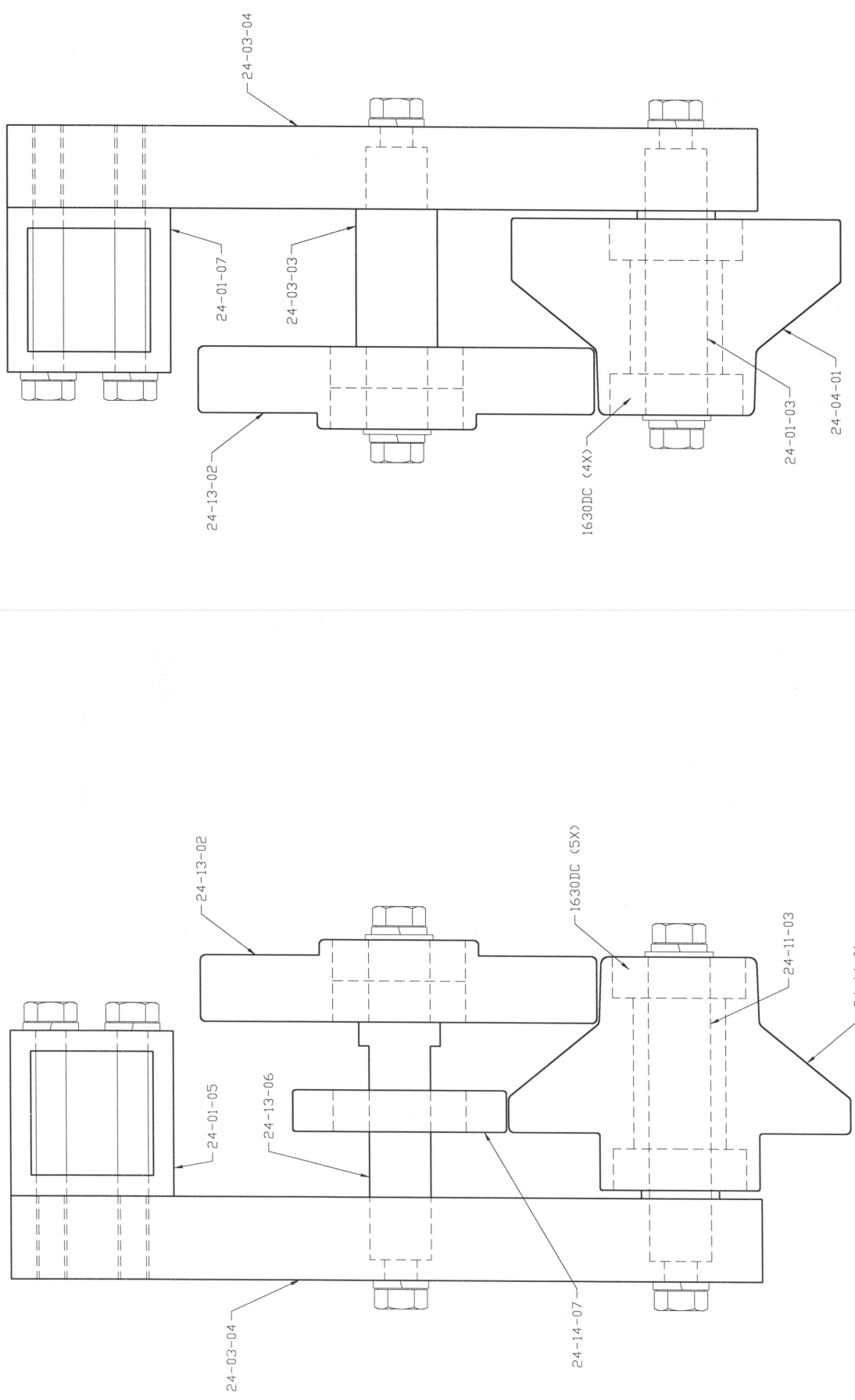
STA #2 ASS'Y

PART NO.	24-00-02
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



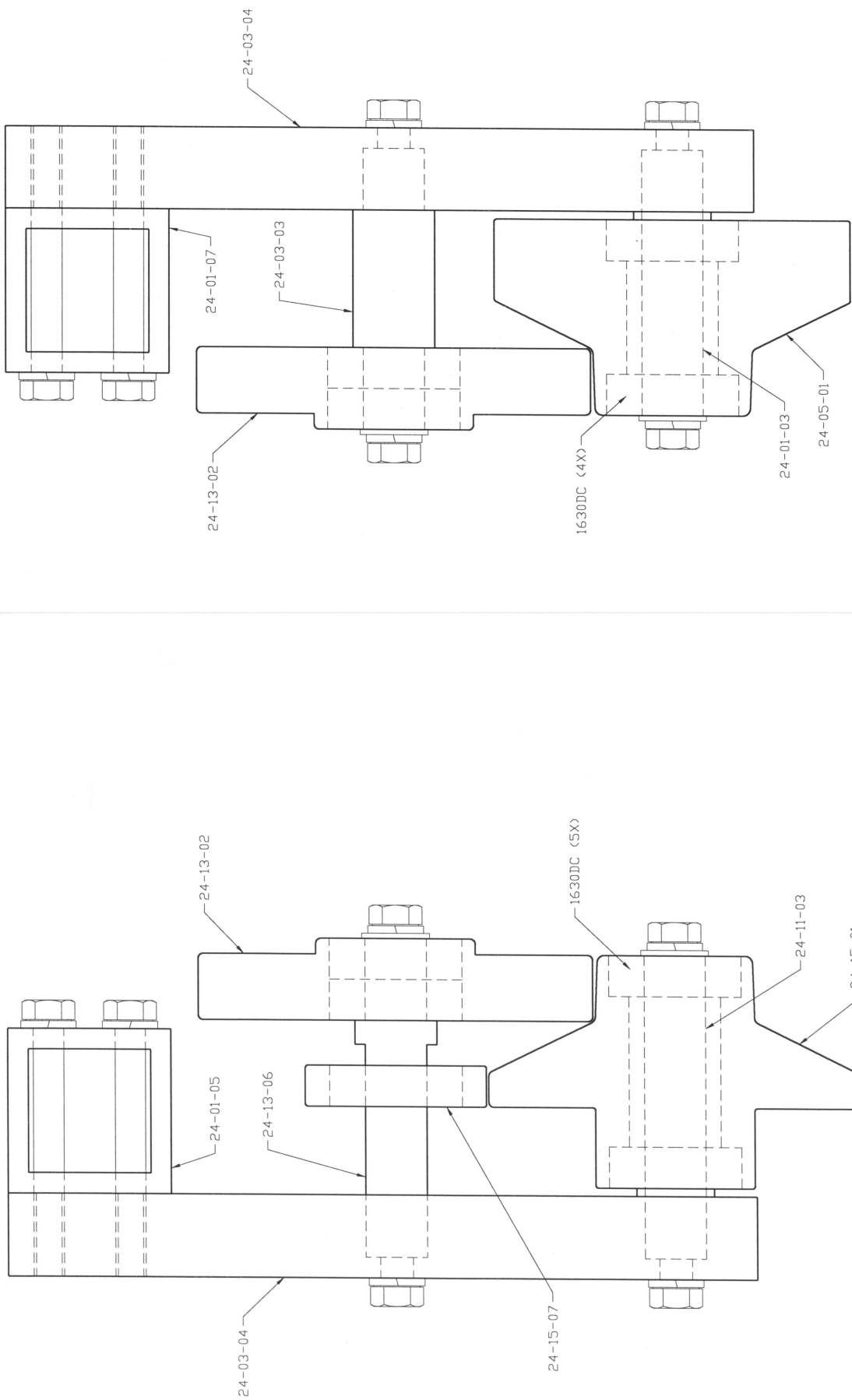
STA #3 ASS'Y

PART NO.	24-00-03
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



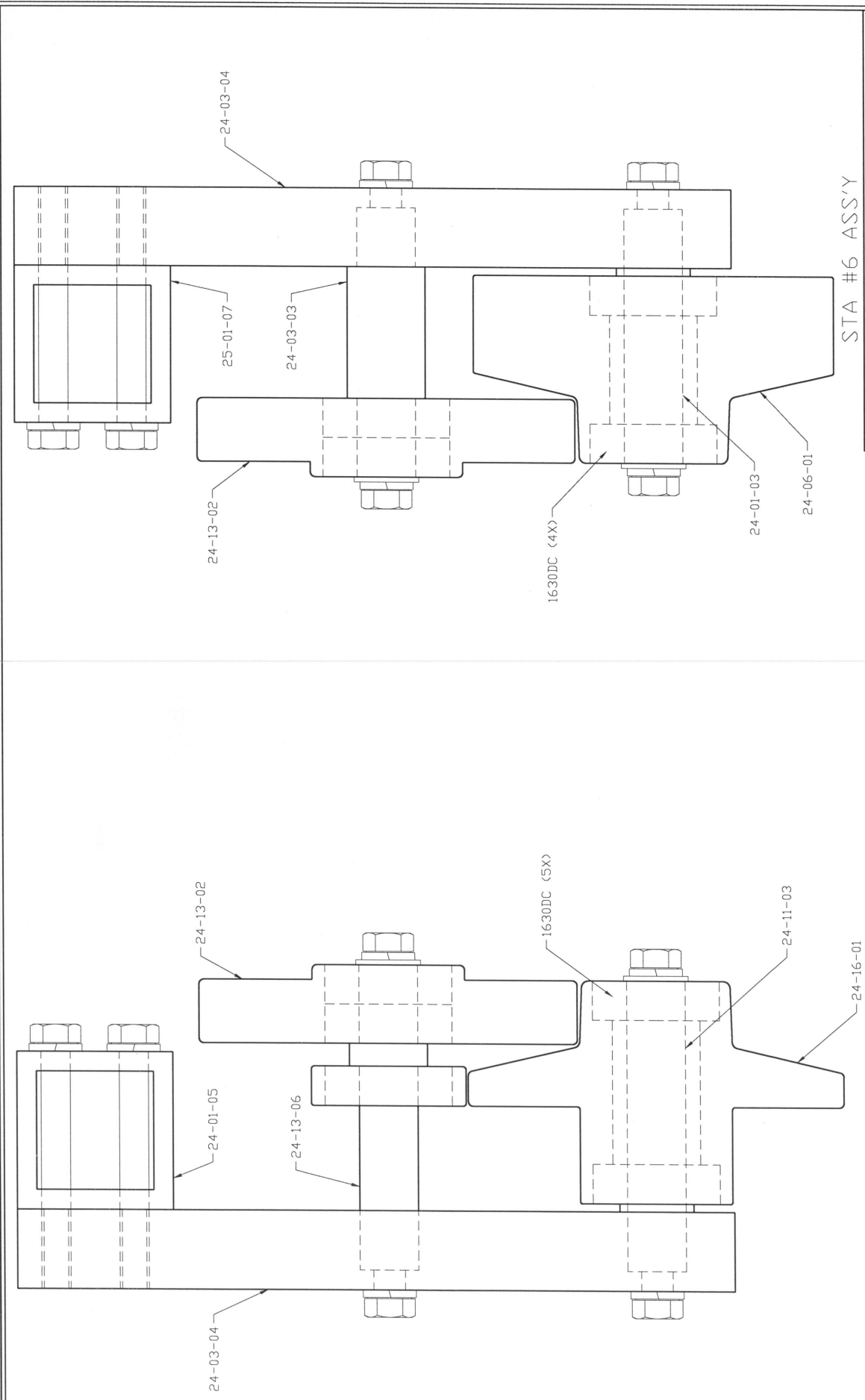
STA #4 ASS'Y

PART NO.	24-00-04
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



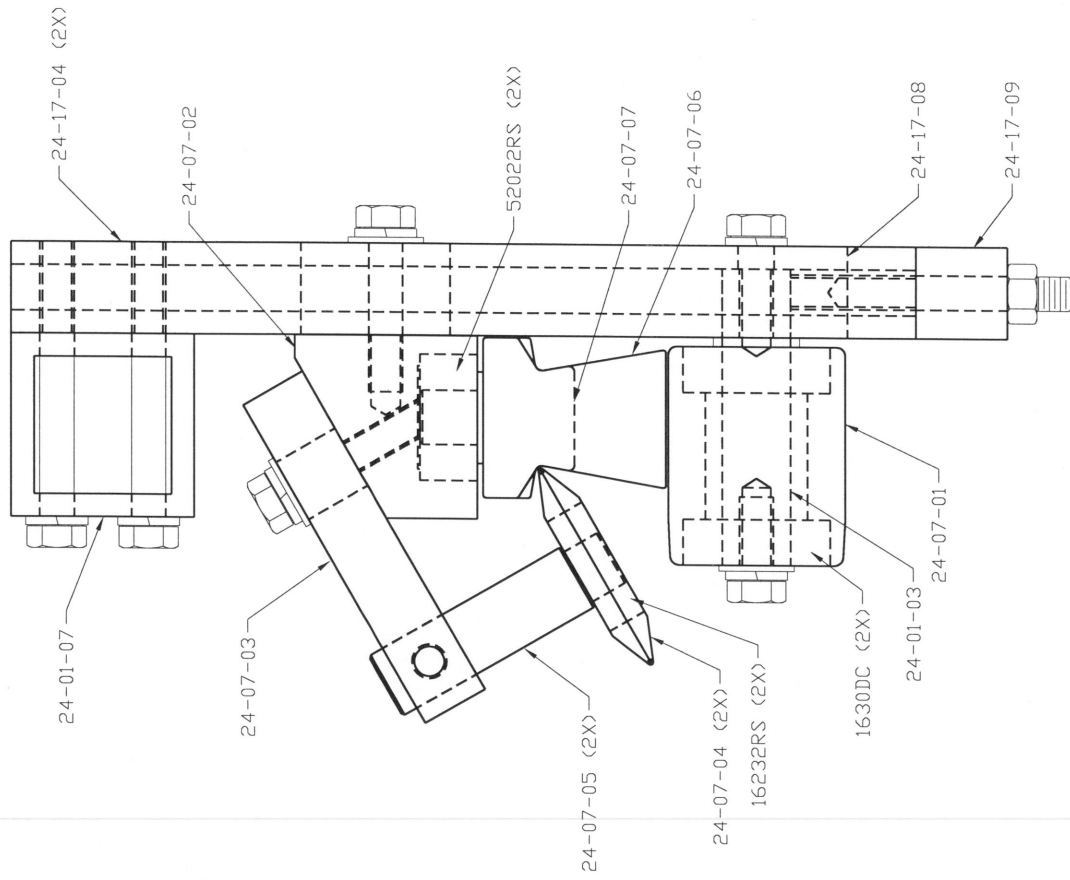
STA #5 ASS'Y

PART NO.	24-00-05
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



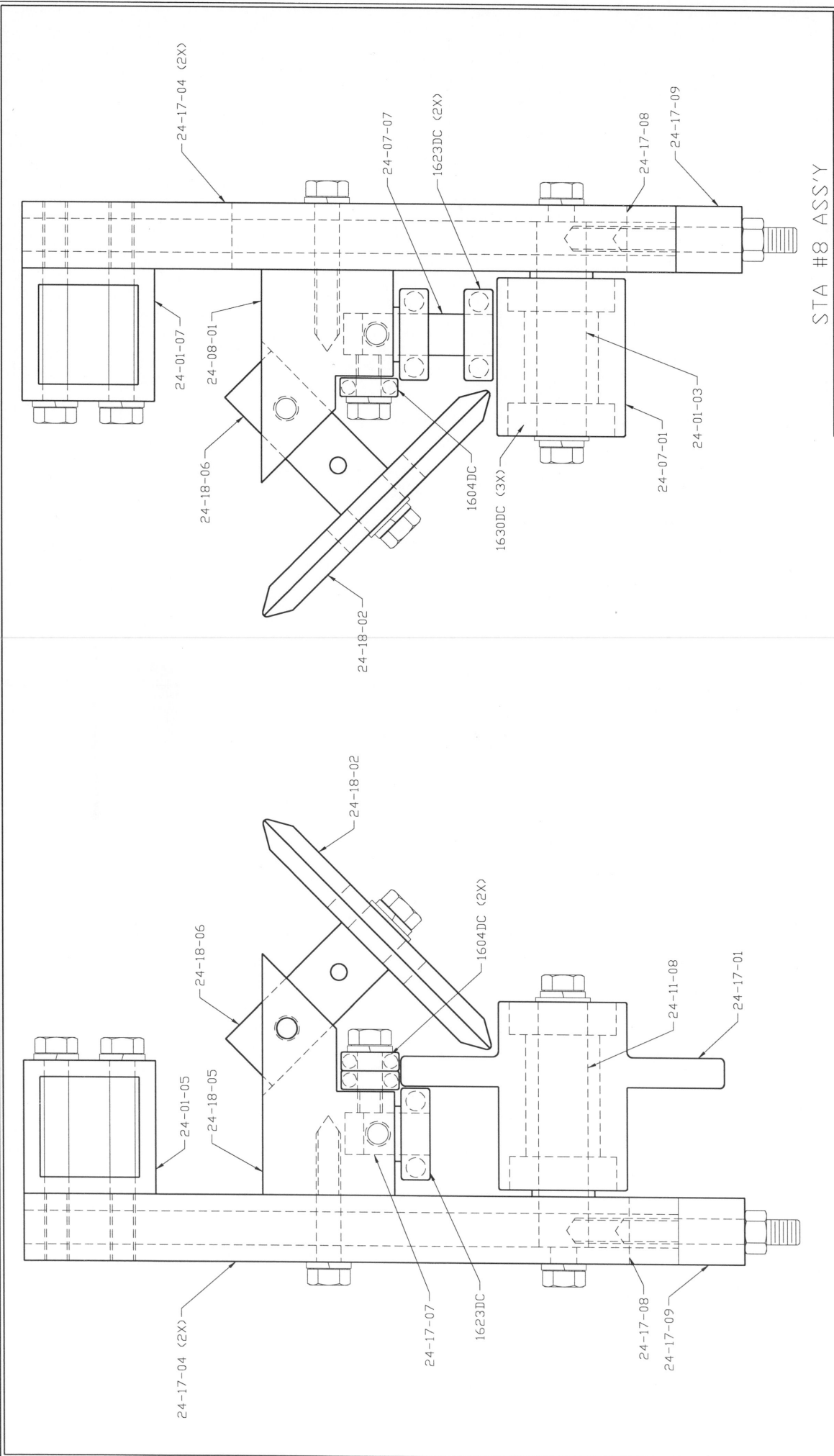
STA #6 ASS'Y

PART NO.	24-00-06
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



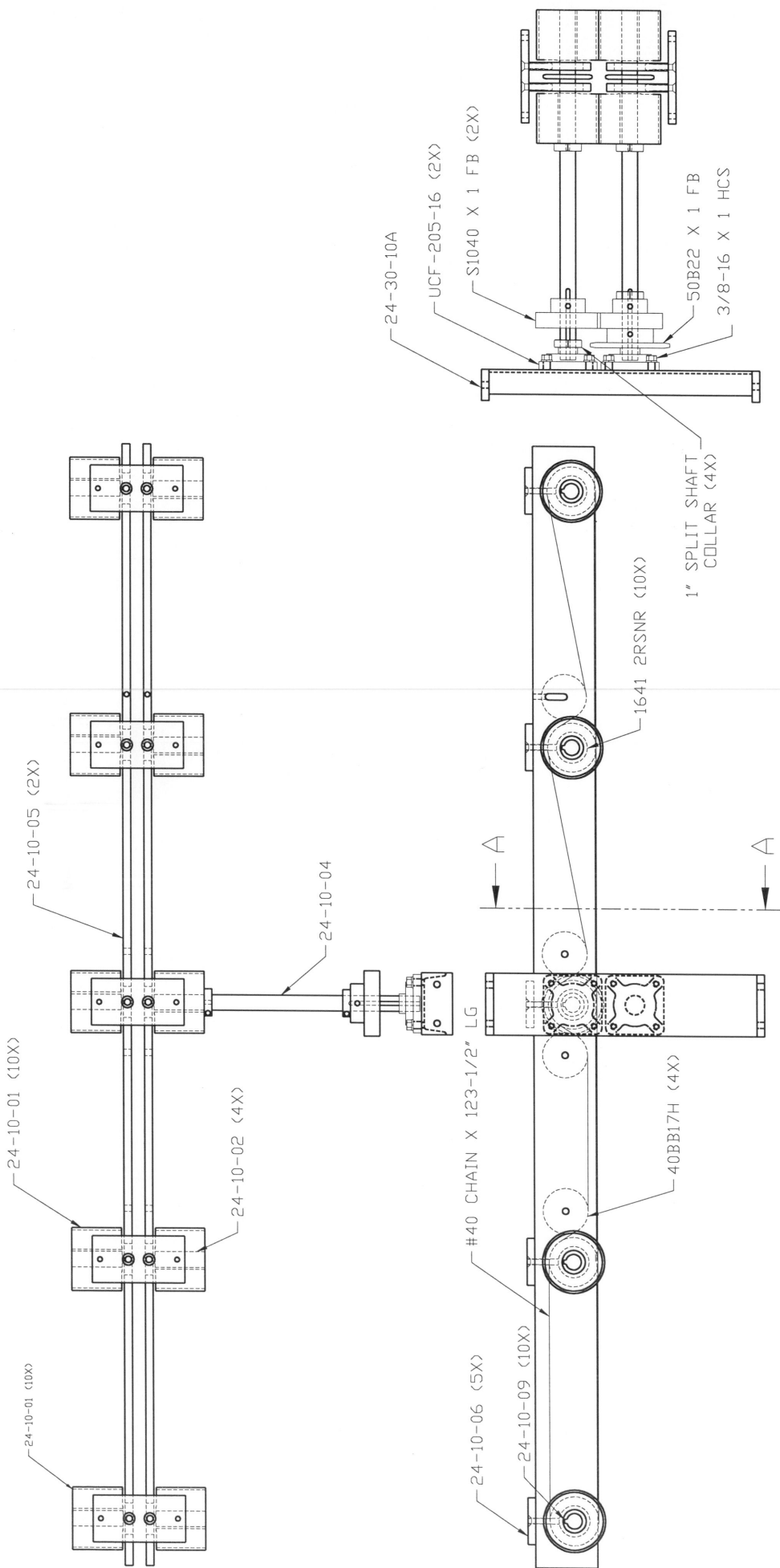
STATION #7 ASS'Y

PART NO.	24-00-07
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



STA #8 ASS'Y

PART NO.	24-00-08
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	

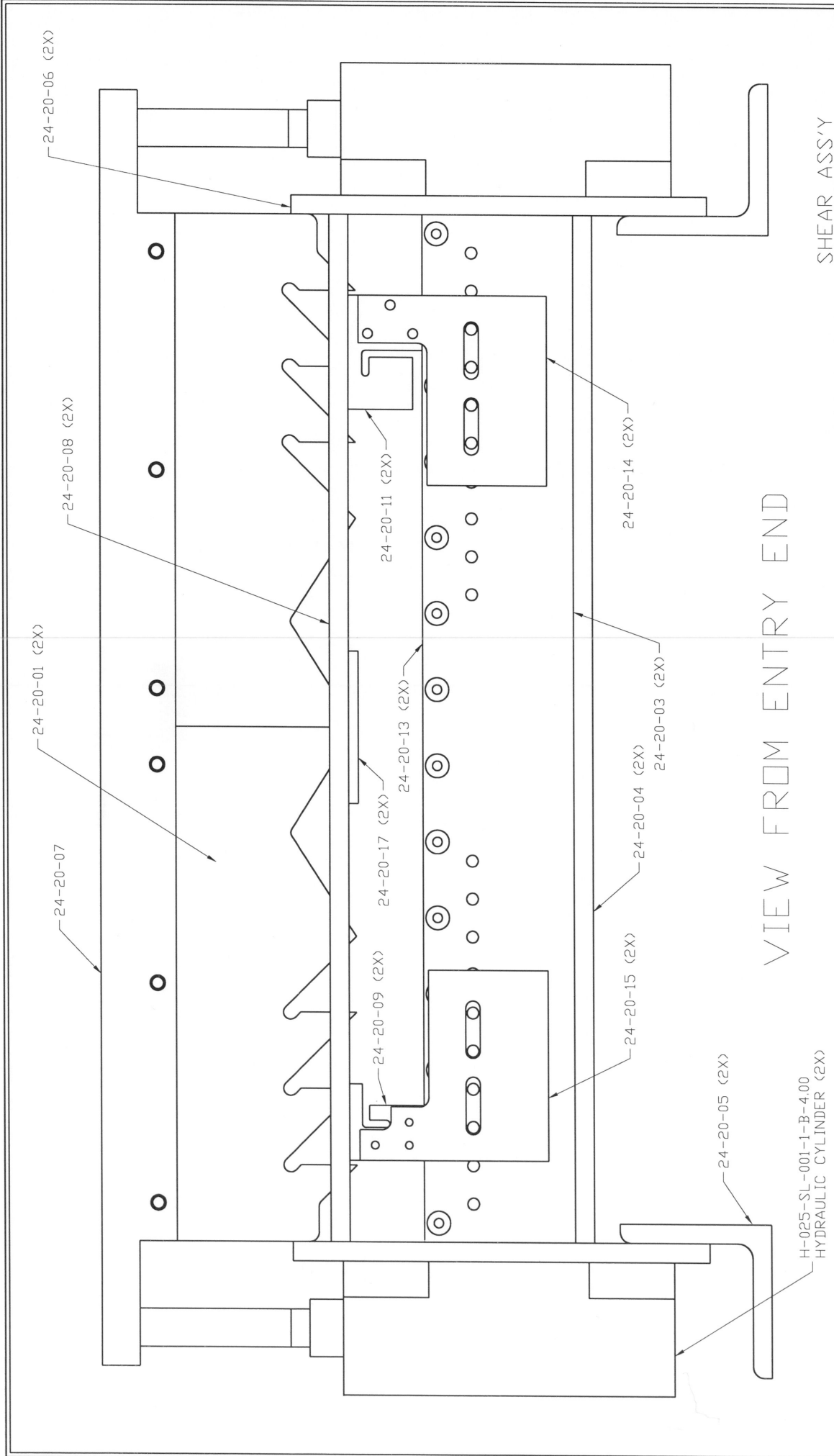


SECTION A-A

SKATE BAR ASS'Y

NOTE: 1) TOP SKATE ASS'Y SHOWN
 BOTTOM SKATE ASSEMBLED MIRROR IMAGE
 2) BOT SKATE SHOWN ON END VIEW FOR
 GEAR & SPROCKET LOCATIONS

PART NO.	24-10-00
MAT'L	
QTY REQ.	2 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



VIEW FROM ENTRY END

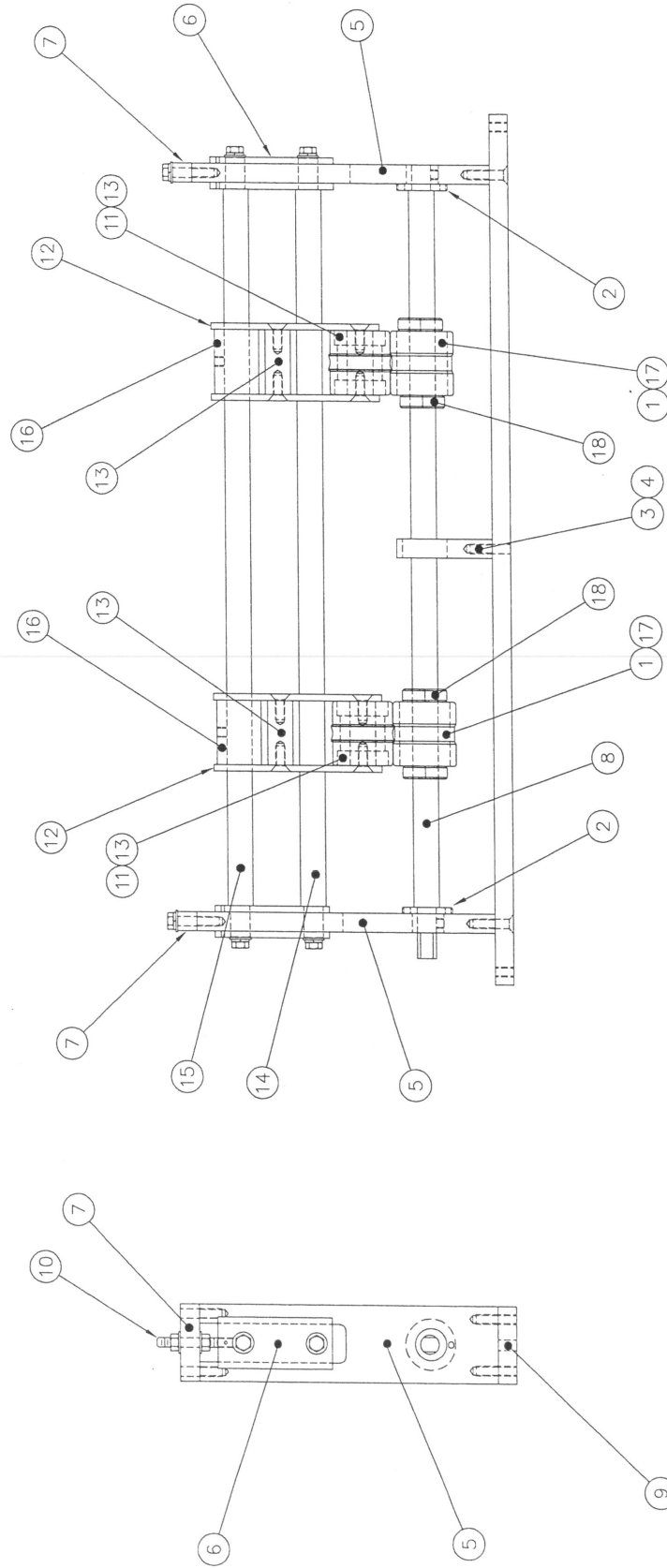
H-025-SL-001-1-B-4.00
 HYDRAULIC CYLINDER (2X)

SHEAR ASS'Y

PART NO.	24-20-00
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	

MATERIAL LIST

ITEM	PART NAME	P/N	QTY
1	BOTTOM RIB ROLLER	24-25-01	2
2	RIB ROLLER CAM	24-25-03	2
3	RIB ROLLER CENTER CAM	24-25-04	1
4	CENTER SUPPORT BLOCK	24-25-05	1
5	RIB ROLLER UPRIGHT	24-25-06	2
6	TAKE UP BLOCK	24-25-07	2
7	TOP CROSS BLOCK	24-25-08	2
8	BOTTOM RIB ROLLER SHAFT	20-25-07	1
9	RIB ASSEMBLY BASE PLATE	24-25-11	1
10	ADJUSTMENT ROD	24-25-14	2
11	TOP RIB ROLLER	20-25-01	2
12	TOP ROLLER MOUNTING BAR	20-25-04	4
13	TOP ROLLER SHAFT	20-25-06	4
14	MID SUPPORT SHAFT	20-25-08	1
15	TOP SUPPORT SHAFT	20-25-09	1
16	TOP SHAFT ADJUSTMENT SLEEVE	20-25-10	1
17	SHAFT COLLAR, 1 PC.	CL-16-F	4
18	BEARING	1641-2RSNR	8
19	CARR LANE LOCK PIN	CL-4BLPT-1.00-C	1
20			



ZIMMERMAN METALS INC.
 201 E 58th AVE.
 DENVER, CO 80216
 (303) 294-0180

TOLERANCES UNLESS OTHERWISE SPECIFIED
 .XX = ±.005
 .XXX = ±.01
 3rd ANGLE PROJ.
 BREAK ALL UNMARKED CORNERS

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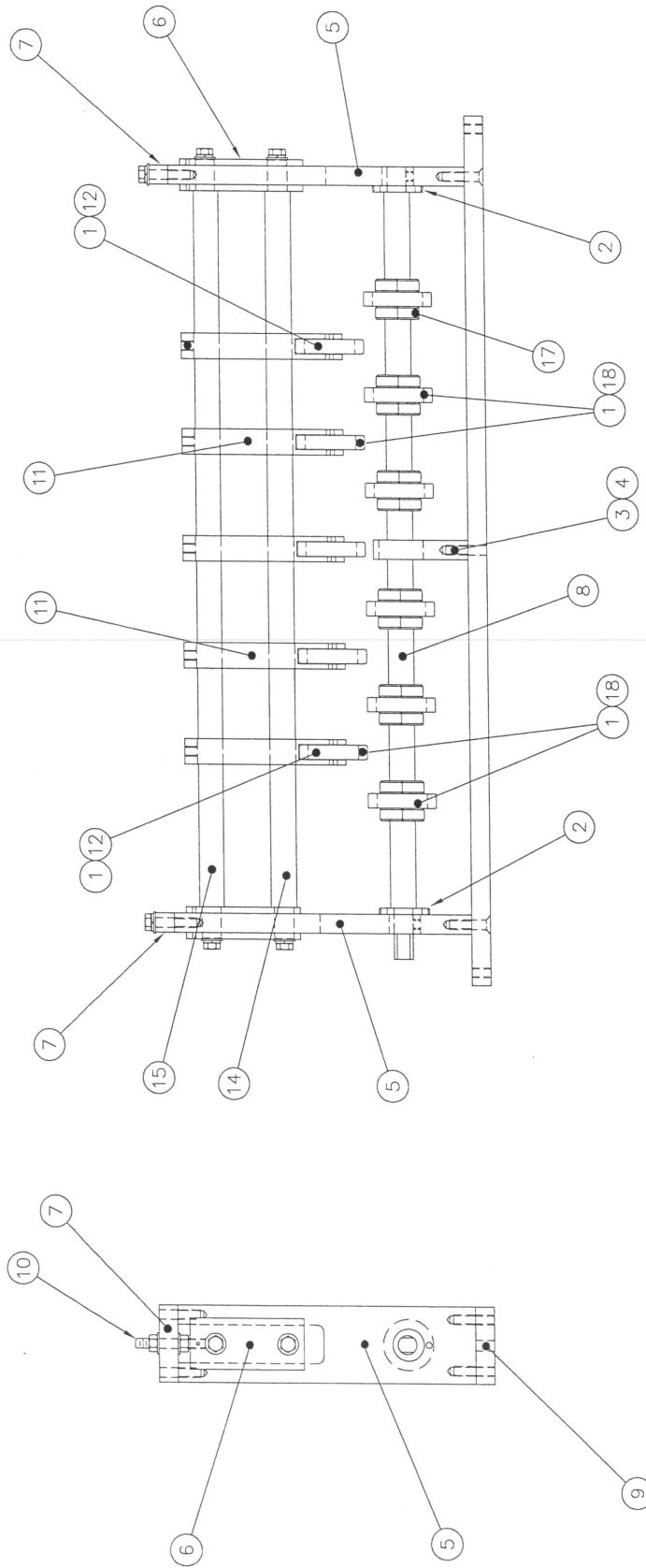
MACH. MOD. NO. Z-PANEL

DRAWING NO. 24-25-00
 SCALE 1:4
 SHEET / OF 1 / 1
 DATE 7/12/00

NOTES: 1 PER MACHINE

MAT'L:

ITEM	PART NAME	P/N	QTY
1	BOTTOM STRIATION ROLLER	24-25-15	11
2	RIB ROLLER CAM	24-25-03	2
3	RIB ROLLER CENTER CAM	24-25-04	1
4	CENTER SUPPORT BLOCK	24-25-05	1
5	RIB ROLLER UPRIGHT	24-25-06	2
6	TAKE UP BLOCK	24-25-07	2
7	TOP CROSS BLOCK	24-25-08	2
8	BOTTOM RIB ROLLER SHAFT	20-25-07	1
9	RIB ASSEMBLY BASE PLATE	24-25-11	1
10	ADJUSTMENT ROD	24-25-14	2
11	TOP ROLLER MOUNTING BAR	20-26-01	5
12	TOP ROLLER SHAFT	20-26-02	5
13			
14	MID SUPPORT SHAFT	20-25-08	1
15	TOP SUPPORT SHAFT	20-25-09	1
16			
17	SHAFT COLLAR, 1 PC.	CL-16-F	12
18	BEARING	1641-2RS	10
19	CARR LANE LOCK PIN	CL-4BLPT-1.00-C	1
20			



ZIMMERMAN METALS INC.
 201 E 58th AVE.
 DENVER, CO 80216
 (303) 294-0180

TOLERANCES UNLESS OTHERWISE SPECIFIED
 FRACTION = 1/32"
 .XX = ±.015
 .XXX = ±.005
 BREAK ALL UNMARKED CORNERS

3rd ANGLE PROJ.

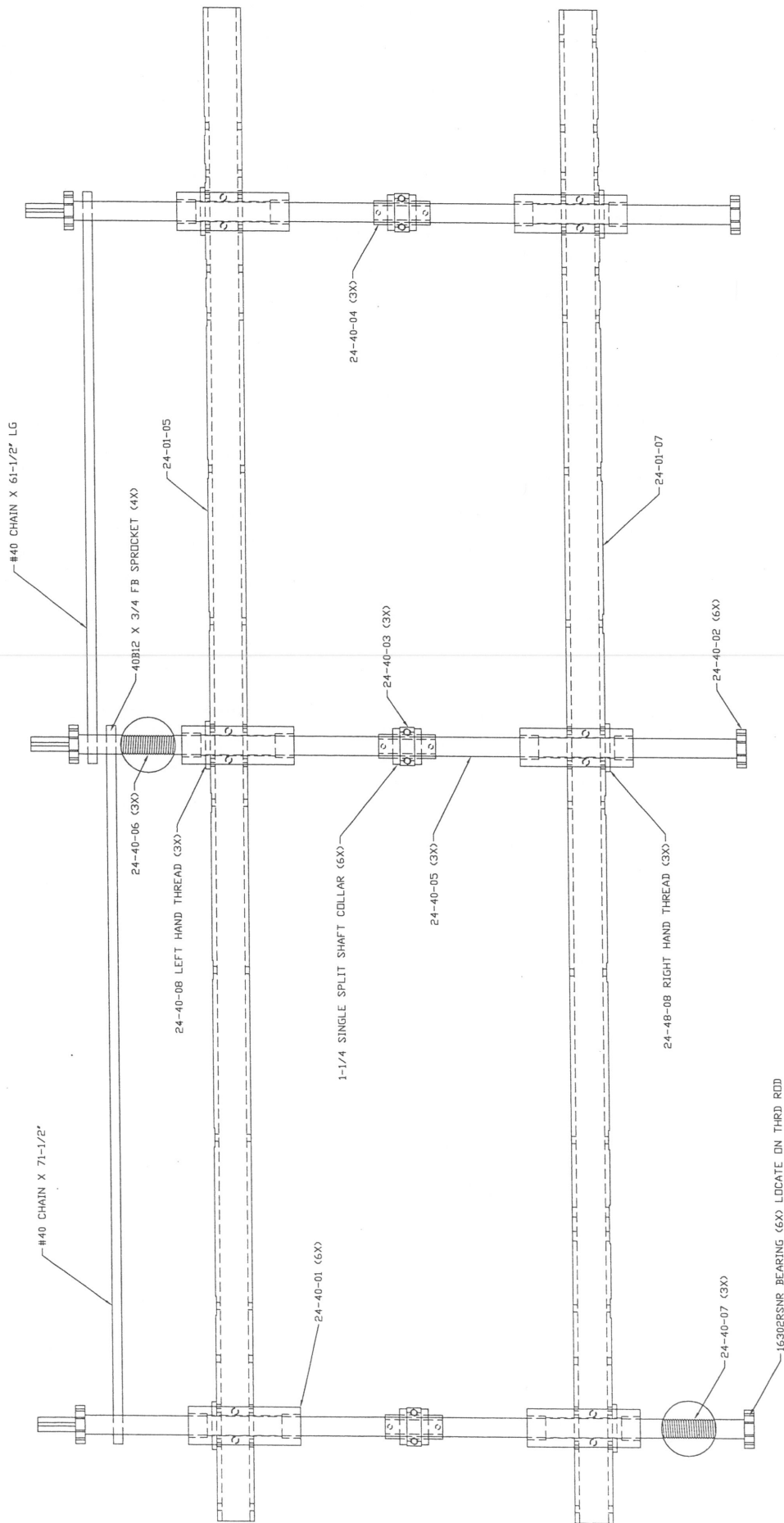
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MACH. MOD. NO. Z-PANEL

DRAWING NO. 24-26-00
 SCALE 1:4
 SHEET / OF BTO

DATE 03/09/01
 DRAWN BY BTO
 APPROV BY

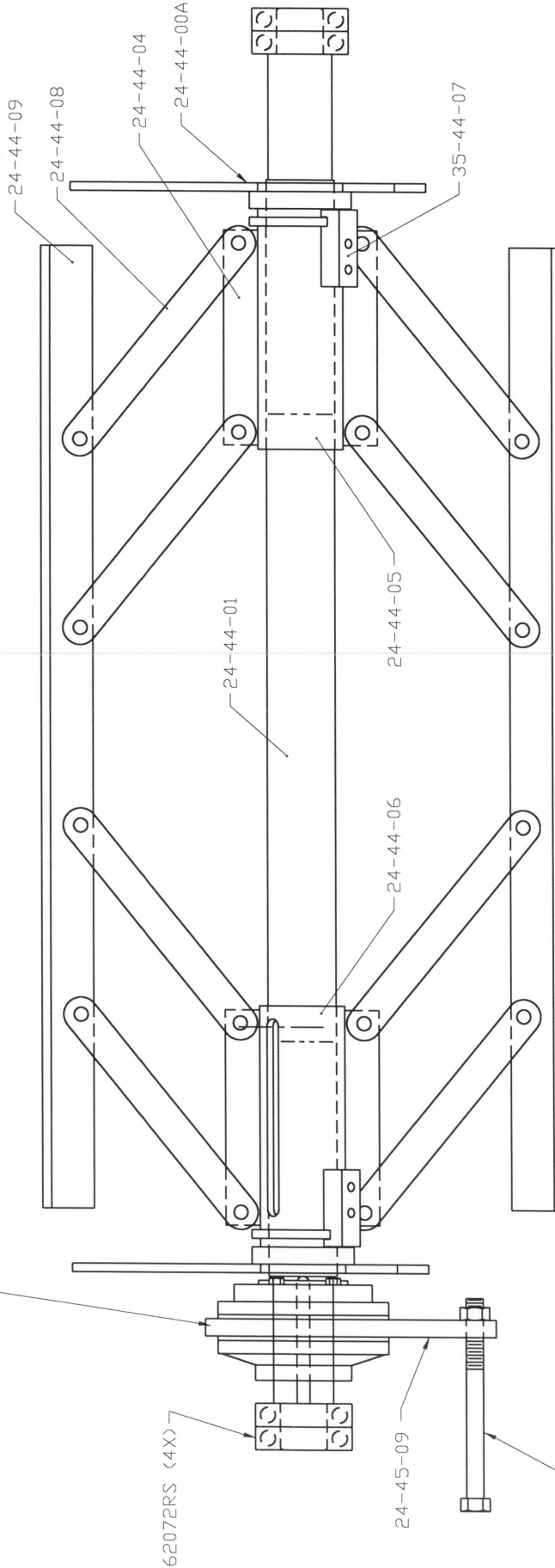
NOTES: 1 PER MACHINE
 MAT'L:



WIDTH ADJUST ASSEMBLY

PART NO.	24-40-00
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	

IT50BSX2" TORQUE LIMITER
BORE TO 1.752/1.753 ID w/ 3/8" STD KEYWAY



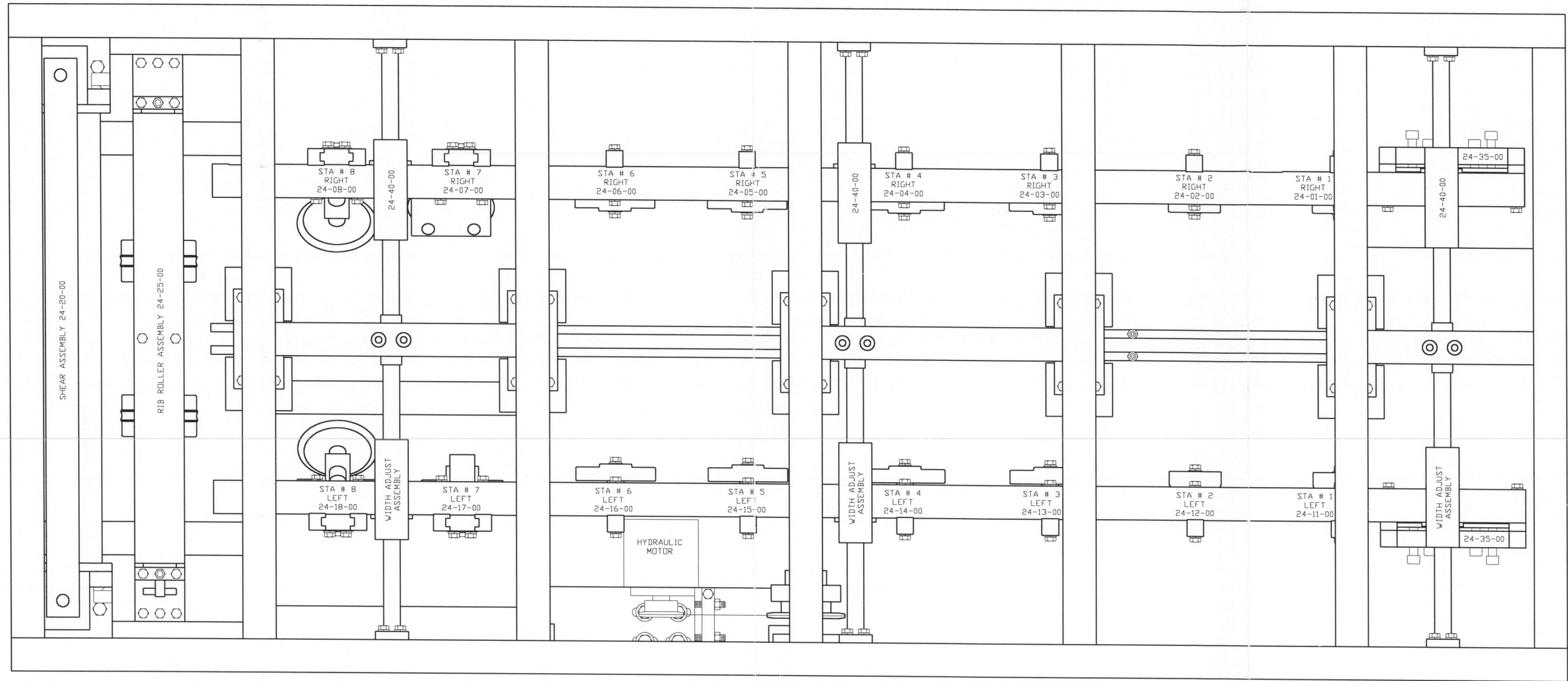
62072RS (4X)

24-45-09

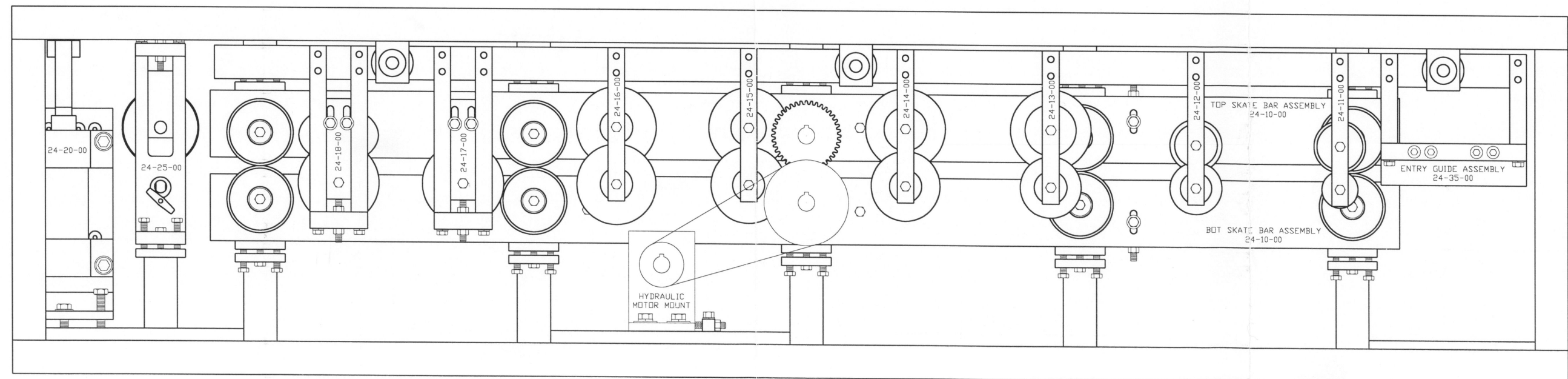
1/2-13 X 5" HEX BOLT

EXPANDABLE SPOOL ASSEMBLY

PART NO.	24-44-00
MAT'L	
QTY REQ.	1 PER MACH
NOTES	
.X ± .030 .XX ± .015 .XXX ± .005 FRACTIONS ± 1/32"	



MACHINE GENERAL LAYOUT



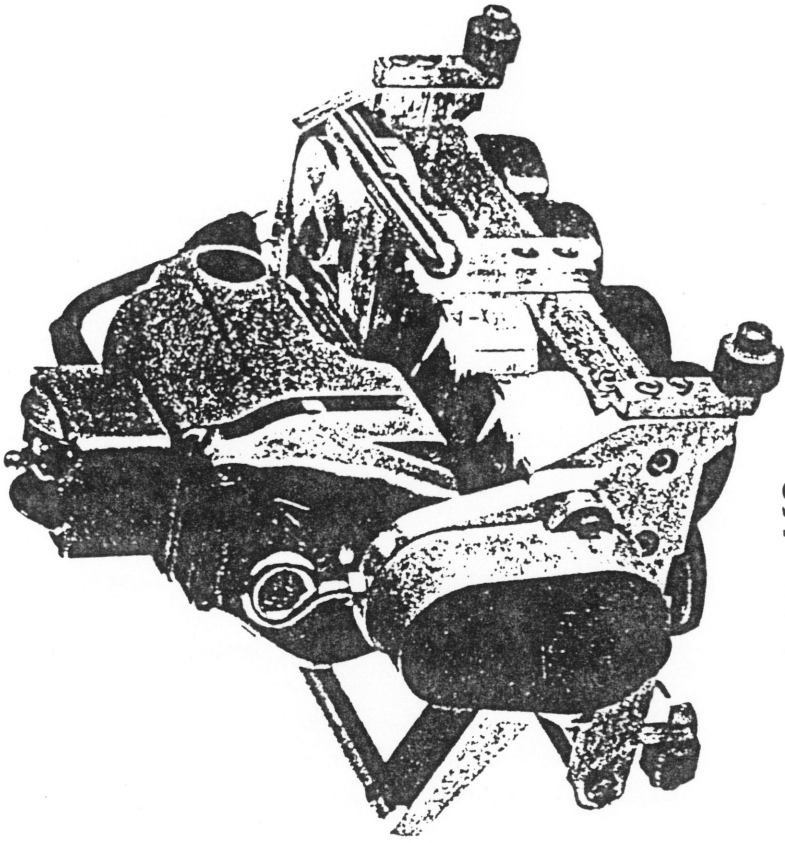
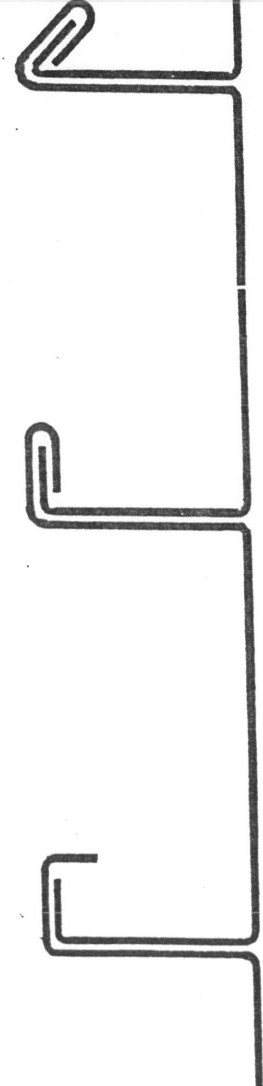
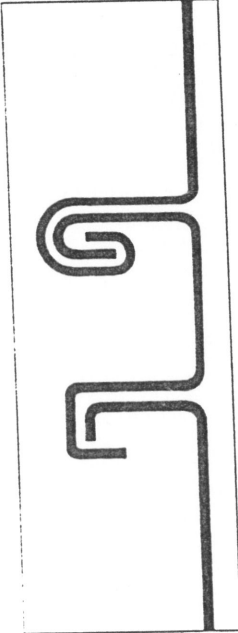
STANDING SEAM SEAMER

ADJUSTABLE 1"-1 1/2"

- Double lock seams in one pass
- Painted or unpainted material
- 30 ft/min
- Ruggedly built, but lightweight (40 lbs)

SPECIFICATIONS

POWER:	
Electric motor	7 Amps
Volts	115 V
Phase	Single
MAXIMUM GAUGE:	
Steel	24 Ga
Aluminum	.032
Copper	20 Oz

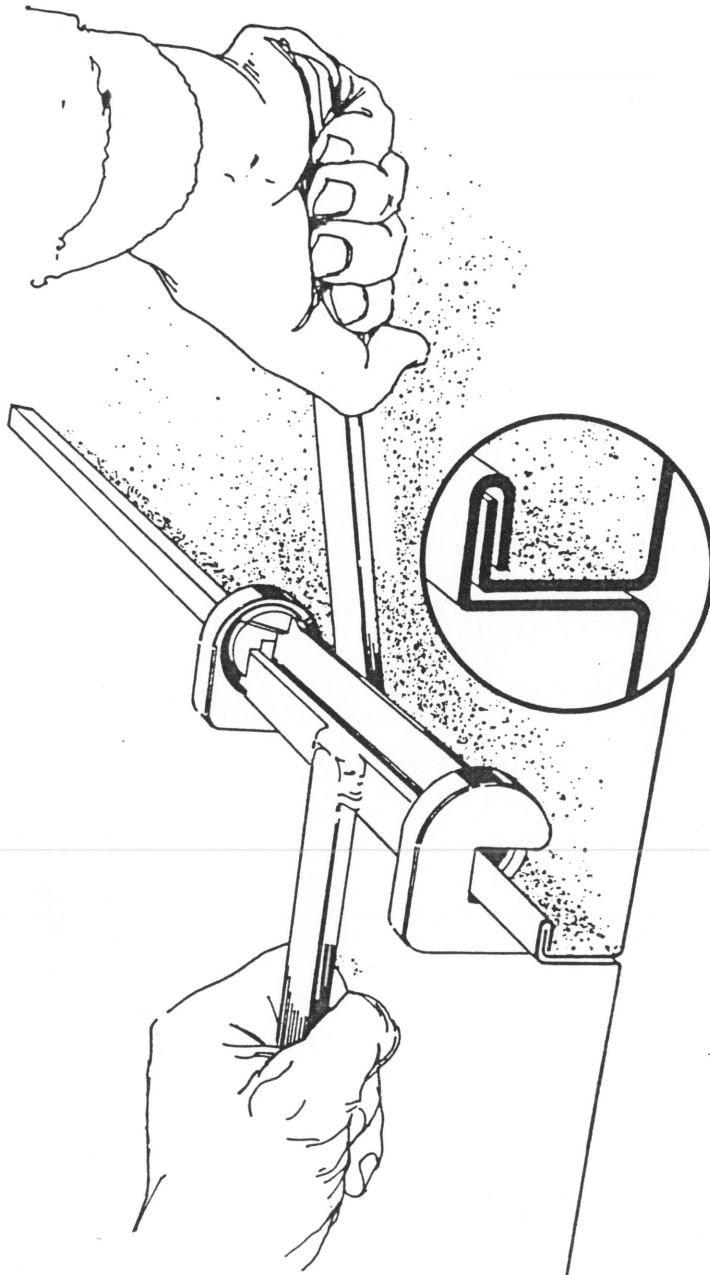


MODEL: K9

HAND SEAMER

FOR STANDING SEAM

ESE 001



TOTALLY NEW AND UNIQUE

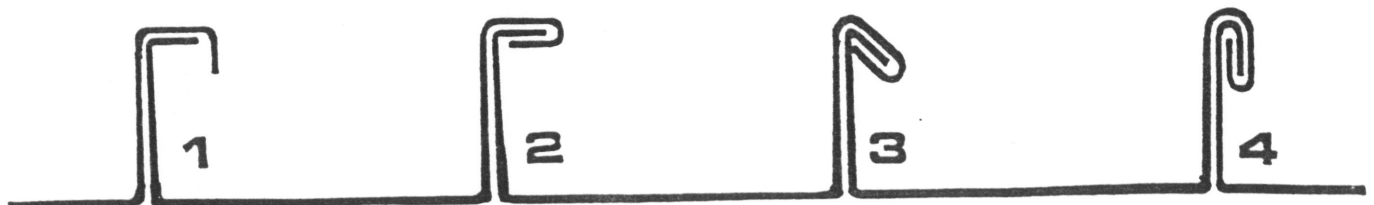
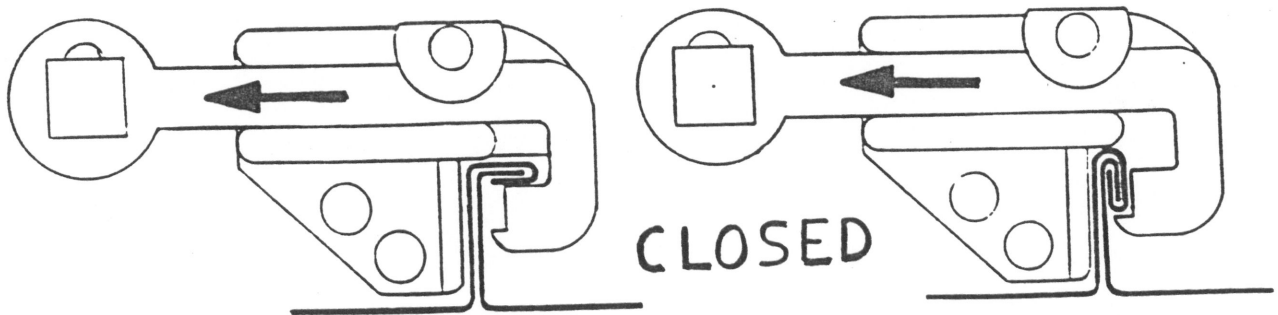
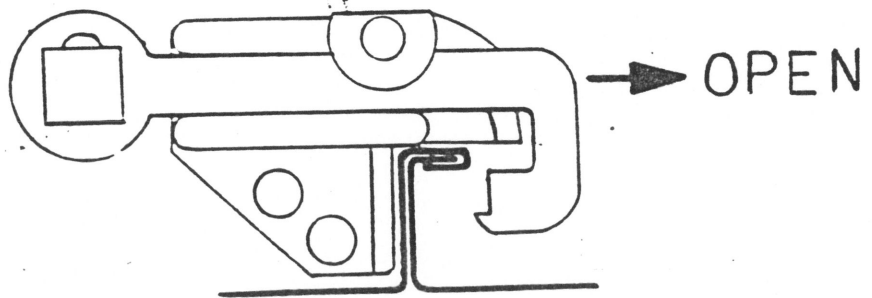
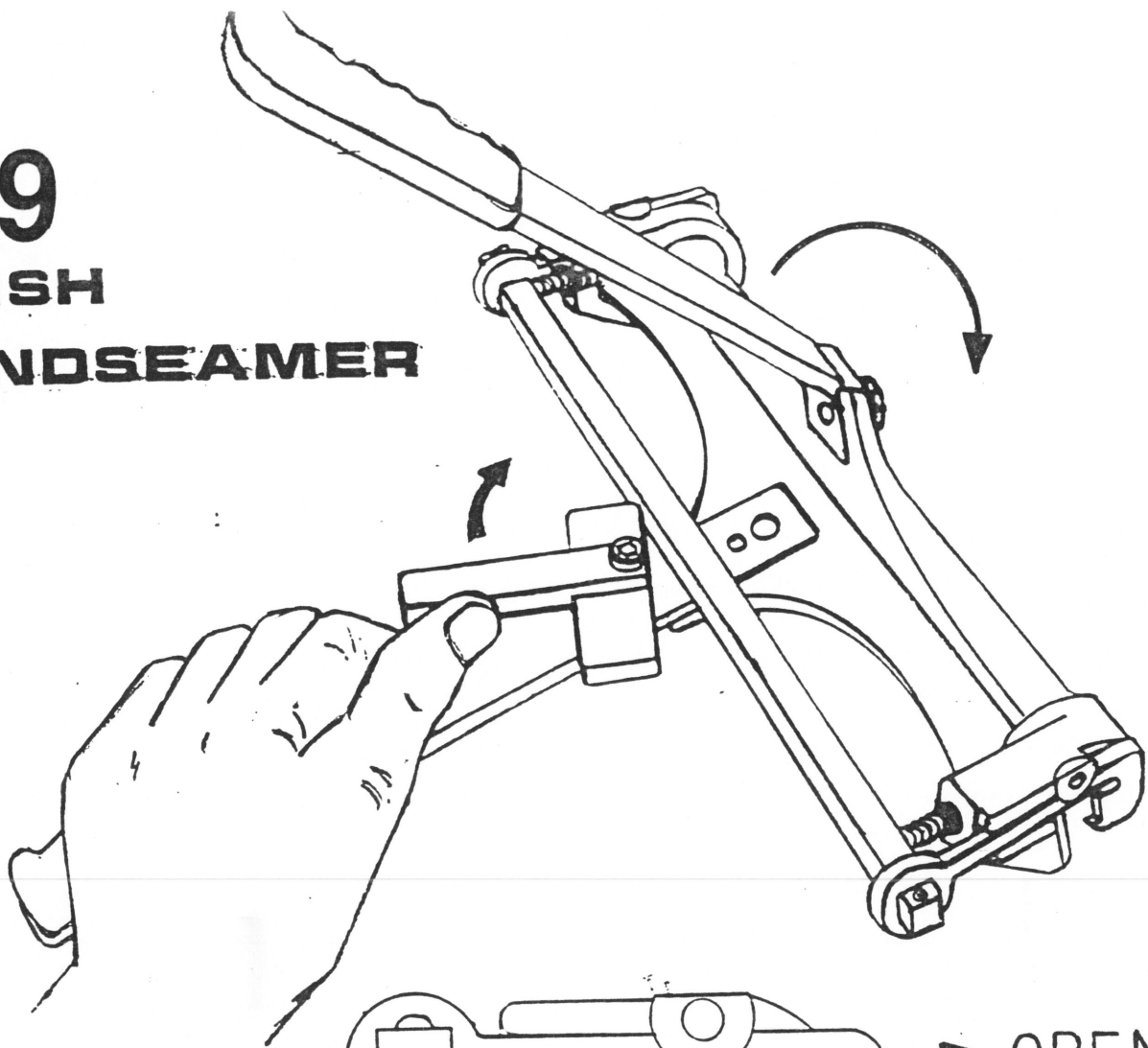
This tool will be your first choice:

- For hard to get at places
- To start or finish (or an entire roof)
- Unique leverage design
- Lightweight
- Easy to use
- Will not scratch or peel paint
- Guaranteed*

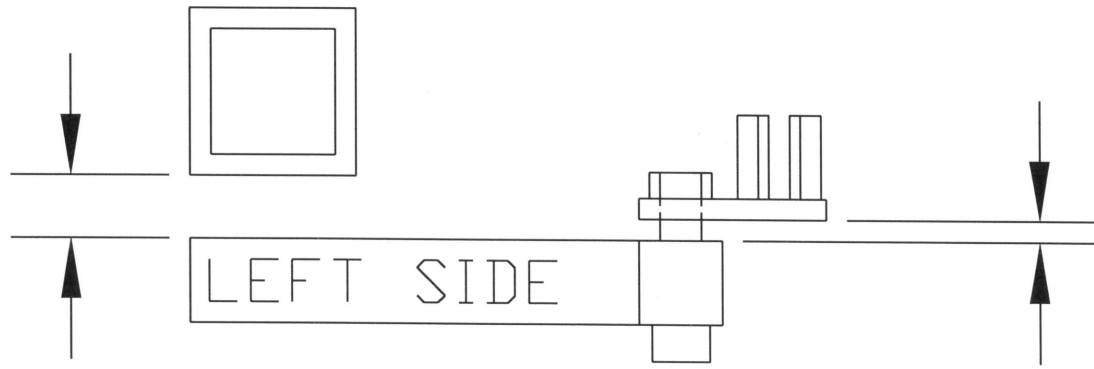
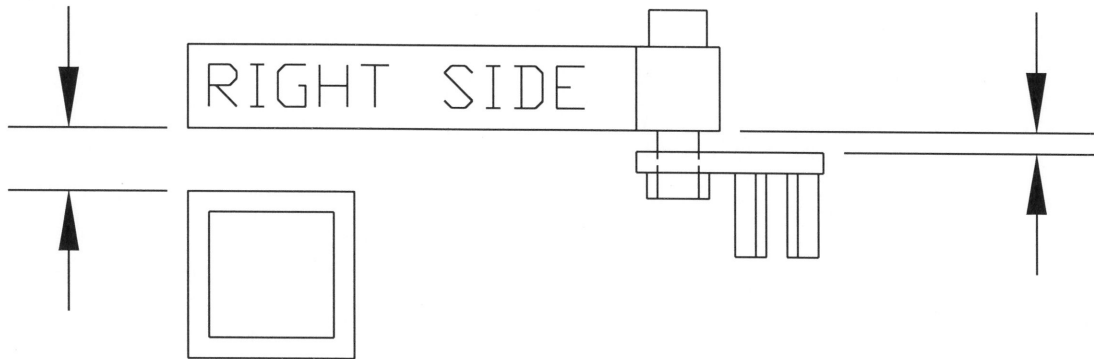
099

FINISH

HANDSEAMER



*BEFORE USING THIS TOOL
PREPARE SEAM UP TO POS. 2
WITH ESE001 HAND SEAMER

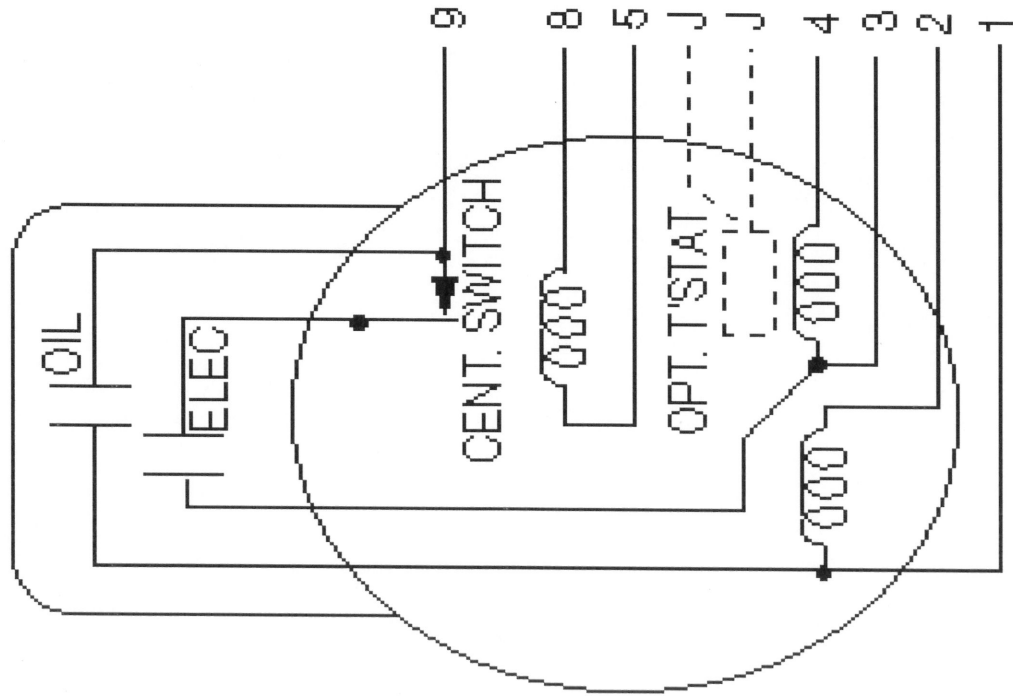


FACTORY ENTRY GUIDE SETTINGS
SS1500 PANEL PROFILE

SECTION 2

Catalog Number: CL3514 Baldor Electric Company (R)





VOLT
HIGH
HIGH
LOW
LOW



LINE A
STD
OPP
STD
OPP

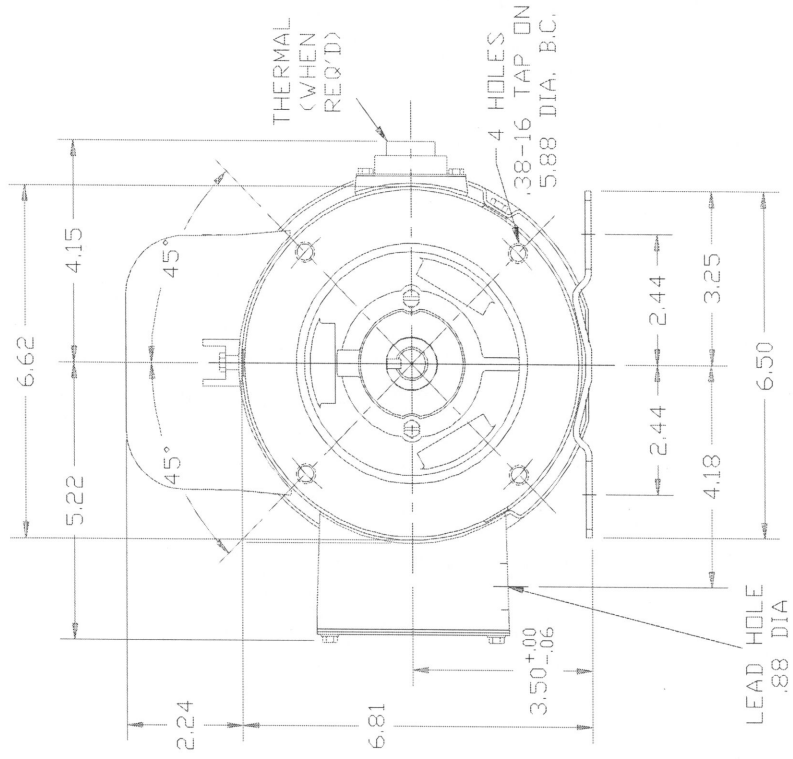
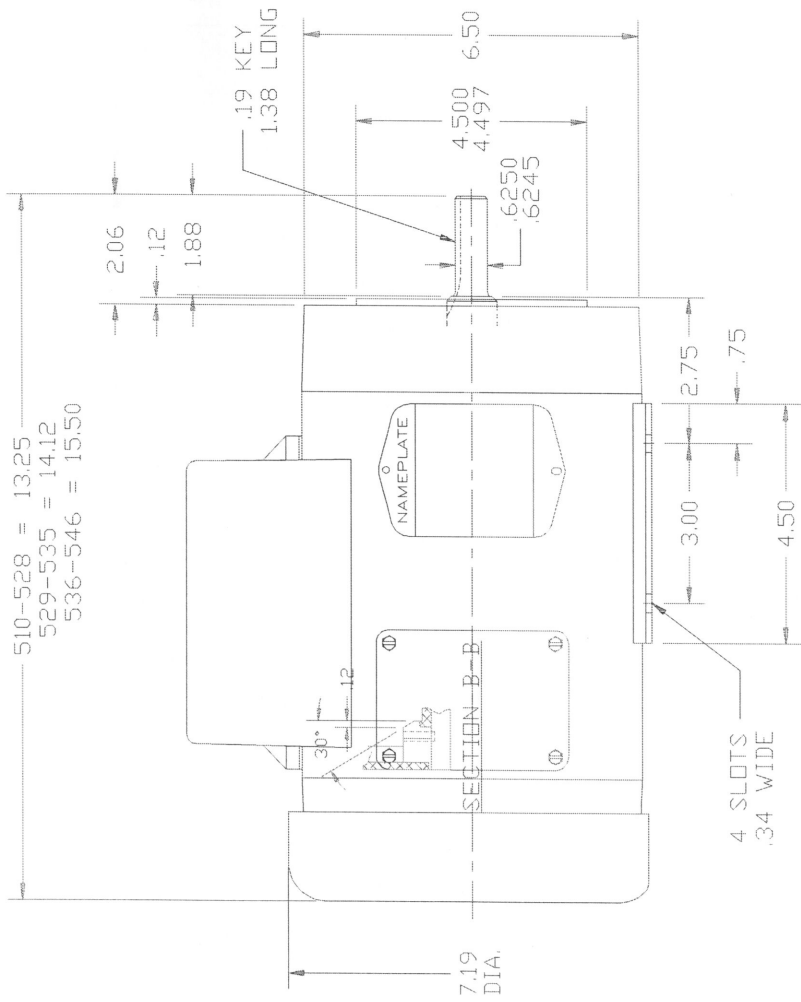
LINE B
4,5
4,8
2,4,5
2,4,8

JOIN
2,3
2,3
8,9
5,9

JOIN
8,9
5,9

Catalog Number: CL3514 Layout=35LYE024

35E24



35E24

CUST. NAME	CUST. P.O.	CERTIFIED BY	MODEL	INSUL	AMB
H.P.	MTG	TYPE	ENCL	PHASE	FREQ
REMARKS:			FRAME		
REV: G	'HORZ' WAS 'VERT' IN TITLE		BALDOR ELECTRIC Co.		
42355	SCALE: .3	BY: JDV	STD HORZ 56C TEFC 35LC FACE-MTD		
	FILE: AAA00004913	REVISED: 01/04/95			
		TDR: 0051038			

CL3514 Performance Data Baldor Electric Company (R)

Winding = 35WGX944

RATING - NOMINALS

Rated Output	1.5
Volts	115/208-230
Full Load Amps	16/8.4-8
Speed	1725
Hertz	60
Phase	1
NEMA Design Code	L
LR KVA Code	B
Efficiency	75.5
Power Factor	80
Service Factor	1.15
Rating - Duty	40C AMB-CONT

CHARACTERISTICS

Break Down Torque	14.5
Locked-Rotor Torque	15
Starting Current	57.0
No-Load Current	5.2
Line-line Resistance @ 25 degrees C	1.41
Temperature Rise, in degrees C @ F.L.	76

LOAD CHARACTERISTICS - TESTED

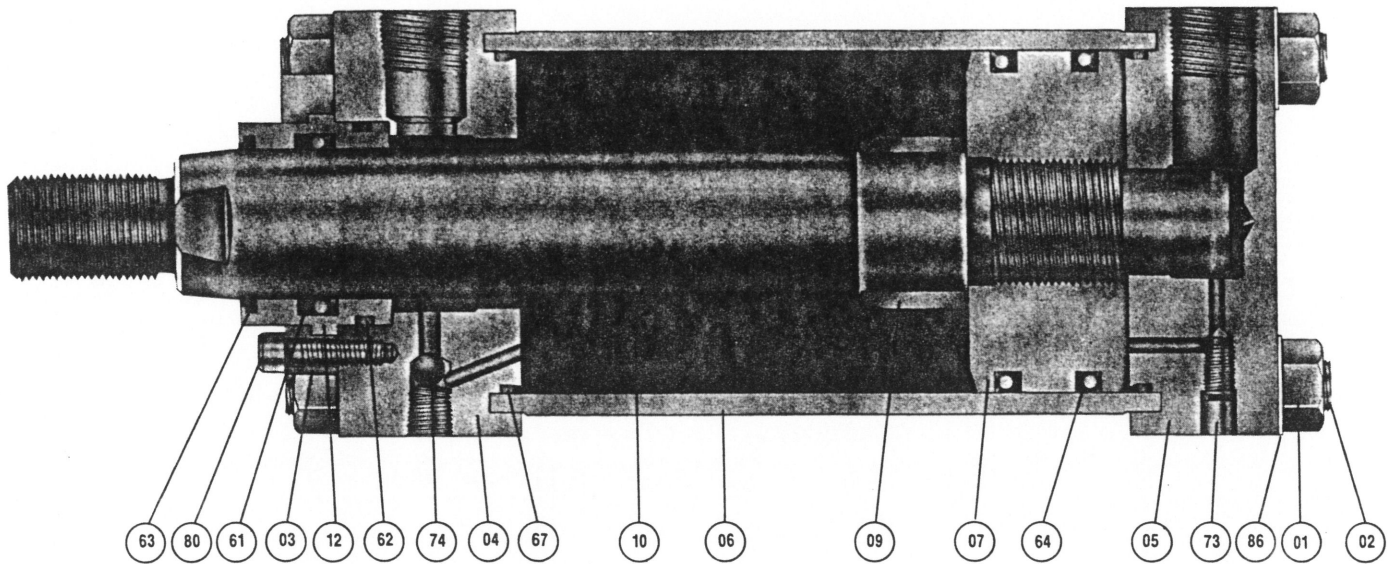
% of Rated Load	25	50	75	100	125	150	S.F
Power Factor	42	59	72	80	85	88	83
Efficiency	59.1	71.6	76.1	76.6	75.7	73.4	76.1
Speed (rpm)	1784	1773	1759	1743	1726	1706	1733
Line Amperes	5.3	5.9	6.7	7.9	9.4	11.0	8.80

Parts List Baldor Electric Company (R)

PRODUCT ID: CL3514	ITEM DESCR: 32LC 4P TEFC HOR 56C		
SPEC: 35E24X944	PLANT: FS		
BRG-6203 D SH, SRI2	BG6203C03	EA B	1.00
BRG- 205 D SH, SRI2	BG6205C03	EA B	1.00
ELEC CAP 115V 2.0 X 4.3	EC1645A06	EA B	1.00
THRUBOLT- 10-32 X 9.250 X	HA3100A18	EA B	4.00
KEY LOCKING RING(.685 ID)	HA7000A04	EA B	1.00
CAPAC SPRING CLIP	HA7010	EA B	1.00
KEY, 3/16 SQ X 1.375	HW2501D13	EA B	1.00
D3019 BRASS WASHER(STIMP)	HW3001A01	EA B	1.00
WAVY WASHER (W1543-017)	HW5100A03	EA B	1.00
LABEL, HIGH EFFICIENCY	LB1110	EA B	1.00
WARNING LABEL	LB1119	EA B	1.00
STANDARD MTR CARTON LABEL	LB1125	EA B	1.00
PAINT-S9282E CHARCOAL	MG1000G27	GA B	.01
GREASE-CHEVRON SRI-2	MJ1000A02	LB B	.05
NAMEPLATE, .020 ALUMINUM	NP0003	EA B	1.00
INSULATOR, CAPACITOR	NS2501A02	EA B	1.00
INSULATOR, CONDUIT BOX X	NS2512A01	EA B	1.00
CYL OIL CP 370V Z24P3715M	OC3015F12	EA B	1.00
BEARING RETAINER, TAPPED	RB4000A01	EA M	1.00
BRG RET, STAMPED X	.RB4000	EA B	1.00
NNNNNN1311	RTFMP006	EA M	1.00
DUMMY ROUTING #	.FRT01	EA M	2.00
MODEL 35 TYPE LC STAT.	SP5056A02	EA M	1.00
CR LK WIRE- #9 WHITE 16GA	.ML1009A16	FT B	1.00
CR LK WIRE #E WHITE 16 GA	.ML1021A16	FT B	.45
CR LK WIRE #O WHITE 16 GA	.ML1022A16	FT B	.66
STAT. SWITCH W/TERM. TABS	.SP5056	EA B	1.00
A661 BRASS EYELET (PARFN)	..HW3000B10	EA B	6.00
MOV. CONTACT SUPP., 35 SW	..SP2000A01	EA B	1.00
STAT. STOP, MODEL 35 SW.	..SP3001A01	EA B	1.00
CONTACT STRIP W/TERM. TAB	..SP3013A01	EA B	1.00
CONTACT(DMC91P)10%CAD.OX.	..SP4500A01	EA B	2.00
20 DEGREE MALE TERMINAL	..SP4706A01	EA B	2.00
41531 AMP FLG.TERM(4M/RL)	.WD1000A03	EA B	2.00
3-520132-2 AMP FLAG TERM.	.WD1000A15	EA B	3.00
3-520132-2 AMP FLAG TERM.	WD1000A15	EA B	4.00
10-32X3/8 HXWSHR HDSDLTYF	11XF1032A06	EA B	3.00
10-32X3/8 HX TY 23 GROUND	11XT1032G06	EA B	1.00
CONDUIT BOX, CAST *	35CB3000	EA B	1.00
CAPACITOR COVER, CAST	35CB3801	EA B	1.00
FR/PU ENDPLATE MACH	35EP3100A02	EA M	1.00
STND RT AL STD EP	.RTFEP5331	EA M	1.00
DUMMY ROUTING #	..FRT01	EA M	1.00
ENDPLATE, CAST *	.35EP3100	EA B	1.00
PU ENDPLATE, MACH	35EP3300A33	EA M	1.00
STND RT AL C-FACE EP	.RTFEP5349	EA M	1.00
DUMMY ROUTING #	..FRT01	EA M	1.00
ENDPLATE, CAST *	.35EP3300	EA B	1.00
FAN CVR STAMPED,W/FLAT X	35FH4001A01	EA B	1.00
EXT FAN, PLASTIC	35FN3002A05	EA B	1.00
1-3/4 ID X 4-1/4 LG CAP.	35GS5001G17	EA B	1.00
LAYOUT DWG. REF 35LYC001	35LYE024*	EA M	1.00
3AL CTEFCNNNN-NNNY+NNYN-Y	.RTFMS033	EA M	1.00
DUMMY ROUTING #	..FRT01	EA M	2.00
PACKAGING GROUP	35PA1000	EA M	1.00
#375 3" TRANSPARENT TAPE	.MH1046D01	RL B	.00
30 IN 90 GA STRETCH FILM	.MP1003A02	RL B	.00

Parts List Baldor Electric Company (R)

WAFERBOARD-10.375X 15.125	.PK4001C01	EA B	1.00
CARTON ASSY, BALDOR	.35PK5000A01	EA M	1.00
CARDBOARD CARTON, BALDOR	..PK1008A01	EA B	1.00
CARDBOARD LINER	..PK3203A01	EA B	1.00
ROTOR ASSY, 3.9615-3.9585	35RA55014032A01	EA M	1.00
#10 BALANCE WASHER (SPL)	.HW1025A10	EA B	4.00
INTERNAL FAN, STAMPED X	.35FN4000A02	EA B	1.00
ROTOR CORE,1.5S 35ER4000*	.35RC4032A00	EA B	1.00
ALUMINUM- 150.1 ALLOY	..MA9000A01	LB B	.87
ROTOR LAMINATION	..35RL4480	IN B	4.00
ROT. SWITCH ASSY, 1725RPM	.35RS4060	EA M	1.00
BRACKET, MODEL 35 SWITCH	..RS1000A01	EA B	1.00
COMPRESSION SPRING(BLACK)	..RS4500A01	EA B	1.00
SLEEVE, ASSY/DWG, MOD 35	..RS5000A01	EA B	1.00
LEVER ASSY/DWG MOD 35 4P	..RS5001A03	EA B	2.00
A661 BRASS EYELET (PARFN)	...HW3000B10	EA B	1.00
LEVER RETAINER, MOD 35 SW	...RS3000A01	EA B	1.00
13.753LX1.188D SHOVS=3.66	.35SH5501C01	EA M	1.00
1035 BAR STOCK 1.188 DIA	..MR3010B19	LB B	4.36
510101000000000113	..RTFSH5002	EA M	1.00
DUMMY ROUTING #	...FRT01	EA M	1.00
STATOR ASSY, HORZ	35SA0016X944A01	EA M	1.00
VARNISH B-535-5SH WATER	.MG5017	GA B	.05
AA BAND ASSY, HOR 164	.35SB0016C00	EA B	1.00
WOUND STATOR ASSY	.35WSX944B01	EA M	1.00
MAG WIRE- MR200 16GA NAT	..MW1000A16	LB B	1.30
MAG WIRE- MR200 17GA NAT	..MW1000A17	LB B	1.38
MAG WIRE- MR200 16GA CLR	..MW1000B16	LB B	1.30
SLOT WEDGE- .406 X 4.375	..NS3000A32	EA M	36.00
P100 STR- 3-10-3 X 0.406	...MH1012A01A41	FT B	.36
STATOR CORE	..35SC4032B00	EA M	1.00
SLOT CELL INSULATION	...NS1021A32	EA M	36.00
MYLAR STR- .014 X 4.625MP1000A02E63	LB M	.00
MYLAR COIL - .014 47" WIDMP1000A02Z00	LB B	1.00
STATOR LAMINATION	...35SL4360	IN B	4.00
CONDUIT BOX LID, STAMPED	36CB4500	EA B	1.00
GASKET, CONDUIT BOX STD. X	36GS1000	EA B	1.00
GASKET, CONDUIT BOX LID	36GS1001	EA B	1.00
GASKET, CAPACITOR BOX	37GS3001	EA B	1.00
10-16X7/16HXWSSLD SERTYB	51XB1016A07	EA B	2.00
10-16X1/2HX WA SL SR ZN X	51XB1016A08	EA B	2.00
12-14X1.0 HX WS SLD SER	51XB1214A16	EA B	1.00
10-32X1 1/4HXWS SLD SER	51XN1032A20	EA B	2.00
8-32X7/16TY23 HXWS SLDSR	51XT0832A07	EA B	6.00
4X1/4 U DRIVE PIN	85XU0407A04	EA B	2.00



PARTS LIST

- | | |
|-----------------------------------|---|
| 01. Tie Rod Nut | 61. Rod Seal |
| 02. Tie Rod | 62. Cartridge O.D. Seal
(‘O’ Ring & Back-up) |
| 03. Packing Cap | 63. Rod Wiper |
| 04. Rod Head | 64. Piston O.D. Seal |
| 05. Cap Head | 67. Barrel Seal (‘O’ Ring) |
| 06. Cylinder Barrel (Honed Steel) | 73. Adjustable Cushion Assembly |
| 07. Piston | 74. Cushion Check Assembly |
| 09. Rod End Cushion Sleeve | 80. Packing Cap Screws |
| 10. Piston Rod | 86. Hardened Washer |
| 12. Rod Bearing Cartridge | |

Cylinder Repair Kit Contents

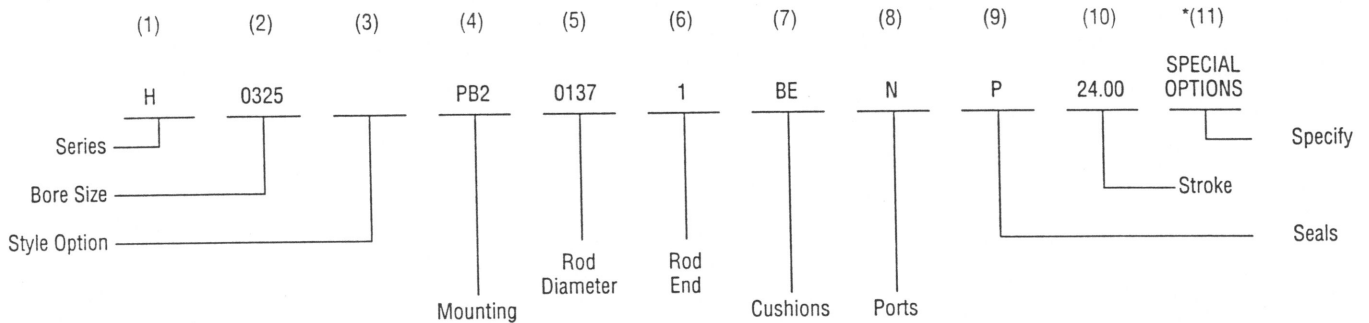
ITEMS 12-61-62-63-64-67

IMPORTANT

To speed the handling of orders for parts or repair kits, please specify:

1. Cylinder serial number
2. Cylinder bore diameter
3. Stroke
4. Piston rod diameter
5. Operating medium

HOW TO ORDER



NOTE: On double rod end cylinders and duplex cylinders, ordering steps 4, 5, & 6 need to be repeated.

Be sure to always include the cylinder Serial Number when ordering replacement parts.

*Please put an "S" at the end of the cylinder model number, if a special option is required. Then, in parentheses, call out exactly what special option you wish.

"H" SERIES CYLINDER CODING SYSTEM

(1) SERIES	(2) BORE	(3) STYLE OPTION	(4) MOUNTING	(5) ROD DIAMETER	(6) ROD END	(7) CUSHIONS	(8) PORTS	(9) SEALS	(10) STROKE (Inches)	(11) SPECIAL OPTIONS
H	015: 1½	- Std	BEF1	0062 - ¾	1 - Standard male	NC - None	N - NPT	P - STD URETHANE	XXX.XX	Specify
*HA	020: 2		BEF2	0100 - 1			S - SAE		(Inches)	With
▼HL	025: 2½	X - DRE	CL	0137 - 1¾	2 - Oversized male	HE - Head End	I - ISO6149	B - BUNA N		Order
	032: 3¼		FS	0175 - 1¾				E - NITRILE		
	040: 4	Y - Duplex	MP2	0200 - 2	3 - Female	CE - Cap End		STD W/ M - METALLIC SCRAPER		
	050: 5		NM0	0250 - 2½	4 - Special	BE - Both Ends		V - VITON		
	060: 6		NM1	0300 - 3						
	070: 7		NM2	0350 - 3½	5 - Safety Coupler					
	080: 8		NM3	0400 - 4	6 - Stub end					
	100: 10		PB1	0450 - 4½						
	120: 12		PB2	0500 - 5						
			REF1	0550 - 5½						
			REF2	0700 - 7						
			SA	0800 - 8						
			SL	0850 - 8½						
			TM1							
			TM2							
			TM3							
			ME5							
			ME6							
			IH3							
			IH4							
			DRE							

BOLD ITEMS ARE STANDARD AND WILL BE SUPPLIED UNLESS OTHERWISE SPECIFIED.

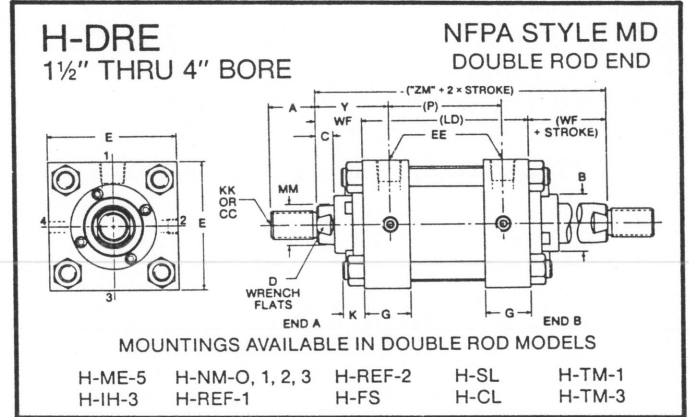
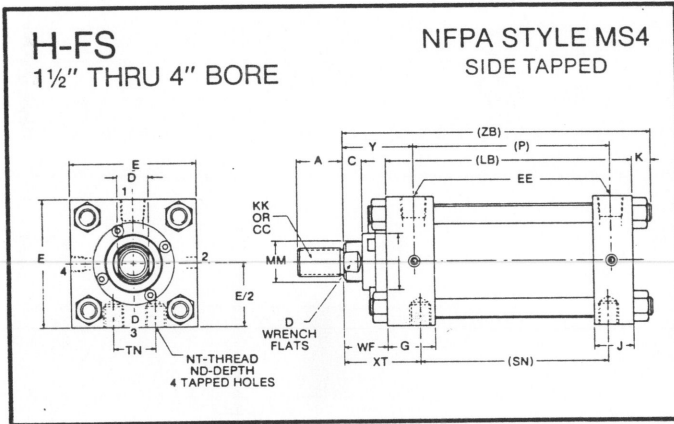
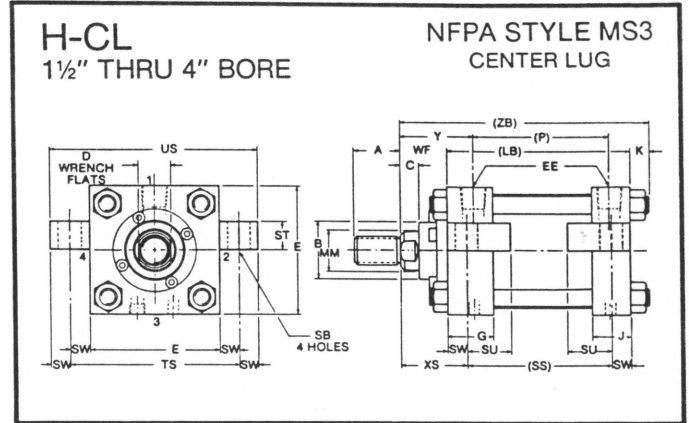
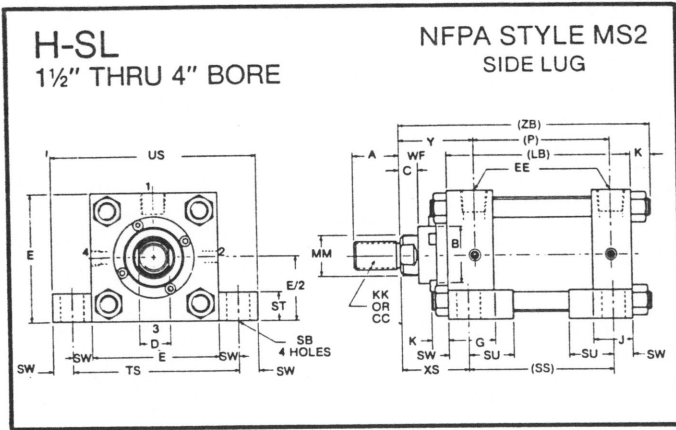
***"HA" THE ATLAS HYDRAULIC FOR AIR SERVICE**

Specify "HA" when ordering, the cylinder will be ready for air service with a chrome plated barrel I.D.

Specify ▼ "HL" for air service PRE-LUBRICATED.

1½" THRU 4" "H" SIDE LUG, CENTER LUG, FLUSH MOUNT AND DOUBLE ROD END

5" THRU 12" TURN PAGE



NOTE: Stroke must be added to the letters in parentheses.

BORE	E	NPT EE	* SAE EE	G	J	K	(LB)	(LD)	ND	NT	(P)	SB	† (SN)	† (SS)	ST	SU	SW	TN	TS	US
1½	2½	½	#8	1¾	1½	½	4⅝	4⅞	7/16	3/8-16	3	7/16	2⅞	3⅞	½	15/16	3/8	¾	3¼	4
2	3	½	#8	1¾	1½	5/8	4⅝	4⅞	7/16	1/2-13	3	9/16	2⅞	3⅝	¾	1¼	½	15/16	4	5
2½	3½	½	#8	1¾	1½	5/8	4¾	5	5/8	5/8-11	3⅛	13/16	3	3⅞	1	19/16	11/16	15/16	4⅞	6¼
3¼	4½	¾	#12	2	1¾	¾	5½	5¾	¾	¾-10	3⅞	13/16	3½	4⅞	1	19/16	11/16	1½	5⅞	7¼
4	5	¾	#12	2⅞	1¾	¾	5¾♦	6⅞	1	1-8	4♦	1⅞	3¾	4	1¼	2	7/8	2⅞	6¾	8½

♦ Subtract ⅛ for H-FS Mount.

† Dimensions will be longer on DRE cylinders.

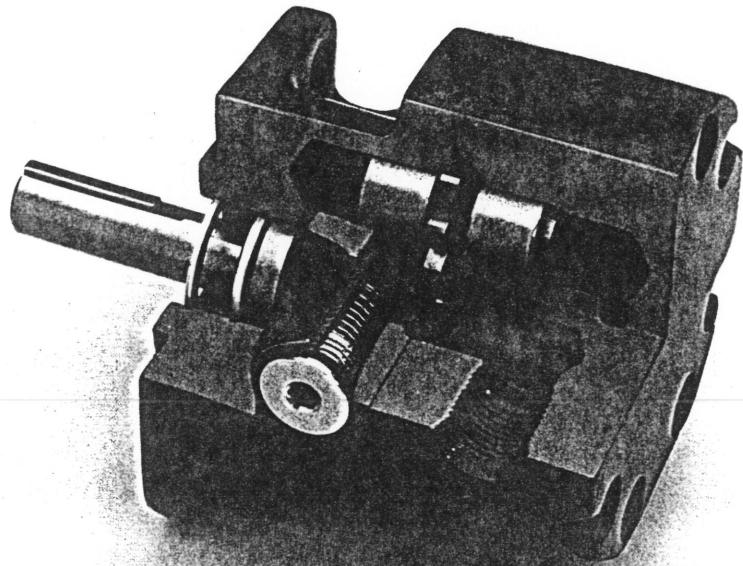
* ISO 6149 Ports Available as standard option.

G.C. Series Hydraulic Pumps

John S. Barnes G.C. Series Hydraulic Pumps are compact, external gear models for use in pumping fluids with lubricating qualities. Suitable for use in a wide variety of material handling, agricultural, and construction equipment in addition to machine tools, robotics, and other types of machinery.

Designed to provide reliable, long-life service under rugged conditions, G.C. Series pumps are built with cast iron bodies and hardened steel gears. Among their other standard, extra-value features are:

- Speeds to 4000 RPM
- Pressures to 4000 PSI
- Superior volumetric efficiency
- Needle bearing construction
- High mechanical efficiency
- Temperature ratings to 400 °F (204 °C)
- Wide variety of options



See the chart on this page for basic sizes. Dimensional and option information is listed on pages 3-5 and performance curves are shown on pages 6 & 7. See the back cover for complete ordering information.

Order Code (Gear)	Displacement Revolution		Flow				Pressure Rating			
			At 1800 RPM		At 3600 RPM		Continuous		Intermittent	
	cu. in.	cc.	GPM	L/Min.	GPM	L/Min.	PSI	BAR	PSI	BAR
04	0.065	1.07	0.50	1.93	1.0	3.86	3000	207	4000	275
06	0.097	1.59	0.75	2.86	1.5	5.72	3000	207	4000	275
08	0.129	2.11	1.0	3.80	2.0	7.60	3000	207	4000	275
▲10	0.161	2.64	1.25	4.75	2.5	9.50	3000	207	4000	275
12	0.194	3.18	1.5	5.72	3.0	11.44	3000	207	4000	275
▲14	0.226	3.70	1.75	6.66	3.5	13.32	2600	179	4000	275
16	0.258	4.23	2.0	7.61	4.0	15.22	2300	159	4000	275
▲18	0.291	4.77	2.25	8.59	4.5	17.18	2100	145	3500	241
20	0.323	5.29	2.5	9.52	5.0	19.04	1900	131	3000	207
24	0.388	6.36	3.0	11.45	6.0	22.90	1600	110	2500	172
28	0.453	7.42	3.5	13.36	7.0	26.72	1300	90	2250	155
32	0.517	8.47	4.0	15.25	8.0	30.50	1200	83	2000	138
†36	0.581	9.52	4.5	17.03	9.0	34.06	2250	155	2475	171
†40	0.647	10.59	5.0	18.92	10.0	37.95	2000	138	2200	152
†44	0.711	11.65	5.5	20.82	11.0	41.64	1800	124	2000	138

Flow listed in U.S. gallons. 200 SSU oil.

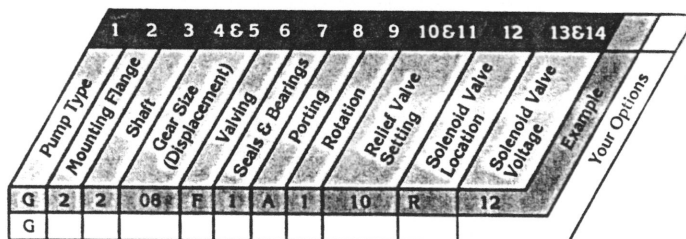
▲ Available, but not standard (100-piece minimum order).

†For speed above 2400 RPM, 1-in. dia. inlet tube must be used.

How To Order G.C. Series Pumps

ORDERING INFORMATION

Each option has been assigned an order code—listed in the tables below—for placement in the sequence shown here.



2

Order Code	Mounting Flange Options
1	4-Bolt w/1.78" Pilot
2	2-Bolt SAE "AA" w/2.0" Pilot
▲3	2-Bolt SAE "AA" w/1.78" Pilot
4	2-Bolt SAE "A" w/3.25" Pilot

▲ 100-piece minimum order

3

Order Code	Shaft Options
1	0.171" Tang w/Short Coupling (.5" long) (For DC Motors)
2	0.50" Diameter x 1.50" Extension, 1/8" Square Key
▲3	Flexible Coupling
▲4	Threaded End (Specify Thread)
5	SAE Spline (9 tooth, 20/40DP standard with flange options 1, 2, and 3; 9 tooth, 16/32DP standard for flange option 4.)
6	0.171 Tang w/Long Coupling (.8" long) (For AC Motors)

▲ 100-piece minimum order

4 & 5

Order Code	Gear Size Width, Inches	Displacement Cu. In./Revolution
04	0.125	0.065
06	0.188	0.097
08	0.250	0.129
▲10	0.312	0.161
12	0.375	0.194
▲14	0.437	0.226
16	0.500	0.258
▲18	0.562	0.291
20	0.625	0.323
24	0.750	0.388
28	0.875	0.453
32	1.000	0.517
36	1.125	0.581
40	1.250	0.647
44	1.375	0.711

▲ 100-piece minimum order

6

Order Code	Valve Options
A	No Valves
B	Relief Valve
†C	Direction Checks
*D	Check Valve
*E	Check & Relief Valves
*F	Check, Relief & Normally Closed Solenoid
*G	Check, Relief & Normally Open Solenoid
*H	Check, Relief & Solenoid Cavity Plugged

†Available only with option "3" of section 9

*Available ONLY for gear sizes 04 through 36

7

Order Code	Seals & Bearings Options
1	Single Lip Buna-N Low Pressure Seal
2	Viton Seal
*3	Viton High-Pressure Seal w/Outboard Ball Bearing
▲*4	Double Seal w/Overboard Drain
*5	Buna-N Seal w/Outboard Ball Bearing

▲ 100-piece minimum order

*Not available with shaft option 3

8

Order Code	Port Location Options
A	SAE Side Ports
▲B	SAE Rear Ports
▲C	NPTF Side Ports
▲D	NPTF Rear Ports
▲*E	Inlet Tube, 1.0" Dia. w/SAE Side Outlet Port

▲ 100-piece minimum order

NOTE: If ordering NPTF Ports, specify size: 1/4", 3/8", or 1/2".

*For gear sizes 36, 40 & 44, 1-in. Dia. Inlet Tube must be used for speed above 2400 RPM.

9

Order Code	Rotation Options
1	Clockwise
2	Counterclockwise
*3	Biorotational

*Must specify option "C" in section 6

10 & 11

Order Code	Relief Valve Setting
02-40	Full bypass pressure in hundreds of PSI. (Example: 00 = No Relief; 09 = 900 PSI (Full Bypass Pressure); 40 = 4000 PSI (Full Bypass Pressure).)

NOTE: The maximum relief valve full bypass setting for each gear size as listed on page 2, "intermittent rating" pressure chart.

Minimum full bypass relief valve settings: 200 psi for gear sizes 04-16 at 1725 rpm, 300 psi for gear sizes 18-44 at 1725 rpm. At speeds above 1725 rpm, the minimum relief valve settings increase. Contact factory for specific information.

12

Order Code	Solenoid Valve Location
R	Rear Mounted Solenoid Valve
S	Side Mounted Solenoid Valve
N	No Solenoid Valve

13 & 14

Order Code	Solenoid Valve Voltage
12	12 Volts DC
24	24 Volts DC
15	115 Volts AC
*PG	Solenoid Valve Cavity Plugged
00	No Solenoid Valve Cavity

*Must specify option "H" in section 6



John S. Barnes Corporation
2222 15th Street
Rockford, Illinois 61104 • USA
Phone: (815) 398-4400
Fax: (815) 398-5977

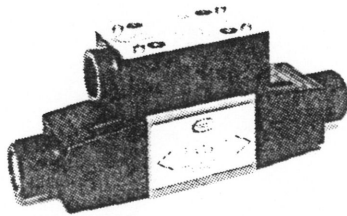
John S. Barnes Corporation
Statesville Division
214 James Farm Road
Statesville, NC 28677 • USA
Phone: (704) 873-2587
Fax: (704) 878-0530



DIRECTIONAL CONTROL VALVES

SOLENOID ACTUATED, DIRECT OPERATED

NFPA SIZE
D03
(FORMER D01)

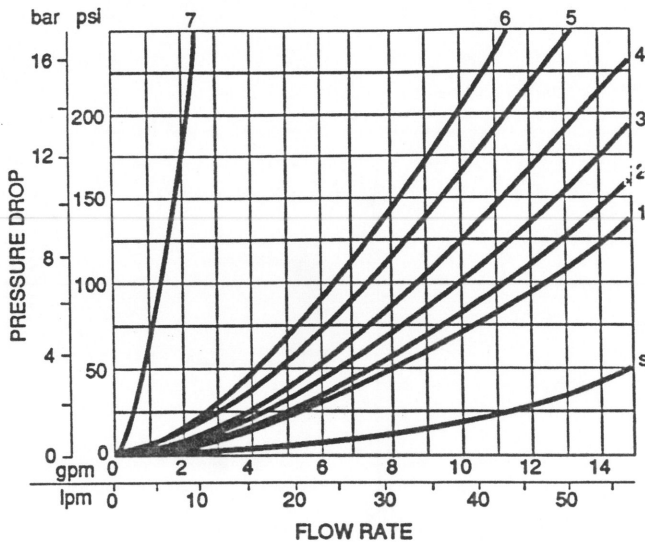


CSA CERTIFIED

TYPICAL PERFORMANCE SPECIFICATIONS

NOMINAL FLOW RATES	@ 4600 psi	7 gpm	27 lpm
	@ 1000 psi	12 gpm	46 lpm
MAXIMUM OPERATING PRESSURE ^①	P, A, B Ports	4600 psi	315 bar
	T port ^② Std. Code P	1500 psi 3000 psi	105 bar 207 bar
INTERNAL LEAKAGE	(2-ports) 4600 psi 100 SUS	3.4 cipm	57 mlpm
MAX. CYCLE RATE	AC Solenoids	400 cpm	
	DC Solenoids	300 cpm	
MOUNTING SURFACE	NFPA T3.5.1.MR1 - 1984 - DO3 ISO/DIS 4401 - SIZE 03		
WEIGHT	Single Actuator	2.75 lbs.	1.25 kg
	Double Actuator	3.5 lbs.	1.59 kg
SPOOL CODES AVAILABLE	A, B, E, F, F1, G, H, J, K, L, N, Q		

TYPICAL PRESSURE DROP



NOTES:

- ① Pressure rates apply to all valves except with code 68L coils. Limitations with Code 68L coils are: P, A, B ports Max. 1500 psi, 5gpm max. Code 68L Recommended Start-up Viscosity 40 to 1000 SUS. Code P with DC volt coils only.
- ② Includes surges.

FLOW PATH ΔP CURVES

SPOOL TYPE	FLOW CURVE NUMBER				
	SPOOL SHIFTED		SPOOL CENTERED		
	P to A or B	A or B to T	P to A or B	A or B to T	P to T
A	2	1	—	—	—
B	5	1	5	4	4
E	2	1	—	4	—
F	3	1	—	4	—
F1	3	1	—	7	—
G	2	2	2	—	—
H	2	1	—	—	6
J	2	1	4	—	—
K	2	1	—	4	—
L	6	5	—	—	4
N	2	1	4	—	—
Q	2	1	—	—	6
SUBPLATE	S (FULL CIRCUIT)				

All pressure drops shown on this data page are based on 100 SUS fluid viscosity and 0.87 specific gravity. For other viscosities see below.

Fluid Viscosities	CS SUS	14.5 75	20.5 100	32 150	43 200	54 250	65 300	76 350	86 400
Multiplier		0.93	1.00	1.11	1.19	1.26	1.32	1.37	1.41

For any other specific gravity (G_s) the pressure drop (ΔP) will be approximately ΔP_s = ΔP (G_s/G).



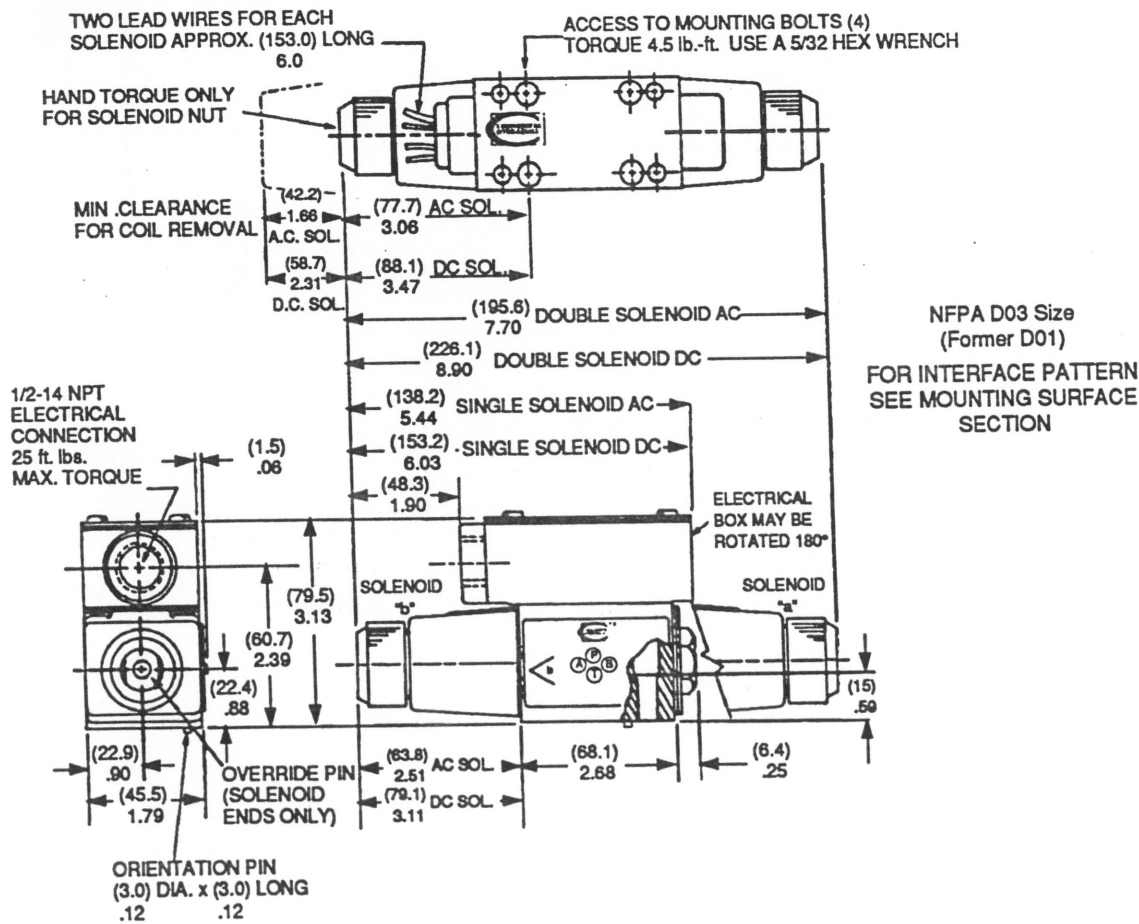
DIRECTIONAL CONTROL VALVES

SOLENOID ACTUATED, DIRECT OPERATED

TYPICAL ELECTRICAL AND RESPONSE TIME

SOLENOID CODE		VOLTAGE & FREQUENCY	VOLTAGE LIMITS	INRUSH CURRENT (AMP)	HOLDING CURRENT	HOLDING POWER	RESPONSE TIME (MILLISECONDS)	
LEAD WIRE	DIN CONN.	VOLTS - Hz	MIN - MAX	MAX	(AMP)	(WATTS)	SOLENOID	SPRING
60L	33L	120 - 60	108 - 126	2.10	.40	21	12	15
		110 - 50	99 - 116		.43	21	14	15
68L		120 - 60	108 - 132	1.10	.18	10	20	28
		110 - 50	99 - 121		.20	9.5	23	28
61L	34L	240 - 60	216 - 252	1.10	.21	22	12	15
		220 - 50	198 - 231		.25	22	14	15
	35L	280 - 60	252 - 297	1.00	.17	22	12	15
		240 - 50	216 - 255		.20	22	14	15
70L	42L	24 DC	21 - 26	1.00	1.00	24	35	30
75L	44L	12 DC	10 - 13	2.00	2.00	24	35	30

DIMENSIONS (MILLIMETERS) INCHES



RA

"TANK CARE" RETURN FILTERS

MATERIALS:

Head and cover *Aluminium alloy*
 Bowl *Polyamide for*
 FRA 21-31-32-33-41
 Zinc plated steel
 FRA 11-51-52-53

Bypass valve *Polyamide*
 Seals *Nitrile NBR (Viton® FPM*
 on request)

Indicator housing *Brass*

COMPATIBILITY

Full with fluids:
HH-HL-HM-HR-HV-HG
 (according to ISO 6743/4)
 For fluids different than the above mentioned, please contact our Sales Department.

PRESSURE

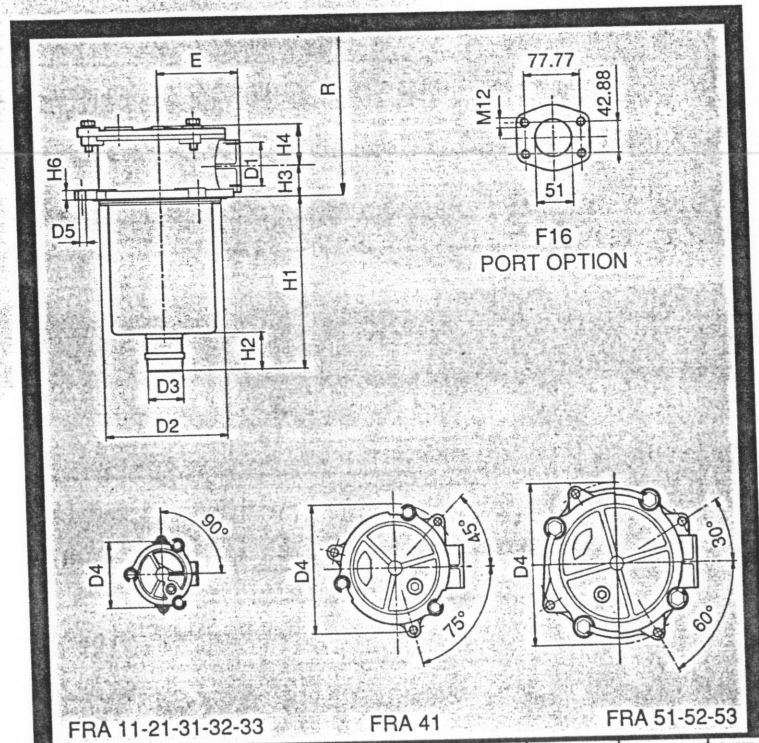
Max working *300 kPa (3 bar)*
 Test *500 kPa (5 bar)*
 Bursting *1.000 kPa (10 bar)*
 Collapse, differential
 for the filter element *300 kPa (3 bar)*

BYPASS VALVE

Setting *170 kPa (1,7 bar)*
 +/-10%

WORKING TEMPERATURE

Da -25° a +110° C



	D1	D2	D3	D4	D5	E	H1	H2	H3	H4	H6	R	Weight Kg.
F RA11	See the ordering and options chart	49,5	12	80	6,5	40	59	16	12	33	9	90	,30
F RA21		66	24	90	6,5	50	80	25	22	33	9	120	,45
F RA31		89	27	115	9	67	102	30	28	47	10	150	,80
F RA32		89	27	115	9	67	147	30	28	47	10	190	,95
F RA33		89	40	115	9	67	223	30	28	47	10	270	1,10
F RA41		129	40	175	9	95	248	30	35	47	13	300	2,10
F RA51		173,5	50	220	10,5	115	178	50	46	61	13	235	3,10
F RA52		173,5	63,5	220	10,5	115	240	50	46	61	13	300	3,60
F RA53		173,5	63,5	220	10,5	115	285	50	46	61	13	340	4,10

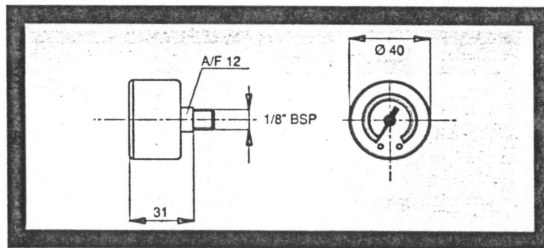
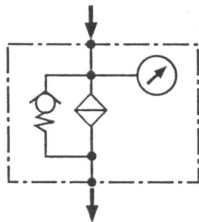


"TANK CARE" RETURN FILTERS

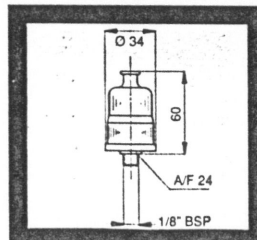
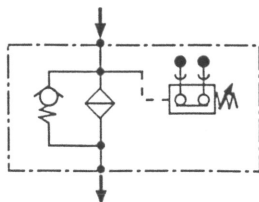
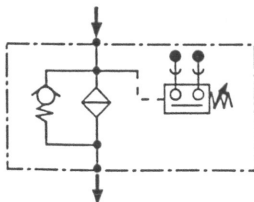
ORDERING AND OPTIONS CHART

F FILTER COMPLETE												ELEMENT		E	
R	A	FAMILY NOMINAL SIZE & LENGTH										FAMILY SIZE & LENGTH		R	A
		11	21	31	32	33	41	51	52	53					
PORT TYPE															
B = BSP thread		B	B	B	B	B	B	B	B	B					
N = NPT thread		N	N	N	N	N	N	N	N	N					
S = SAE thread		=	S	S	S	S	S	S	S	S					
F = SAE flange 3000 psi		=	=	=	=	=	=	=	F	F					
PORT SIZE (quote "D1")															
03 = 3/8"		03	=	=	=	=	=	=	=	=					
04 = 1/2"		=	04	04	=	=	=	=	=	=					
06 = 3/4"		=	=	06	06	=	=	=	=	=					
08 = 1"		=	=	=	08	08	08	=	=	=					
10 = 1" 1/4		=	=	=	=	10	10	10	=	=					
12 = 1" 1/2 (not available F12)		=	=	=	=	=	=	12	12	=					
16 = 2"		=	=	=	=	=	=	=	16	16					
BYPASS VALVE															
B = 170 kPa (1,7 bar)		X	B	B	B	B	B	B	B	B					
SEALS												SEALS			
N = nitrile NBR		N	N	N	N	N	N	N	N	N			N = NBR		
F = Viton® FPM		F	F	F	F	F	F	F	F	F			F = FPM		
FILTER MEDIA												FILTER MEDIA			
FC = fiber 12μ β>100		FC	FC	FC	FC	FC	FC	FC	FC	FC			FC = fiber 12μ		
FD = fiber 25μ β>100		FD	FD	FD	FD	FD	FD	FD	FD	FD			FD = fiber 25μ		
CC = cellulose 10μ β>2		CC	CC	CC	CC	CC	CC	CC	CC	CC			CC = cellulose 10μ		
CD = cellulose 25μ β>2		CD	CD	CD	CD	CD	CD	CD	CD	CD			CD = cellulose 25μ		
CLOGGING INDICATOR															
01 = 1/8" port, plugged		01	01	01	01	01	01	01	01	01					
30 = press. gauge, rear connection		30	30	30	30	30	30	30	30	30					
32 = press. gauge, bottom connection		32	32	32	32	32	32	32	32	32					
40 = press. switch, N.O. contacts		40	40	40	40	40	40	40	40	40					
41 = press. switch, N.C. contacts		41	41	41	41	41	41	41	41	41					
ACCESSORIES															
W = without		W	W	W	W	W	W	W	W	W					
P = with filling plug		P	P	P	P	P	P	P	P	P					

CLOGGING INDICATORS



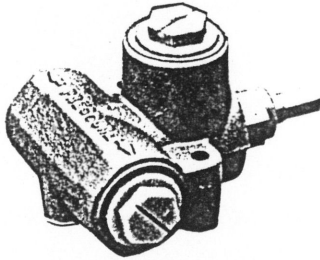
Series 30 (rear connection)
& series 32 (bottom connection):
pressure gauge, scale 0-400 kPa (0-4 bar)



Series 40 (N.O. contacts)
& series 41 (N.C. contacts):
pressure switch, max voltage 220 Vca 50-60 Hz
max current 0.5A resistive, 0.25A inductive - switching power 100 VA, setting 150 kPa (1,5 bar)

DIFFERENTIAL POPPET STYLE RELIEF VALVES - RV AND DRV SERIES

MODEL RV DIFFERENTIAL POPPET INLINE RELIEF



The PRINCE valve model RV is a differential poppet type inline relief. The valve is made up of a relief cartridge and a cast iron valve body. The differential poppet type relief provides smooth quiet performance with a minimum variation between cracking and full flow pressures. This type relief is also less sensitive to system contamination. The model RV is well suited as a system relief up to 30 GPM and 3000 psi. It is available in two pressure ranges and both an externally adjustable and shim adjustable version.

VALVE SPECIFICATIONS:

Capacity: 30 gpm max inlet flow
Pressure: 3000 psi max

Weight: 3 lbs.

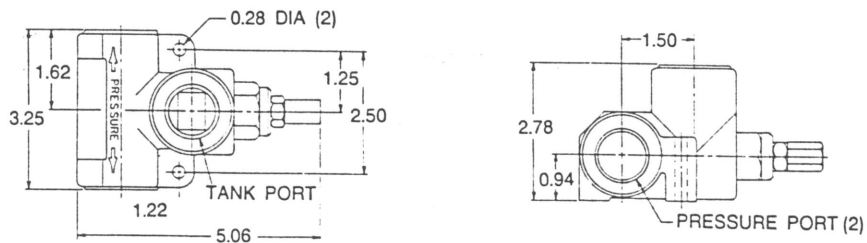
MODEL RV AND DRV SPECIAL MODELS AND MOUNTING DIMENSIONS

SPECIAL MODEL RV RELIEF VALVES

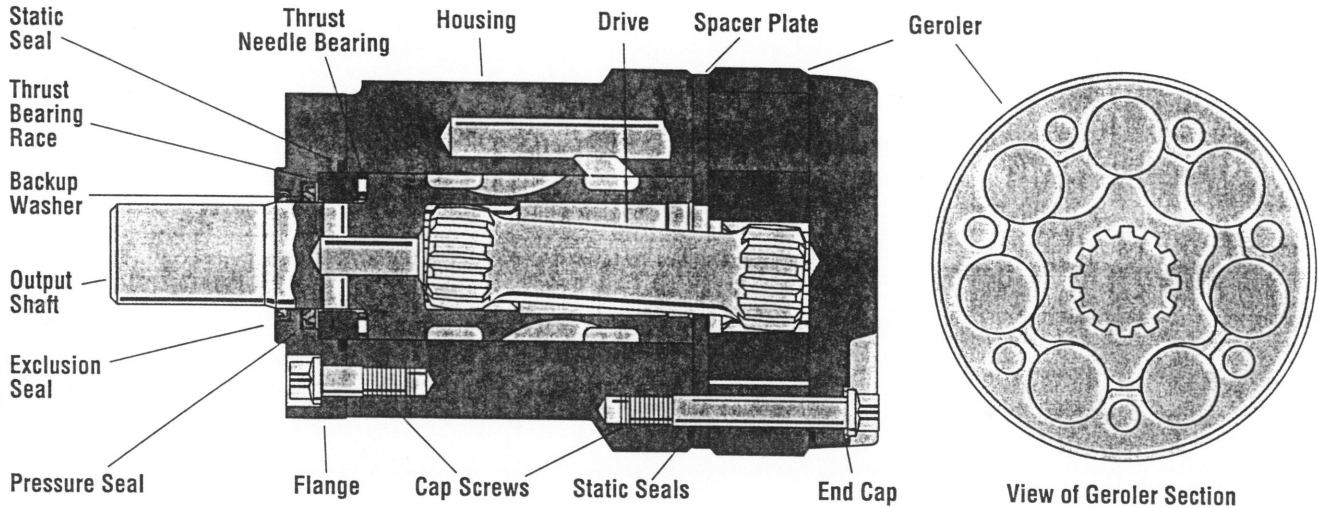
Other relief valve models not listed on previous page are available in OEM quantities. To select a model number use the order code matrix shown at right. Consult a sales representative if options other than those listed are required.

RV	—	—	—
MODEL NUMBER	PORT SIZE	RELIEF TYPE	PRESSURE SETTING
<u>RV</u>	1- #12 SAE 2- 3/4 NPTF 3- #10 SAE 4- 1/2 NPTF 5- #8 SAE O- Cartridge Only No Body.	H- Adjustable 1500-3000 PSI L- Adjustable 500-1500 PSI NH- Non-Adjustable 1500-3000 PSI NL- Non-Adjustable 500-1500 PSI	Specify Relief Pressure. Leave Blank for Standard Settings. STANDARD SETTING: 2000 PSI for H and NH 1000 PSI for L and NL

RV-SERIES MOUNTING DIMENSIONS



Specifications S Series



Specification Data—S Series

Displ. cm ³ /r [cu. in ³ /r]		59 [3.6]	74 [4.5]	97 [5.9]	120 [7.3]	146 [8.9]	159 [9.7]	185 [11.3]	231 [14.1]	293 [17.9]	370 [22.6]
Max. Speed (RPM) @ Continuous Flow		962	762	585	470	385	353	303	243	192	153
Flow LPM [GPM]	Continuous	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]	57 [15]
	Intermittent	68 [18]	76 [20]	76 [20]	76 [20]	76 [20]	76 [20]	76 [20]	76 [20]	76 [20]	76 [20]
Torque Nm [lb-in]	Continuous	107 [943]	139 [1228]	181 [1591]	227 [2010]	263 [2332]	290 [2567]	324 [2870]	369 [3265]	411 [3641]	452 [4004]
	Intermittent **	133 [1174]	173 [1529]	225 [1991]	281 [2490]	323 [2861]	347 [3072]	390 [3450]	438 [3877]	485 [4295]	514 [4548]
Min. Starting Torque Nm[lb-in]	@ Cont. Pressure	90 [800]	113 [1000]	148 [1310]	184 [1630]	212 [1880]	232 [2050]	263 [2330]	302 [2670]	338 [2990]	369 [3270]
	@ Int. Pressure	116 [1030]	146 [1290]	190 [1680]	236 [2090]	271 [2400]	289 [2560]	329 [2910]	374 [3310]	417 [3690]	438 [3880]
Pressure Δ Bar [Δ PSI]	Continuous*	138 [2000]	138 [2000]	138 [2000]	138 [2000]	131 [1900]	131 [1900]	128 [1850]	117 [1700]	103 [1500]	90 [1300]
	Intermittent**	172 [2500]	172 [2500]	172 [2500]	172 [2500]	162 [2350]	159 [2300]	155 [2250]	141 [2050]	124 [1800]	103 [1500]

Maximum Case Pressure - without Case Drain — 103 Bar [1500 PSI] — See Page 34-35

* Maximum intermittent pressure at motor inlet port of **172 Bar [2500 PSI]** without regard to Δ Bar [Δ PSI] and/or back pressure ratings or combination thereof.

** **A simultaneous maximum torque and maximum speed NOT recommended.**

6B Splined or Tapered shafts are recommended whenever operating above 282 Nm [2500 lb-in] of torque, especially for those applications subject to frequent reversals (see page 30).

Δ Bar [Δ PSI] — True pressure difference between inlet port and outlet port.

Continuous Rating — Motor may be run continuously at these ratings.

Intermittent Operation — 10% of every minute.

Recommended Fluids — Premium quality, anti-wear type hydraulic oil with a viscosity of not less than 70 SUS at operating temperature.

Recommended Maximum System Operating Temp — Is 82° C [180° F]

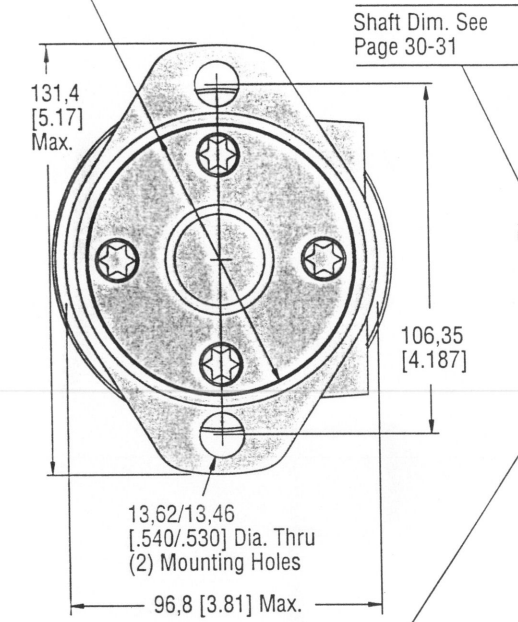
Recommended Filtration — per ISO Cleanliness Code, level 18/13

To assure optimum motor life, run motor for approximately one hour at 30% of rated pressure before application to full load. Be sure motor is filled with fluid prior to any load applications.

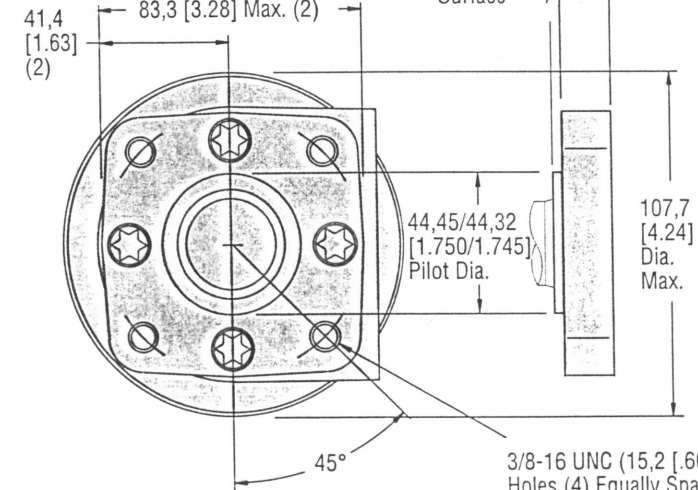
Dimensions S Series

2 Bolt Flange

82,55/82,42
[3.250/3.245]
Pilot Dia.

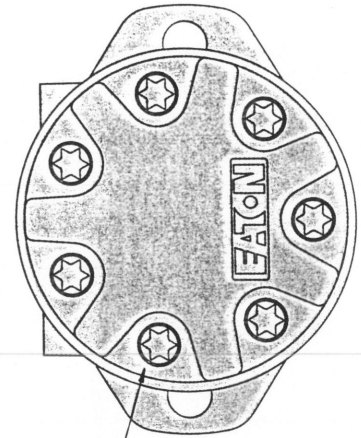
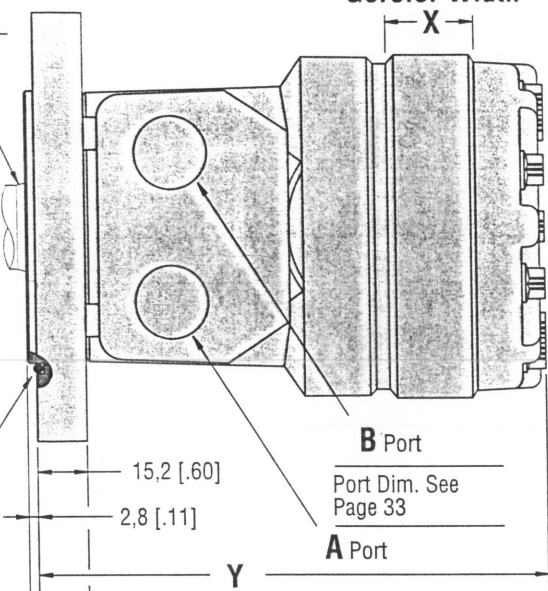


4 Bolt Flange



Standard Rotation
Viewed from Shaft End
Port A Pressurized — CW
Port B Pressurized — CCW

Geroler Width



Standard Motor End Cap
End Cap with Case Drain Port
See Page 34

Displ. cm ³ /r [in ³ /r]	X	Y
	Width mm [in.]	Length mm [in.]
59 [3.6]	10,2 [.40]	136,4 [5.53]
74 [4.5]	10,2 [.40]	136,4 [5.53]
97 [5.9]	13,2 [.52]	139,4 [5.65]
120 [7.3]	16,5 [.65]	142,7 [5.74]
146 [8.9]	20,1 [.79]	146,3 [5.88]
159 [9.7]	21,9 [.86]	148,3 [5.95]
185 [11.3]	25,4 [1.00]	151,6 [6.09]
231 [14.1]	31,8 [1.25]	158,0 [6.34]
293 [17.9]	40,4 [1.59]	166,6 [6.68]
370 [22.6]	50,8 [2.00]	166,6 [7.09]

3/8-16 UNC (15,2 [.60] Max. Bolt Thread Engagement) Mounting Holes (4) Equally Spaced on 82,6 [3.25] Dia. Bolt Circle
or
M10 x 1,5 (15,2 [.60] Max. Bolt Thread Engagement) Mounting Holes (4) Equally Spaced on 82,6 [3.25] Dia. Bolt Circle

Note: Mounting Surface Flatness Requirement is ∇ ,13 mm [.005 inch] Max.

Product Numbers S Series 103-xxxx

Product Numbers—S Series

Add three digit prefix —**103**—to four digit number from chart for complete product number—Example 103-1537.
Orders will not be accepted without three digit prefix.

Mounting	Shaft	Ports	Displ. cm ³ /r [in ³ /r] Product Number 103-xxxx									
			59 [3.6]	74 [4.5]	97 [5.9]	120 [7.3]	146 [8.9]	159 [9.7]	185 [11.3]	231 [14.1]	293 [17.9]	370 [22.6]
2 Bolt Flange	1 in. Straight w/Woodruff Key	7/8-14 O-ring	103-1537	-1034	-1035	-1538	-1539	-1036	-1037	-1038	-1039	-1040
		1/2 NPTF	103-1540	-1026	-1027	-1541	-1542	-1028	-1029	-1030	-1031	-1032
		Manifold	103-1543	-1042	-1043	-1544	-1545	-1044	-1045	-1046	-1047	-1048
	1 in. SAE 6B Splined	7/8-14 O-ring	103-1552	-1082	-1083	-1553	-1554	-1084	-1085	-1086	-1087	-1088
		1/2 NPTF	103-1555	-1074	-1075	-1556	-1557	-1076	-1077	-1078	-1079	-1080
		Manifold	103-1558	-1090	-1091	-1559	-1560	-1092	-1093	-1094	-1095	-1096
4 Bolt Flange	1 in. Straight w/Woodruff Key	7/8-14 O-ring	103-1570	-1010	-1011	-1571	-1572	-1012	-1013	-1014	-1015	-1016
		1/2 NPTF	103-1573	-1002	-1003	-1574	-1575	-1004	-1005	-1006	-1007	-1008
		Manifold	103-1576	-1018	-1019	-1577	-1578	-1020	-1021	-1022	-1023	-1024
	1 in. SAE 6B Splined	7/8-14 O-ring	103-1579	-1058	-1059	-1580	-1581	-1060	-1061	-1062	-1063	-1064
		1/2 NPTF	103-1582	-1050	-1051	-1583	-1584	-1052	-1053	-1054	-1055	-1056
		Manifold	103-1585	-1066	-1067	-1586	-1587	-1068	-1069	-1070	-1071	-1072

103-1587

Product Numbers—S Series Motors with Corrosion Protection

Shaft	Mounting	Ports	Displ. cu. cm/rev. [cu. in./rev.] Product Number 103-xxxx									
			59 [3.6]	74 [4.5]	97 [5.9]	120 [7.3]	146 [8.9]	159 [9.7]	185 [11.3]	231 [14.1]	293 [17.9]	370 [22.6]
1 in. Straight w/Woodruff Key	2 Bolt Flange	7/8-14 O-ring	103-1645							-1649	-1650	
	4 Bolt Flange	1/2 NPTF								-1620	-1621	

For S Series Motors with a configuration Not Shown in the charts above: Use the model code number system on page 38 to specify the product in detail.

For Product Numbers—S Series Motors with Low Speed Valving — See Page 28.

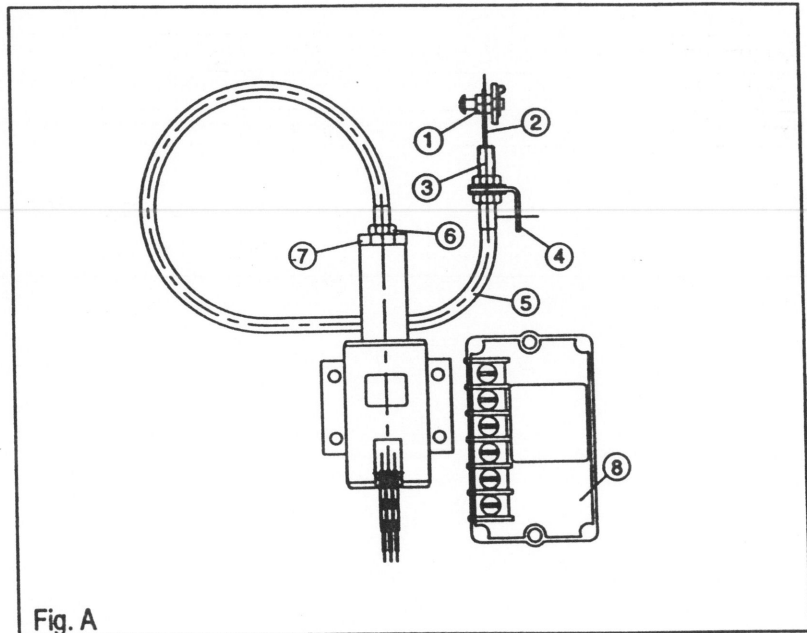
Installation Instructions

Patented Throttle Control Solenoid Kit

P613 - K Series (12 VDC Systems)
P613 - K Series (24 VDC Systems)

Parts List

Item No.	Replacement Part No.	Description
1	E07195	Cable Pivot
2	NA	Wire Core
3	NA	Cable Bulkhead Fitting
4	NA	Cable Bracket
5	Specify Kit No.	Cable Assembly
6	NA	Jam Nut UNF 3/8-24
7	NA	Aluminum Adjustment Nut 1.00 Inch Hex
8	S500-A6	Control Module



S500 - A6 Control Module Specifications

Specification	Note
Operating Temperature Range	-40 to 185° F (-40 to 85° C)
Maximum (Jump Start) Voltage	32 VDC
Maximum Solenoid Wattage (12 VDC System)	1000 Watts
Pull-In Coil Activation Duration	0.5 Seconds
Module Recycle Time	0.1 Seconds
Maximum Module Cycle Rate	6 per minute
Minimum Operating Voltage	8.8 VDC at 68° F (20° C)
Voltage Loss Through Module	0.35 VDC Maximum

Notes:

1. The output of the control module must be connected to the contactor/relay in 24 VDC systems. See wiring diagram.
2. Do not leave the module connected if you use over 32 VDC to jump-start a vehicle
3. If the load exceeds 1000 watts or if the voltage exceeds 32 VDC, use an external contactor as an interface between the module and the load.
4. Recycle time is the time the module must be de-energized before it will re-initiate the pull-in cycle.
5. Although the module can tolerate higher cycle rates, the solenoid may overheat in these situations. Consult the factory if you anticipate a high cycle rate.
6. This is the voltage drop anticipated between the input voltage and output voltage to the solenoid.

Solenoid Assembly Specifications

Specifications	P613-A41V12	P613-A41V24
Rated voltage	12 VDC	24 VDC
Pull-In Current	70.5 Amps	36.4 Amps
Hold-In Current	0.9 Amps	0.5 Amps
Pull-In Force (at 68° F [20° C])	20 lb.	20 lb.
Hold-In Force (at 68° F [20° C])	40 lb.	40 lb.
Maximum Ambient Temperature	257° F (125° C)	257° F (125° C)
Maximum Coil Temperature	380° F (193° C)	380° F (193° C)
Maximum Solenoid Cycle Rate	6/min.- see note 5 above	6/min. - see note 5 above

Safety First

Trombetta has made every effort to provide you with a safe solenoid kit, but wishes to point out information on safe installation and operation

⚠ WARNING

To avoid control module damage, always disconnect the module when you jump-start the vehicle with voltages that exceed 32 VDC.

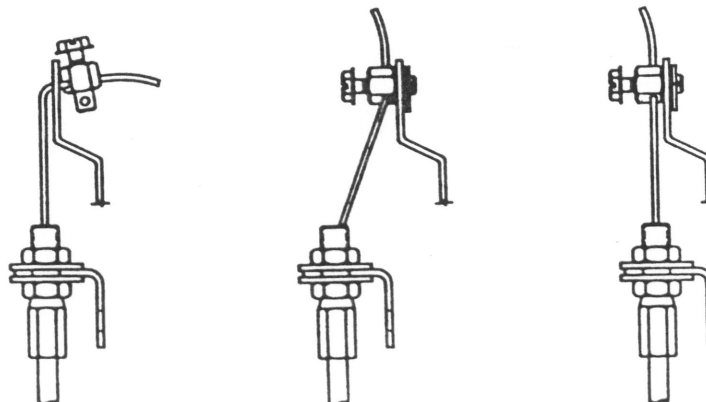
⚠ CAUTION

To avoid eye and/or face injury, eye and/or face protection must be worn when installing this device.

Improper installation of cable pivot can result in premature wire cable failure.

Consult the diagram below for proper installation.

Contact Trombetta service representatives at (414) 251~ 5454 with questions regarding your application.



INCORRECT

INCORRECT

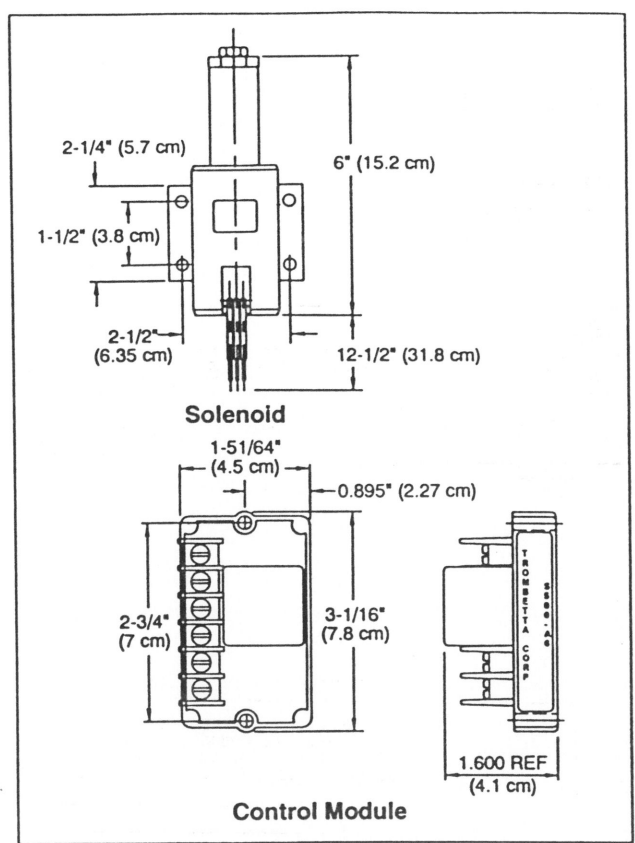
CORRECT

Installing Your Throttle Control Solenoid

Location

Follow these simple rules to properly locate your throttle control kit:

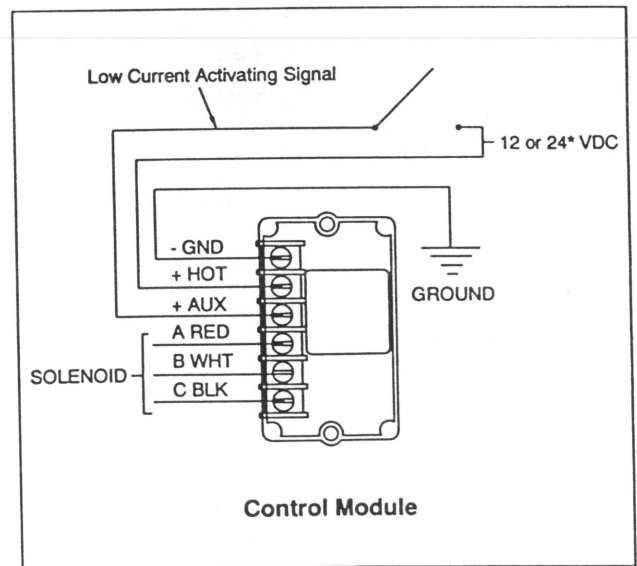
- Mount the solenoid off the engine but within 46 inches (116.8 cm) of the throttle lever, to avoid engine vibration and high temperature components (more than 257° F [125° C]).
- Mount Control Module out of the engine compartment if possible. If not possible, mount the module as far away from high temperature components as possible. Maximum temperature range is 185° F (85° C).
- Route the Flexible cable away from high temperature (220° F [105° C]) components such as exhaust manifolds.
- Avoid sharp bends in flexible cable. Bends should form a smooth arc (360° maximum) with a radius of 5 inches (12.7 cm) minimum.



Controlling the Solenoid Throttle Kit

The throttle kit can be controlled remotely by applying a low current 12 or 24 VDC signal to the module "AUX" terminal.

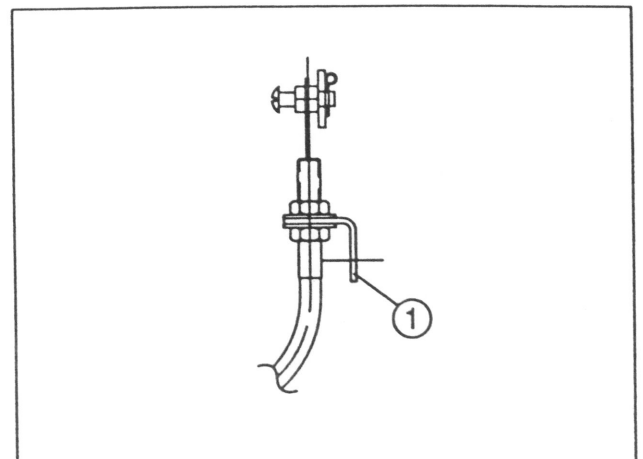
Examples of activating signals are the air compressor pressure switch or air conditioning switching circuits.



Mounting Procedures

Use the following procedure to mount your throttle controller:

1. Mount the solenoid and control module according to the recommendations on the "Location" instructions.
2. Electrically connect the solenoid to the control module and power source according to the wiring diagram.
3. Mount the cable bracket (1) and fasten the cable sheath to the bracket using the collar nut so the sheath does not turn during idle adjustment.



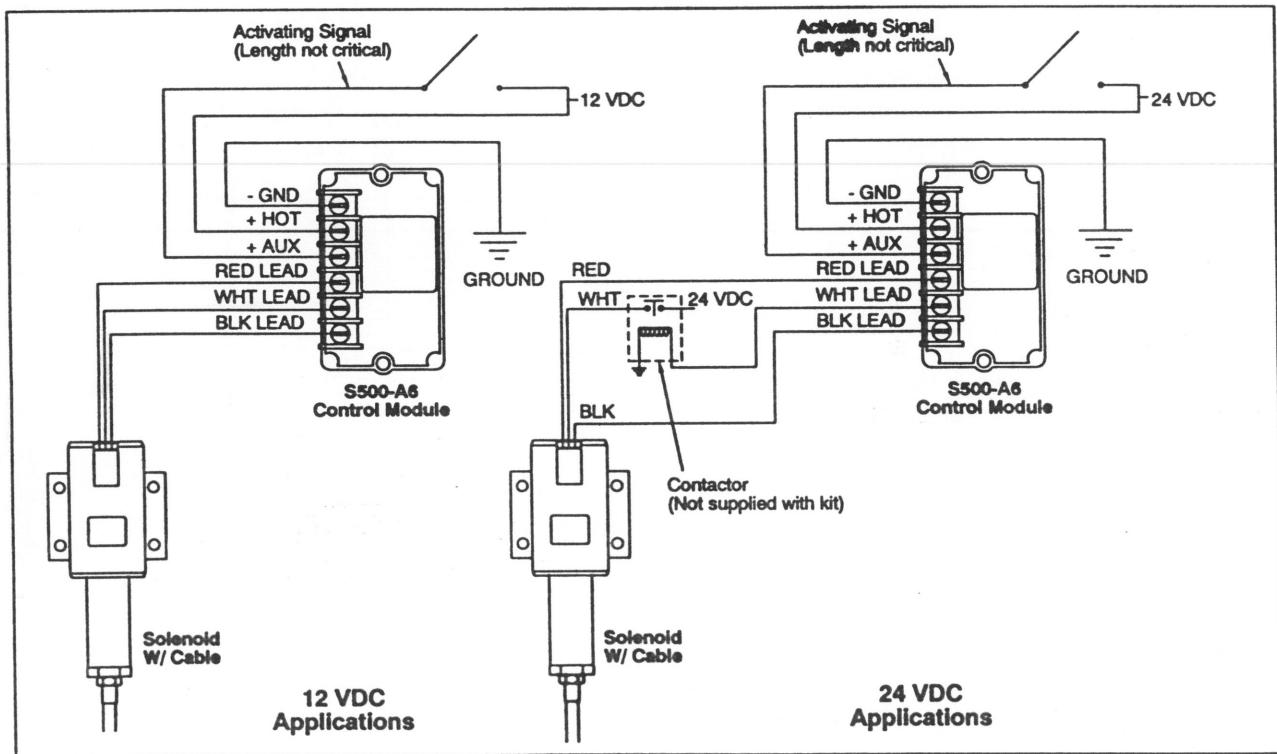
Use the following table to determine all wire lengths except "AUX" terminal:

Note: The wire size and length to "AUX" terminal of the control module is not critical because of low current; 16-18 gage wire may be used.

Maximum Lead Length - In Feet*

System Voltage	Wire Gage						
	18 AWG	16 AWG	14 AWG	12 AWG	10 AWG	8 AWG	6 AWG
12 VDC	2.5 ft.	4 ft.	6 ft.	10 ft.	16 ft.	25 ft.	40 ft.
24 VDC	10 ft.	16 ft.	25 ft.	40 ft.	64 ft.	100 ft.	160 ft.

* Total of "-GND" and "+HOT" wire lengths plus "B WHT" and "C BLK" wire length.



Set Normal Engine Idle Speed

Use the following procedure to set the "normal" engine idle speed with the solenoid de-energized:

1. With the engine "off", attach the cable pivot assembly (1) to the throttle lever.
- Note: DO NOT tighten the wire core pivot setscrew (1A). The wire core (2) must be free to move through the pivot until step
2. Insert the wire core (2) into the wire core pivot (1).
 3. If the cable adjuster is not fully retracted into the solenoid, loosen the jam nut (6) and turn the aluminum adjustment nut (7) counterclockwise until the cable adjustment nut (7) is flush with the solenoid (8).
 4. With all connections made to the throttle control systems, apply 12 VDC to "AUX" terminal of the control module. Make sure the wire core (2) is free to move through the cable pivot (1) with out restriction.
 5. Adjust "normal" engine idle speed using the "standard method" required for your engine.
 6. Eliminate the slack in the cable (2).
 7. Tighten the cable pivot setscrew (1A).

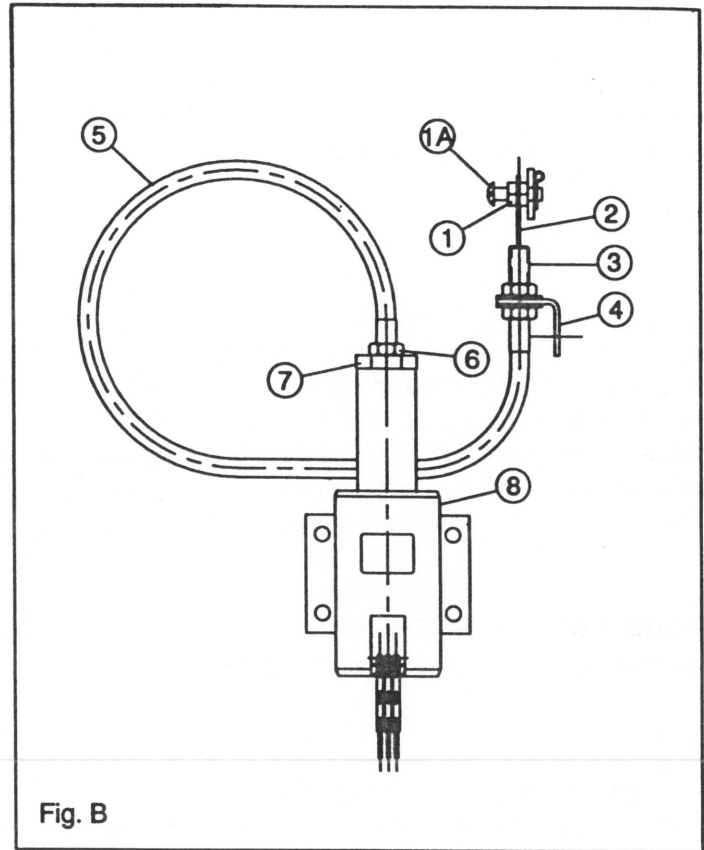


Fig. B

Set High Idle Speed

Use the following procedure to set the "high" engine idle speed with the solenoid activated:

1. Set the "normal" engine idle speed per the previous procedure.
2. With the engine running, apply 12 VDC to the "AUX" terminal of the control module.
3. Make sure the jam nut (6) is loose and turn the aluminum adjustment nut (7) clockwise until the high engine idle speed is reached.
4. Tighten the jam nut (6).
5. Check the throttle speed controller operation rechecking the "normal" engine idle speed with the solenoid deactivated and high engine idle speed with the solenoid activated. If necessary, repeat the "normal" idle speed and high idle speed adjustments.

Note: Do not leave the aluminum adjustment nut (7) tight against the solenoid body since this does not allow the cable (5) to float.

System Operation

Trombetta's P613-K1 throttle control solenoid kit consists of a "three wire," dual coil solenoid, electromechanical control module and stainless steel sheathed pull cable. The sheathed pull cable allows the solenoid to be mounted away from hostile environments, such as engine vibration and high temperature.

The throttle solenoid can be activated automatically for "on demand" or bring the idle speed to a pre-set high idle position.

The control module allows the solenoid to operate as a continuous duty device. When the module is wired as recommended, applying 12 VDC to the "AUX" terminal applied voltage to the hold-in and pull-in coil of the solenoid. After 0.5 seconds to 0.75 seconds, power is automatically removed from the pull-in coil. Power will remain at the hold-in coil until the 12 VDC signal is removed from the "AUX" terminal.

Control Module Voltage Measurements

Terminal Designation	Voltage
- GND	Chassis Ground
+ HOT	12 or 24 VDC at all times
+ AUX	12 or 24 VDC required to activate solenoid
A RED	12 or 24 VDC when signal is present at "AUX" terminal
B WHT	12 or 24 VDC for 0.5 to 0.75 seconds after signal at "AUX" terminal
C BLK	Common for solenoid

Troubleshooting Hints

If the solenoid will not engage, check the following:

1. Check the stranded pull cable for damage (e.g., melted or crimped sheath).
2. Check the stranded pull cable for binding
3. Check system voltage at the "+HOT" and "AUX" terminals.
4. Check module terminals for proper voltage and operation. If the module does not meet these specifications, replace it.
5. Check solenoid resistance (remove wires from module). If resistance is not within specifications listed below, replace the solenoid.
6. Make sure you have the recommended wire length and gage (refer to wire chart).
7. Be sure cable is not bent beyond guidelines.
8. Check for proper adjustments.
9. Contact the factory if you are unable to resolve the problem.

12 VDC System	24 VDC System
0.17 ohms White to Black wire	0.66 ohms White to Black wire
0.13 ohms Red to Black wire	0.48 ohms Red to Black wire

Trombetta Pull Cable Shortening Instructions

Use the following procedures to shorten pull cables supplied with Trombetta products.

IMPORTANT!

DO NOT cut wire core (2) until step #11! Remove wire core (2) from cable sheath (5) *before* cutting the sheathing.

1. Remove the cable assembly (1-7) from the solenoid body (8) by loosening the jam nut (6) and turning the large aluminum adjusting nut (7) "clockwise".

Note: The solenoid "plunger" located inside the solenoid body can be removed at this point. Take care not to damage or contaminate the plunger while it is out of the solenoid body (8). Be sure to keep the inside of the solenoid body (8) "clean" while the plunger is removed.

2. Remove the wire core (2) from the cable sheath (5).
3. Lightly fixture the cable sheath (5) in a vise or other suitable holding device.

Note: Over tightening the vise may deform the cable sheath (5) and cause the wire core (2) to bind!

!! CAUTION !!

Safety Goggles must be worn before proceeding!

4. Use an abrasive "cut-off wheel" (eg. A Dremel tool and Dremel abrasive disk), to cut the cable sheath (5) to the desired length. Deburr and clean the "cut end" of the sheath (5).
5. Mark the cable sheath (5) 1" from the end with a wrap of masking tape (see Fig. C).
6. If the threaded-on bulkhead connector is to be reused, remove it from the cut-off piece of cable sheathing by unthreading it in a counter-clockwise direction. Wipe the connector clean and reuse it for step #8.
7. Wipe the wire core (2) clean and then re-insert this core (2) through the cable sheath (5).

Note: Make sure the wire core (2) moves "freely" inside the cable sheath (5). If it does not, discard the whole cable assembly and replace.

8. Turn the "cable bulkhead fitting" (see fig. A) onto the sheathing (5). Torque to maximum 8 pound - inches. At this point, the fitting should be approximately $\frac{1}{4}$ " or less from the tape mark on the sheath.

!! CAUTION !!

Cable bulkhead fitting must engage at least $\frac{3}{4}$ " of the cable sheath to be properly attached. Over tightening the fit may strip the threads.

9. Re-install the cable assembly.
10. Using the "throttle solenoid" setting instructions, proceed with setting the throttle solenoids.
11. After the throttle solenoid is set and connections are tightened, cut the excess wire core approximately "one" inch beyond the cable pivot (1).

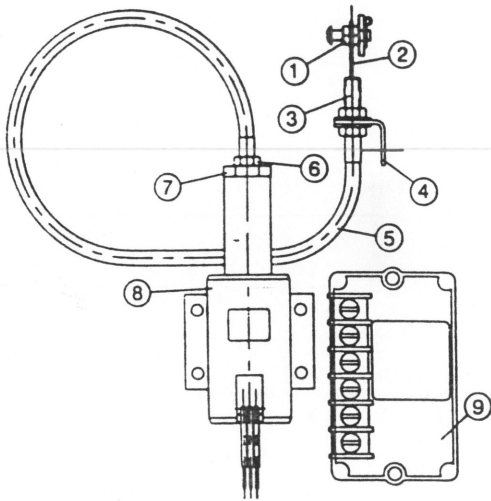


Fig. A

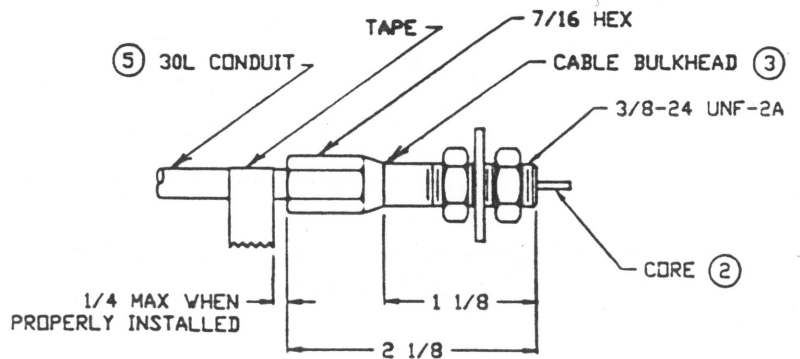


Fig. C

**If you have problems or questions, please contact the
Factory Service Department at (414) 251-5454.**