



Burr **OAK** Tool

Vertical Mechanical Expander

CSE-M234-1

Machine Manual





Burr **OAK** Tool

Password Page

IMPORTANT: To protect your system against manipulation, you should protect the default password and keep it in a safe location, accessible only to authorized persons.

BOTI Default Passwords

USER	PASSWORD	LEVEL
Operator	1111	1
Setup	9393	2
Maintenance	6514324	3
Master	botg9393	5

Password Change Record

OLD PASSWORD	NEW PASSWORD	EMPLOYEE	DATE



Who We Are

For 70 years Burr Oak Tool has delivered machines, tools and expertise to the world's heating, refrigeration, air conditioning, tube processing industries. Our focus is to provide effective solutions to customers worldwide by delivering quality machines, service and parts.

Why We Deliver

Oak machines are designed and manufactured for quality, durability and productivity. We will work with you to find cost effective and timely solutions to the challenges you face. Meeting your production requirements means greater success and profitability for you.

What We Deliver

Burr Oak Tool produces quality fin dies, fin lines, tube expanders, tube cutoffs, tube benders, and coil forms for companies in over 70 countries. We guarantee our machines are finished, tested, and most importantly, will work properly upon installation in your facility.

How We Deliver

Burr Oak Tool's experienced and dedicated workforce innovates to meet and anticipate our customers' needs. Our service technicians are experienced in setup, troubleshooting, and upgrading Oak equipment. Service locations in the USA, Europe, India, and China allow us to quickly respond to needs worldwide.

SET-UP INSTRUCTIONS FOR SE-CL-M234 EXPANDER

I. Machine settings for set-up.

- A. Start pump using "pump start" push button.
- B. Energize control circuit using "control start" push button.
- C. Set "hand-auto" selector switch to "hand".
- D. Set lift "hand-auto" selector switch to "hand".
- E. Lower pre-sizer actuators until they are approximately 6" from the cylinder mounted on the bolster plate.
- F. Using "lengthen coil" push button, raise pressure screws so the bottom of the screw will not contact the top of the upper guide plate when the ram cylinder is fully extended.
- G. Using "jog up" push button, raise the ram until all plates are picked up and are suspended by the tie rods and stripper bolt.
 1. Loosen (3) bolts on latch body and push latch body against bottom of the bushing housing. Tighten (3) bolts. Caution - these bolts must be tight.
 2. See sketch #2 of 6.
- H. Using "open lift" push button, open lift to horizontal position.
- J. Shut off machine using "pump stop" push button and "emergency stop" push button.
 1. "Pump stop" push button will shut off pump.
 2. "Emergency stop" push button will shut off all controls except the pump.

II. Insert tooling plates and components.

- A. Expander rods.
 1. Slide rods through plates and into rod holder plate.
 - a. Chamfered hole on lower end of rod must be toward operator.
 - b. Put pin through hole in rod and pull to make sure rod is properly locked in.

B. Final expanders and bullets.

1. Slide final expander pusher over rod and into expander insert.
 - a. Turn pusher until the ring snaps into the notch.
 - b. Slip final expander tip over rod and fasten bullet to end of rod with a #6-32 N.C. screw with tapered head.

C. Strippers.

1. Push strippers into stripper insert until they "snap" in place.

D. Hairpin Receivers.

1. Set dowel end into desired holes and push into place.
 - a. A plastic faced hammer may be necessary to tap receivers into place.

III. Tooling component removal.

A. Strippers.

1. Pry out with hooked tool provided.

B. Expander rod, bullet, and final expander tip.

1. Turn rod 180°.
2. Pull rod straight down.
3. Bullet and final expander tip will stay on end of rod.
 - a. Remove bullet from rod with Allen Key.

C. Final Expander Pushers.

1. Turn approximately 180° and pull out final expander pushers.

D. Hairpin Receivers.

1. Using hooked tool, insert in notch on bottom and pry out.

IV. Setting machine for coil length.

- A. With plates still in suspended position as shown by sketch #2 of 6 and the latch body tight against the bushing housing (ref. I.G. 1 and 2), attach pick-up plate to latch body and bushing housing per sketch #3 of 6.

- B. When pick-up plates are secured, loosen (3) bolts on latch body.
- C. The ram cylinder can now be used to position the latch body.
 - 1. Move latch body up or down until a measurement between top of receiver and bottom of stripper reads what the finished coil size over end plates should be.
 - a. See sketch #1 of 6.
 - 2. When measurement is correct, tighten (3) bolts on the latch body. Bolts must be tight.
 - 3. Remove pick-up plates.
- D. Using "jog down" push button, run ram cylinder down until bottomed (cylinder full extended).
 - 1. Make sure bottom end of pressure screws never contact the upper guide plate when extending ram cylinder.
- E. Using "shorten coil" push button, run pressure screws down until the bottom of the screw contacts the top of the upper guide plate.
 - 1. Hold "jog down" push button in while holding "shorten coil" push button. When clutch slippage occurs, release both buttons.
- F. Using "jog up" push button, raise plates until strippers are approximately 6" above the latch body.
- G. Using "close lift" push button, close lift to vertical position.
 - 1. Mount receiver plate to lift plate and arrange receivers for pattern (ref. II. D. 1).

V. Arrange coil enclosures and locators.

- A. Back plates.
 - 1. Determine how many back plates will be used.
 - 2. Each back plate requires (2) hanger bars.
 - 3. Fasten hanger bars to "T" nuts on column of machine.
 - 4. Position hanger bars so the top of the back plate is approximately 1-1/2" below the top of the finished coil and secure with cap screws.

5. Hang back plates on hanger bars.
6. Position of spacer ring is determined by pattern being expanded.
 - a. For 25 mm pattern, spacer ring is in front of hanger bar.
 - b. For 32 mm pattern, spacer ring is behind the hanger bar.

NOTE - MINIMUM COIL THAT CAN BE RUN WITH THE LIFT IS 12".

B. Doors (front plates).

1. Mount hinge arms to the aluminum frame, located on lift plate, using lock plates and hand knobs.
2. Use same quantity of doors as back plates.
3. Mount doors inline with back plates.
4. Doors and back plates must not stick up above finished coil or extend below bottom of coil.

C. Coil Locators (side guides).

1. If enclosures are used as doors (lift not used), locators are mounted to back plates.
 - a. Locators are mounted by toe clamps.
2. If enclosures are used as front plates (lift used), locators are mounted to doors (front plates).

VI. Coil alignment and pre-sizer adjustment.

- A. Close door and adjust door latch mechanism for approximate coil thickness (1 row, 2 rows, etc.).
- B. Open lift using "open lift" push button.
- C. Lay loose coil on front plate(s).
- D. Position coil, with hairpins pushed into receivers, square with receiver plate.
- E. Position coil locators against the edges of the coil and snug screws "finger tight".
- F. Close lift using "close lift" push button.
- G. Position door latch mechanism for coil thickness and secure.

- H. Using "jog down" push button, run ram down until strippers are approximately 2" from the top of the tubes.
 - 1. Continue bringing ram down, using the "inch down" push button, until strippers are approximately 1/2" from top of the tubes.
- J. Position pre-sizer actuators against bottom of guide blocks on stripper plate.
- K. Using "inch down" push button, extend ram until bullets almost enter the tubes.
- L. Check coil alignment and make adjustments.
- M. Using "jog up" push button, raise plates so strippers are approximately 2" above the tubes.
- N. Lower pre-sized actuators approximately 6".
- O. Using "inch down" push button, extend ram until strippers contact the top tube sheet.
 - 1. Continue "inching down" until the tube stickout is desired amount.
- P. Position pre-sizer actuators against bottom of guide blocks on stripper plate.
 - 1. See sketch #6 of 6.
- Q. Set shaft collar on deceleration (see section IX.) at this time.
 - 1. Set bottom collar so limit switch has been actuated (shaft collar past limit switch).

VII. Expanding coil manually.

- A. Bring ram down using "inch down" push button until bullets enter tubes.
- B. Using "jog down" push button, run ram down until full stroke is used.
- C. Retract ram using "jog up" push button until strippers are approximately 6" above the tubes.
- D. Using "open lift" push button, open lift.
- E. Remove coil and inspect.
- F. Make adjustments.

VIII. Expand coil on automatic cycle.

- A. Set "hand-auto" selector to "auto".
- B. Set lift "hand-auto" selector to "auto".
- C. Load coil to be expanded on front plate(s) and between locators.
- D. Push hairpins into receivers.
- E. Push "cycle start" push button.
 - 1. Lift will close.
 - 2. Expand coil.
 - 3. Retract bullets.
 - 4. Lift will open.

IX. Deceleration.

- A. As bullets approach the tube, the ram slows so bullet can enter the tubes at slow speed.
- B. After bullet entry, ram speed is increased.
- C. Limit switches for deceleration are located on the latch body (See sketch #5).
- D. Set bottom shaft collar so that limit switch has been actuated (Refer to VI. Q. 1.).

X. Limit switch on machine column.

- A. This switch reverses the machine during automatic cycle.
- B. Stroke of ram cylinder should always reach bottom stroke.
NEVER USE THIS SWITCH TO CONTROL STROKE LENGTH.

XI. Maintenance.

- A. Clean hydraulic reservoir at least once a year.
- B. Replace filters when necessary.
- C. Always use top grade hydraulic oil.
 - 1. American Oil Rykon #21 or comparable grade.
- D. Frequently lubricate guide rods.
 - 1. Brush on good grade heavy weight oil.

- E. Lubricate gearmotor with good grade worm gear oil.
- F. Repair any hydraulic leaks at once.

CARTRIDGE LOAD EXPANDER

TOOLING PACKAGE REMOVAL

1. Start pump, turn selector switch to "hand" operation. Use "jog up" switch to run ram to full up position.
2. Open lift to horizontal position.
3. Remove front and side expanded metal guards. Be sure to replace guards when tooling change has been completed.
4. Remove clamp block on rod holder plate.
5. Remove three (3) screws on each end of the front stiffener ribs on the expander, guide, and stripper plates. These screws secure the ribs to the heavy plates during the machine operation. These ribs will remain attached to the expander, guide, and stripper insert plates.
6. Attach two (2) aluminum hanger bars to the front of the holder plate. They are marked for right and left hand sides. Attach lower ends of hanger bars to the stiffener rib on the expander insert plate. Arms on the hanger bars will fit under the guide insert plates.
7. Pull out complete tooling assembly.
 - a. Use Kipp handles in the tapped holes in expander plate rib to assist in removing the stripper and expander plates.
 - b. Use Kipp handles in plain (drilled) holes in expander plate rib to assist in putting plates in machine.
8. With tooling pulled out in front position it can now be removed from the machine using a fork lift truck with the forks placed under the rod holder plate, or with an overhead hoist. Tapped holes are provided in the rod holder plate for attaching eye bolts or lifting rings if a hoist is used.
9. Tooling can now be hung on a convenient, customer provided storage bracket until it is to be re-installed. Tooling component changes can be made at this time.

SE-CL-M234 MECHANICAL EXPANDER

SERIAL NUMBER: SE-CL-M234-012880-1

GUIDE ROD CENTERS: 68"

PRESSURE SCREW CENTERS: 68"

PATTERN: 10 MM - 25 MM X 21.65 MM STAGGERED - 4 ROWS

PATTERN: 12 MM - 32 MM X 27.71 MM STAGGERED - 4 ROWS

NUMBER OF TUBES: (10 MM - 200) (12 MM - 152)

MINIMUM COIL SIZE: 250 MM

MAXIMUM COIL SIZE: 1700 MM

REMOTE SET-UP TOOLING PLATES

RAM CYLINDER SIZE: 8" BORE X 75" STROKE (H-L)

TABLE TYPE: HYDRAULIC LIFT

EXP. ROD TYPE: RING-LOK

FINAL EXPANDER TYPE: RING-LOK WITH PILOTED TIP

CUSTOMER: HAPPEL (W. GERMANY)

DATE ORDERED: DEC., 1979

DATE SHIPPED:

COLOR: RAL3018

POWER REQUIREMENTS: 380/3/50

CONTROL: 220/50

MACHINE ASSY LAYOUT: E46872

PLATE PILE-UP ASSY

PLATE BURNOUT DRAWINGS: D46923

ELECTRIC CIRCUIT: D46722

HYDRAULIC CIRCUIT: D46722

COIL ENCLOSURE ASSY: E47567

MACHINE SUB ASSEMBLIES

1. BODY
2. CENTRAL PLATES & LATCHES
3. UPPER PLATES
4. PRESSURE SCREW & DRIVE
5. TOOLING
6. COIL ENCLOSURES
7. HYDRAULICS
8. ELECTRICS
9. LIFT MECHANISM
10. AIR COUNTERBALANCE
11. ELECTRIC DECELERATION

SUB ASSY #1 - BODY

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Column	M.S. Weldment	1	D47020
Base Plate	M.S. Weldment	1	C47425
Side Supports	5" Std. Pipe	2	E46872
Guide Rods	3" Dia. x 221 1/8"	2	C33237
Nuts	2 1/2"-12 Hex. Nuts	4	Purch.
Bolster Plate		1	D47259
Bolster Support	M.S. Weldment	3	C47426
Cylinder Mtg. Plate	M.S. Weldment	1	D47135
Guide Rod Removal Bush.		2	C22003
Cyl. Gland Removal Bush.		1	C47324

SUB ASSY #2 - CENTRAL PLATES AND LATCHES

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Strip. Roller Bracket		2	C47428
Strip. Insert Support Bar		1	C38199
Stripper Plate		1	D47241
Bushing Housing		2	C4884
Bushings	Bunting #P301-24	4	Purch.
Strip. Plt. Guide Block	Weldment	2	C47325
Expander Plate		1	D47254
Bushing Housing		2	C7057
Bushing	Bunting #P301-32	2	Purch.
Guide Plt. Support Bars	Rear	4	D47511
Upper Guide Plates	Weldment	2	D47270
Lower Guide Plates	Weldment	2	D47270
Guide Plate Bushings	Bunting #P301-20	8	Purch.
Guide Plt. Support Bars	Front	8	D47510
Exp. Plate Tie Rod	1" Dia. x 94½	2	C42250
G.P. Tie Rods	5/8" Dia. x 72½, 60½, 43½, 26½	4 ea.	C42250
Actuator Block		2	C4885
Latch Body		2	C8249
Latch Block		2	C4885
Key		2	C15118
Holding Block		2	C15118
Lock		2	C15118
Latch Actuator Arm		2	C4886
Latch Actuator		2	C4886
Spacer Block		2	C4886
Latch Pivot Pin		2	C4886
Spring Retainer		2	C15118
Bushing	Bunting #D252	4	Purch.

SUB ASSY #3 - UPPER PLATES

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Cylinder Adapter	Weldment	1	C47424
Adapter Plate	Weldment	1	D47185
Pressure Plate	Weldment	1	D47185
Press. Plate Guides	Weldment	2	C47325
Press. Plt. Roller Br'k't		2	D43242

SUB ASSY #4 - PRESSURE SCREWS & DRIVE ASSY

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Pressure Screw	32" Long	2	C9398
Pressure Scr. B'r'g.	Bunting #P301-24	4	Purch.
Pressure Nut	Bronze Casting	2	C16433
Spacer	12" Long	8	C12502
Spacer Bushings	Bunting #P301-24	16	Purch.
Hub & Sprocket	#40A42	2	D45016
Sprocket	#40A42	1	D45016
Chain	#40 Roller	20'	Purch.
Morse Torque Limiter	#350-A2 1" Bore	1	Purch.
Retainer		2	D45016
Spacers	3" and 1/2"	2 ea.	D45016
Idler Bracket	Weldment	2	C9219
Idler Sprocket	#40B18	2	C9219
Cam Follower	McGill #CFH-1½	2	Purch.
Morse Reducer	#20GCT-20:1 Ratio	1	Purch.

SUB ASSY #5 - TOOLING

Pattern: 25 mm x 21.65 Staggered
 4 Rows, 50 Holes Per Row, 200 Total
 Tube Diameter: 10 mm x 0.5 Wall

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Rod Holder Plate	"Ring-Lok"	1	D47497
Guide Inserts	Micarta	4	D47498
Expander Insert	"Ring-Lok"	1	D47499
Stripper Insert		1	D47500
Receiver Plate		1	D47501
Expander Rod	5/16 Dia. x 93.875	200	A47306
Bullet	.371 Dia.	200	A46621
Scr. for Bullet		200	C47898
Final Expander Pusher		200	A46624
Final Expander Tip		200	A46623
Stripper		200	A17248
Hairpin Receiver	25 mm Ctr.	100	A46620
Retainer Ring	TruArc #5108-78	200	Purch.
Ring-Lok Collar for Exp. Rod		200	A39111
Ring-Lok Collar for Exp. Pusher		200	A33048
Strip. Insert Stiffener		1	D47509
Exp. Insert Stiffener		1	D47508
Exp. Plt. Insert Holder	R.H. & L.H.	1 ea.	C47506
Guide Insert Holder		8	C47507
Rod Holder Stop Block		2	C47507

SUB ASSY #5 - TOOLING

Pattern: 32 mm x 27.71 mm Staggered
 4 Rows, 38 Holes Per Row, 152 Total
 Tube Diameter: 12 mm x 0.5 mm Wall

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Rod Holder Plate	"Ring-Lok"	1	D47514
Guide Inserts	Micarta	4	D47515
Expander Insert	"Ring-Lok"	1	D47516
Stripper Insert		1	D47517
Receiver Plate		1	D47518
Expander Rod	5/16 x 93.875	152	A47306
Bullet	.450 Dia.	152	A46621
Scr. for Bullet		152	C47898
Final Expander Pusher		152	A46624
Final Expander Tip		152	A46625
Stripper		152	A17248
Hairpin Receiver	32 mm Ctr.	76	A47307
Retainer Ring	Tru Arc #5108-78	152	Purch.
Ring-Lok Collar for Exp. Rod		152	A39111
Ring-Lok Collar for Exp. Pusher		152	A33048
Strip. Insert Stiffener		1	D47509
Exp. Insert Stiffener		1	D47508
Exp. Plt. Insert Holder	R.H. & L.H.	1 ea.	C47506
Guide Insert Holder		8	C47507
Rod Holder Stop Block		2	C47507

SUB ASSY #6 - COIL ENCLOSURES

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Enclosure Ass'y			E47567
Tee Nut Mtg. Rail		2	C47562
Tee Nut	#CL-2-TN ($\frac{1}{2}$ -13N.C.)	20	Purch.
Cross Bar		10	A47593
Back Plate Spacer & Cap		20	A47560
Pattern Change Spacer	.478 Thick	20	A47594
Door Plate Assy	7" & 10"	1 ea.	D47635
Front Plate Ass'y	10"	3	D47635
Back Plate Assy.	7" (1) & 10" (4)	Noted	D47636
Coil Locator Bar	9" (2) & 12" (8)	Noted	C47566
Toe Clamp		20	C47566
Latch Assy.		2	C31349
Latch Details		2	C31350
Latch Block		2	A43403
Latch Handle Br'k't		2	A43401
Hinge & Latch Arm		18	A47558
Hinge & Latch Arm Block		18	A47559
Hinge Pin	7" Door	2	A43397
Hinge Pin	10" Door & Front Plt.	14	A43396
Lock Screw Ass'y	#CL-23-PHK ($\frac{1}{2}$ -13N.C.)	36	A43400

SUB ASSY #7 - HYDRAULICS

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Circuit Diagram			D46722
Hyd. Fluid Reservoir	120 Gal.	1	C38276
Ram Cyl.	8" Bore x 75" Str.	1	Purch.
Lift Cyl.	4" Bore x 18" Str.	1	Purch.

See circuit dwg. for complete bill of materials.

SUB ASSY #8 - ELECTRICS

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Circuit Diagram			D46722

See circuit diagram for complete bill of materials.

SUB ASSY #9 - LIFT MECHANISM

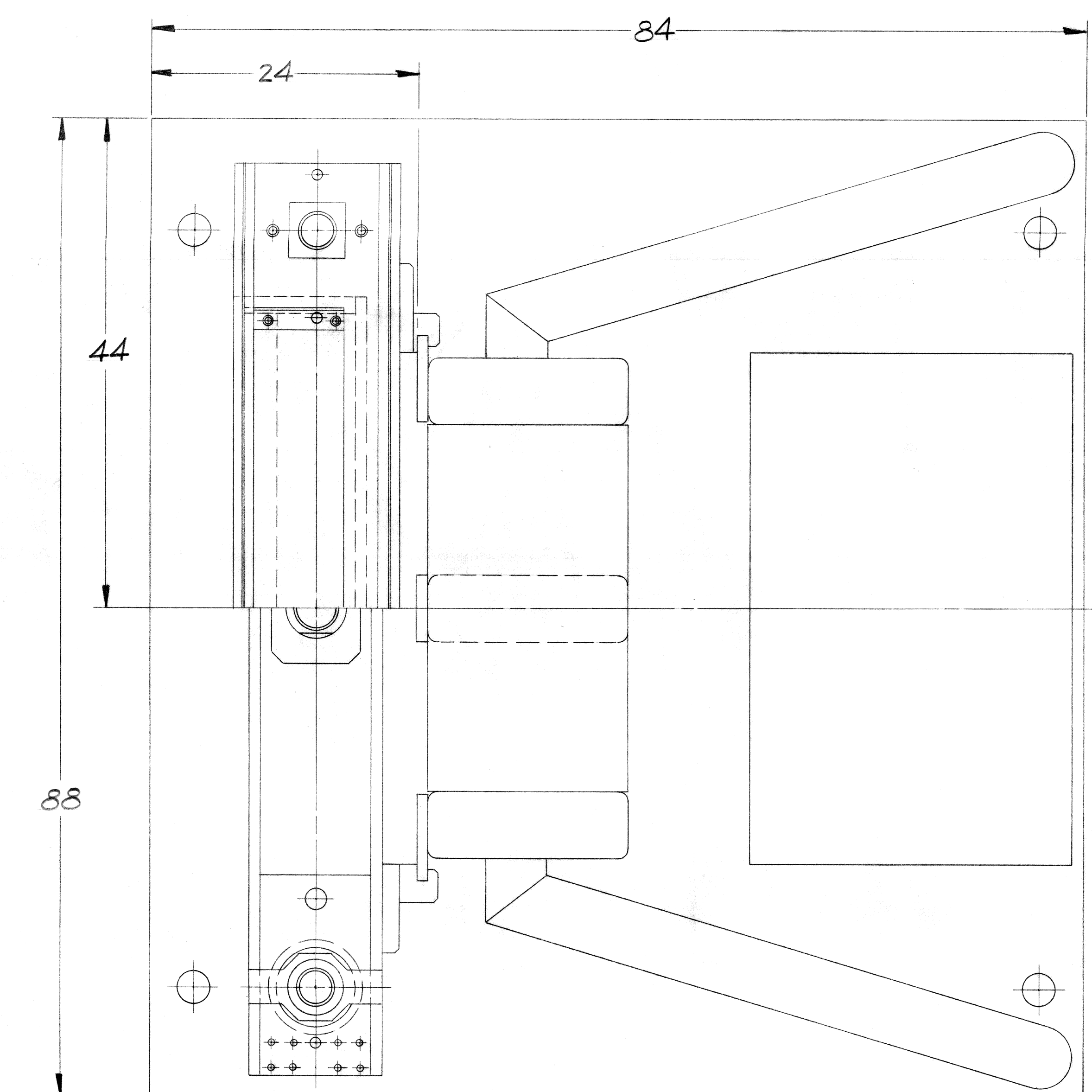
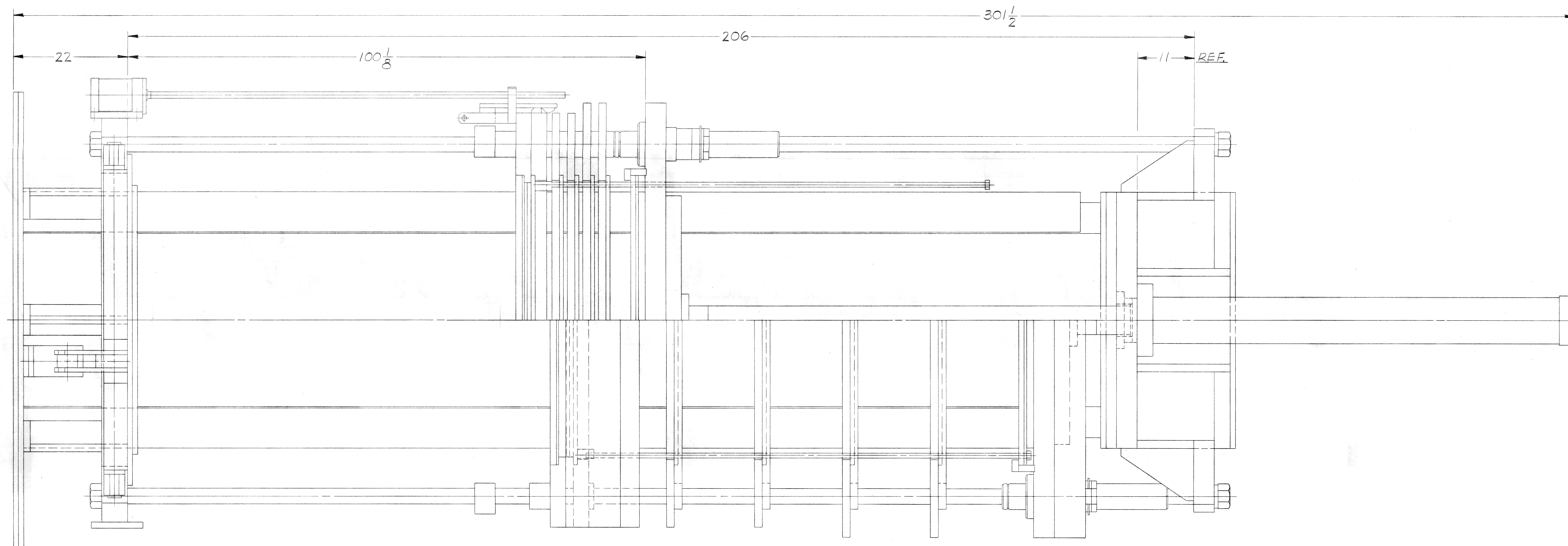
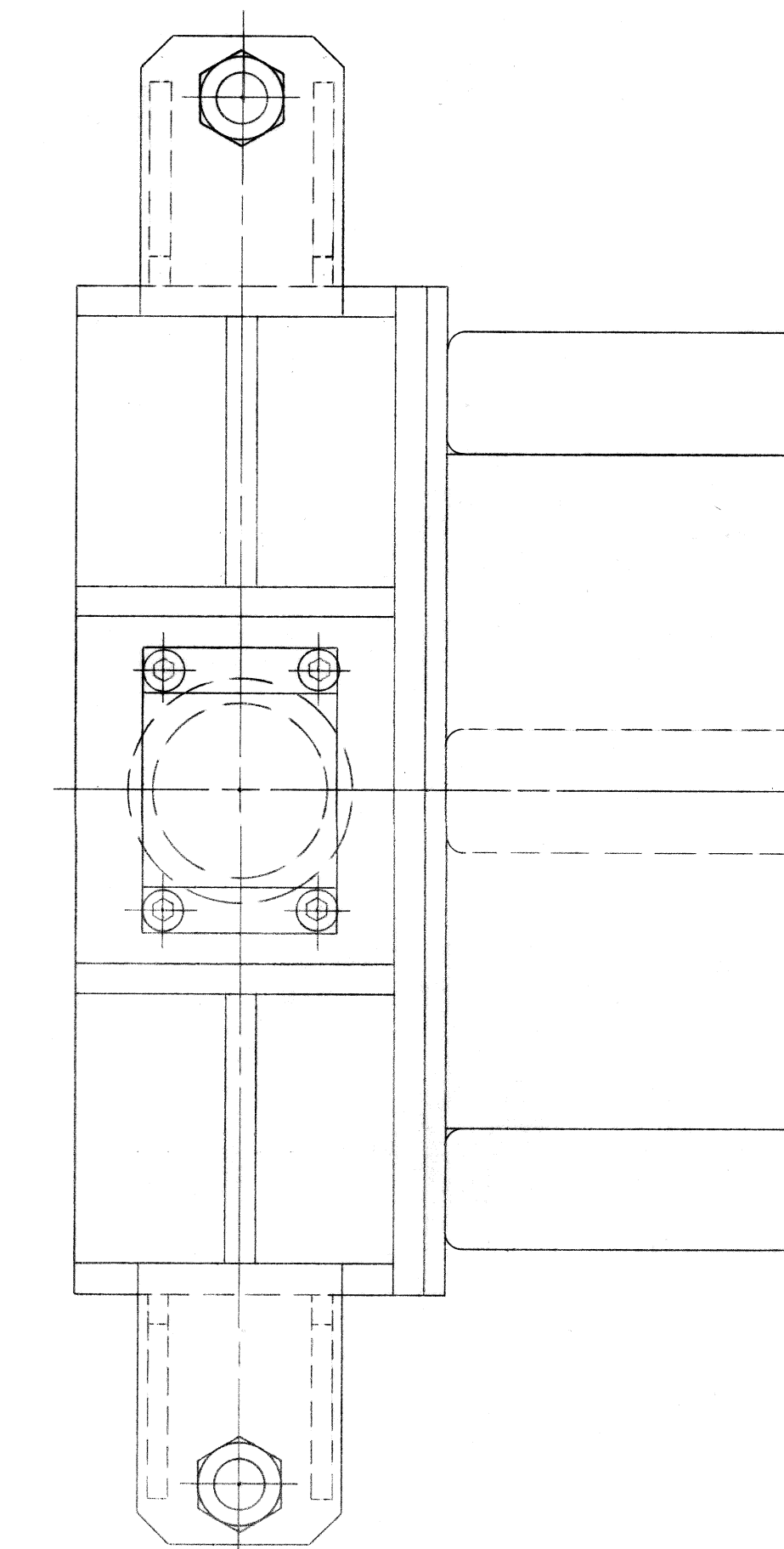
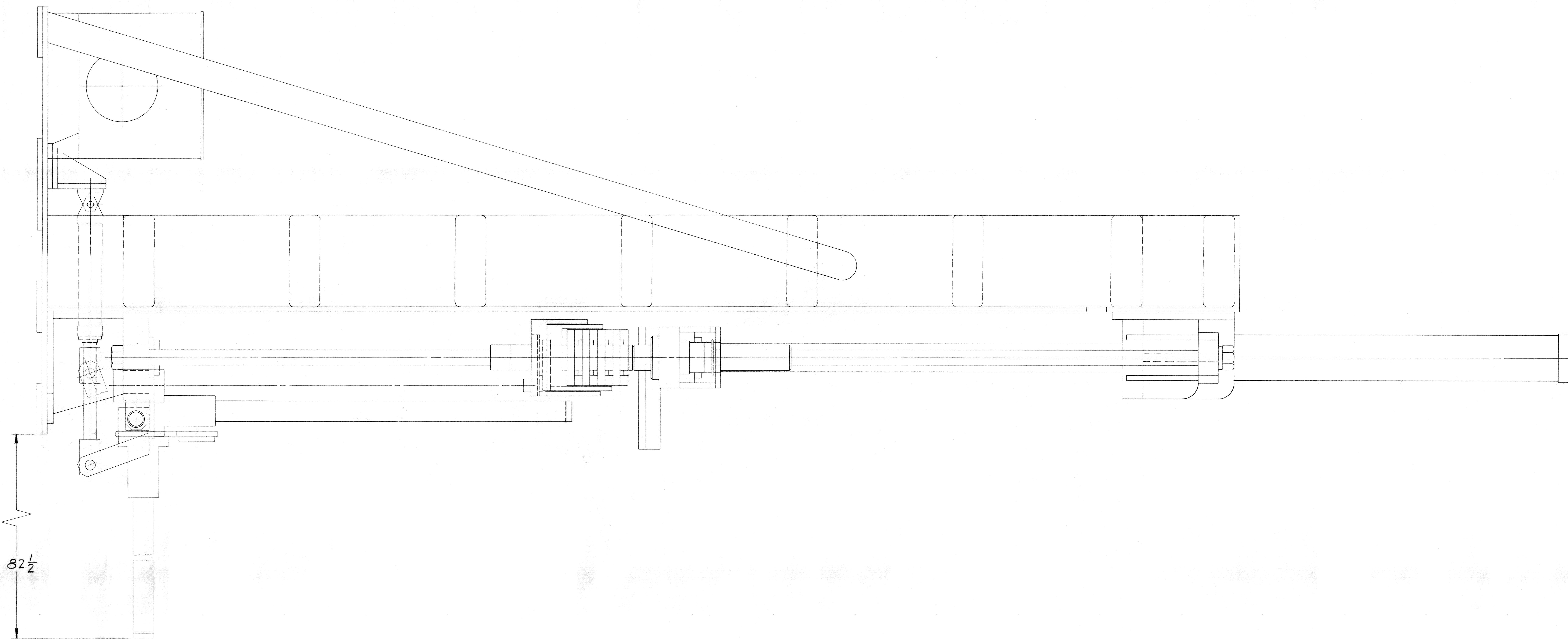
<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
General Assy			E46872
Lift Cylinder	4" Bore x 18" Stroke	1	Purch.
Knuckle	#C-9312 HydroLine	1	C28902
Bushing	Bunting #H3168	1	Purch.
Mtg. Plate	#C-8908 HydroLine	1	Purch.
Mtg. Bracket	Weldment	1	C47326
Lift Plate		1	C47423
Bearing Blocks	M.S. Weldment	2	C24431
Bushings	Bunting #H6190	2	Purch.
Lift Shaft	4½ Sq. x 68 3/4	1	D44001
Lift Arm	M.S. Weldment	1	C44000
Lift Enclosure	1¼ x 4 Alum. Ass'y	1	C47327
Enclosure Bracket	Alum. Plate	2	C47326
Locator Block		2	C33825
Clamp Plate		2	C33825
Locator Pin Holder		2	C33825
Locator Pin		2	C33825

SUB ASSY #10 - AIR COUNTERBALANCE

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Air Cylinder	6" Bore x 5" Str.	2	Purch.
Spacer Plate	1¼ x 6½ x 10	2	E46872
Filter-Regulator-Lubricator		1	Purch.
Bracket		1	Purch.
Actuator Rod	1¼ Dia. x 81½	2	C40160
Guide Block	C.R.S. Weldment	2	C47427
Bushing	Bunting #Pl25-12	2	Purch.
Clamp Block		2	C31585
Lock Handle	Monroe Kipp #27600	2	Purch.

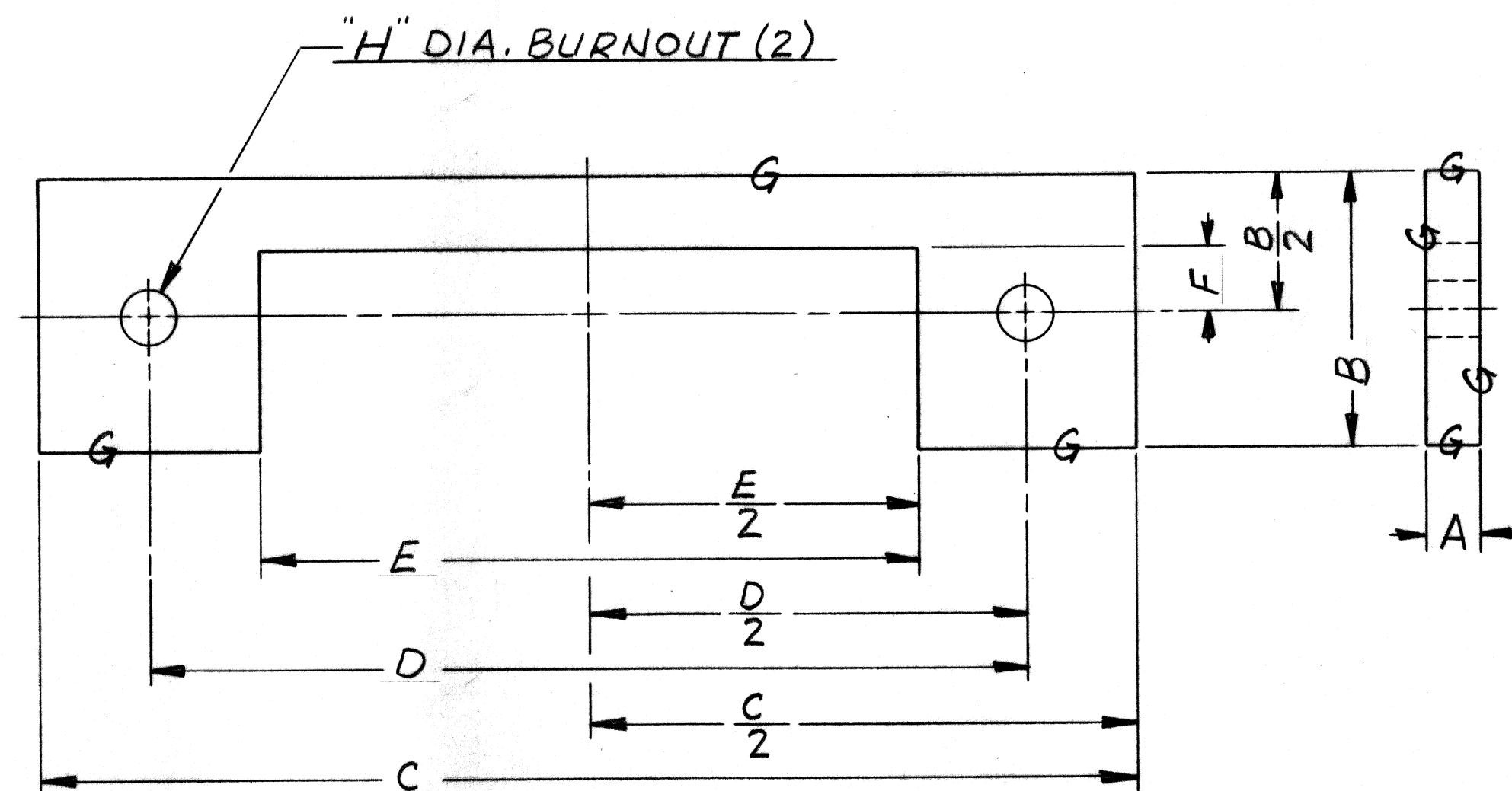
SUB ASSY #11 - ELECTRIC DECELERATION

<u>Part Name</u>	<u>Description</u>	<u>Quan.</u>	<u>Drawing#</u>
Switch Mtg. Plate	Weldment	1	C31587
Actuator Shaft	5/8 Dia. x 19-3/4	2	C31587
Actuator Support		1	C31587
"Up-Stop" Actuator	5/8" Shaft Collar	1	Purch.
Deceleration Actuator	5/8" Shaft Collar	1	Purch.
Limit Switches		2	Purch.



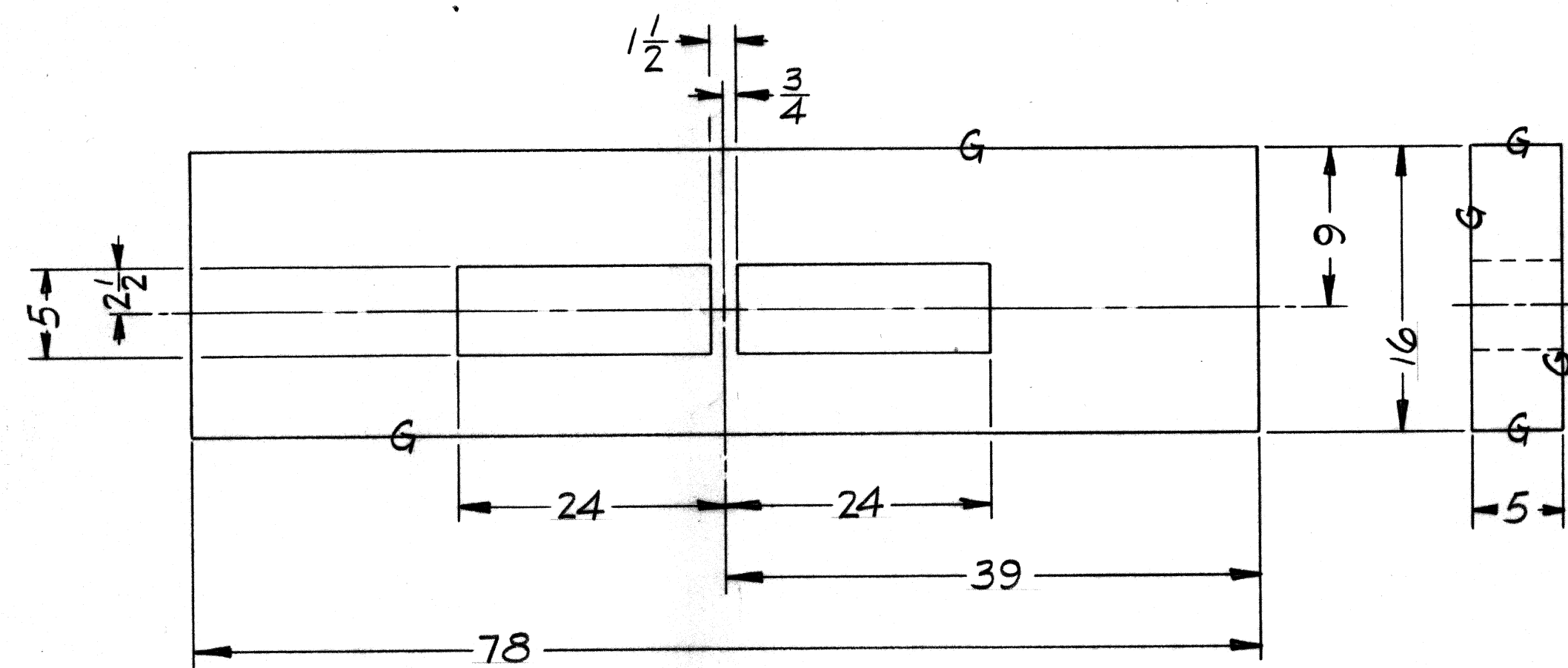
SE-CL-M234-12380-1 EXPANDER HAPPEL
 1700mm MAX. - 250mm MIN. COIL ~ 1250mm MAX. FIN LENGTH
 REMOTE SET-UP ~ HYDRAULIC COIL LIFT
 PATTERN #1: 10mm - 25mm x 21.65mm STAGGERED
 4 ROW - 50 HOLES PER ROW
 PATTERN #2: 12mm - 32mm x 27.71mm STAGGERED
 4 ROW - 38 HOLES PER ROW

SCANNED
 AUG 14 2012

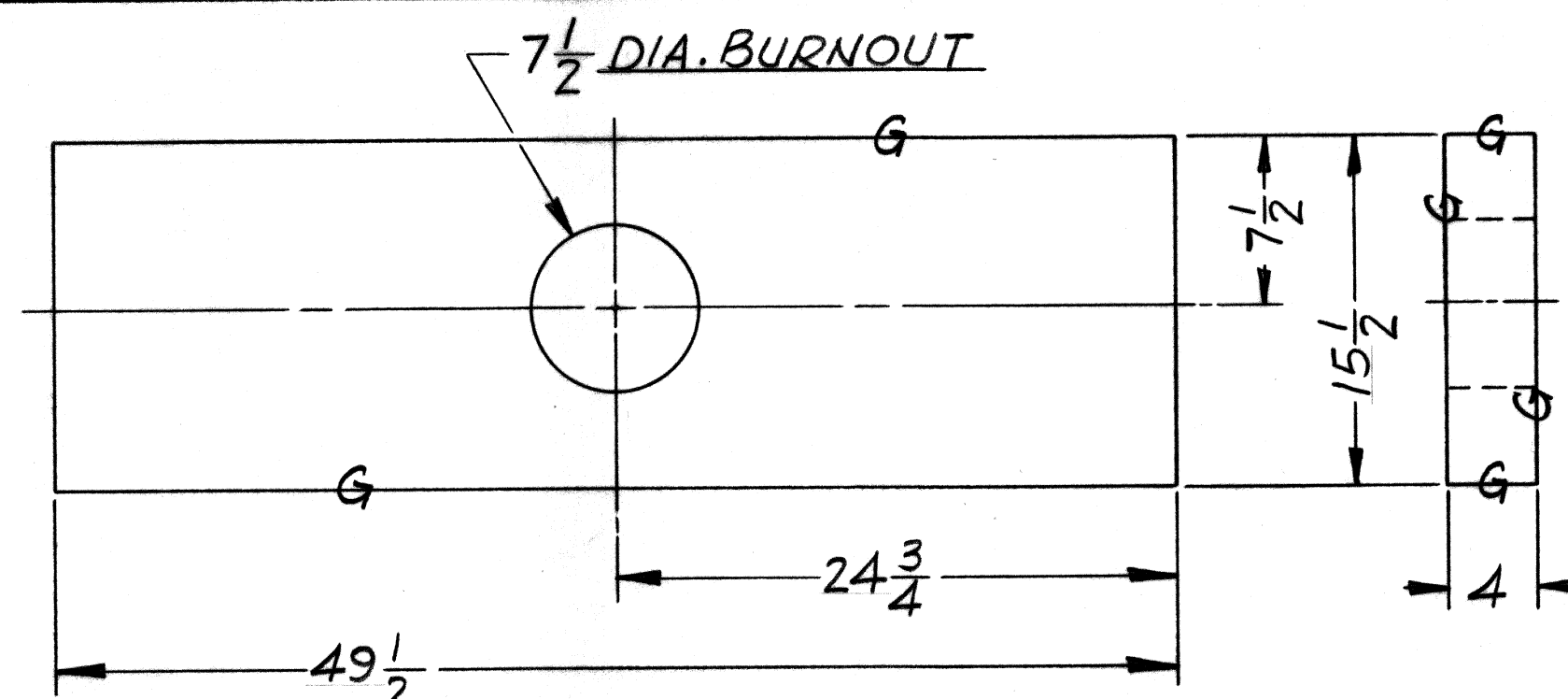


BURN FROM MILD STEEL PLATE - BLANCHARD GRIND
TOP, BOTTOM, & 2 LONG EDGES TO CLEAN-UP. MUST BE FLAT & PARALLEL.

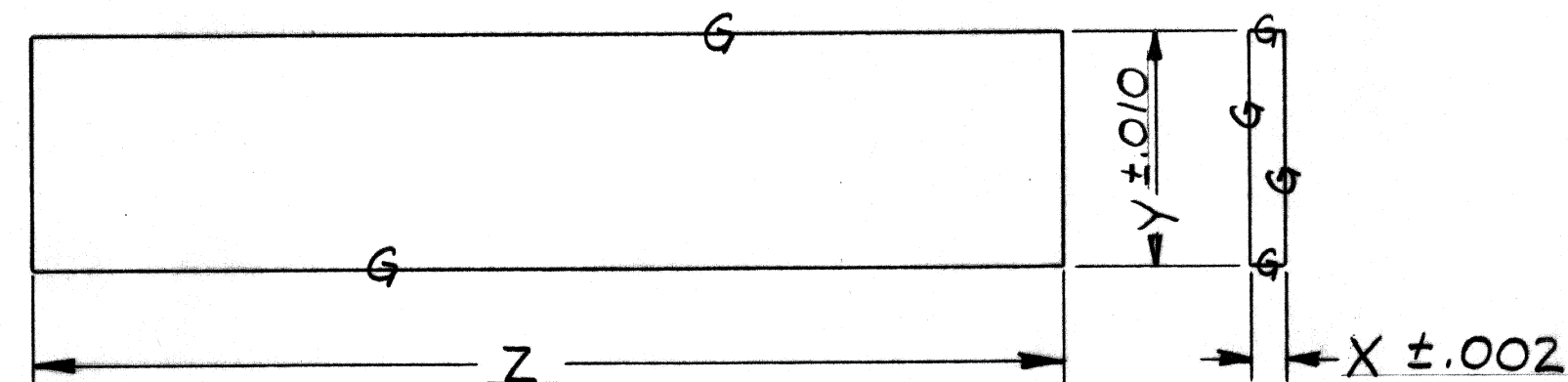
PART NAME	QUAN.	A	B	C	D	E	F	H
STRIPPER PLT.	1	3	15	80	68	53 1/4	3 5/8	3 3/4
EXPANDER PLT.	1	3	13	80	68	54	2 1/2	3 3/4
GUIDE PLT. #1 AND #2	2	1 1/2	11	80	68	54	2 1/2	2 3/4
GUIDE PLT. #3 AND #4	2	1 1/2	11	84	68	54	2 1/2	2 3/4



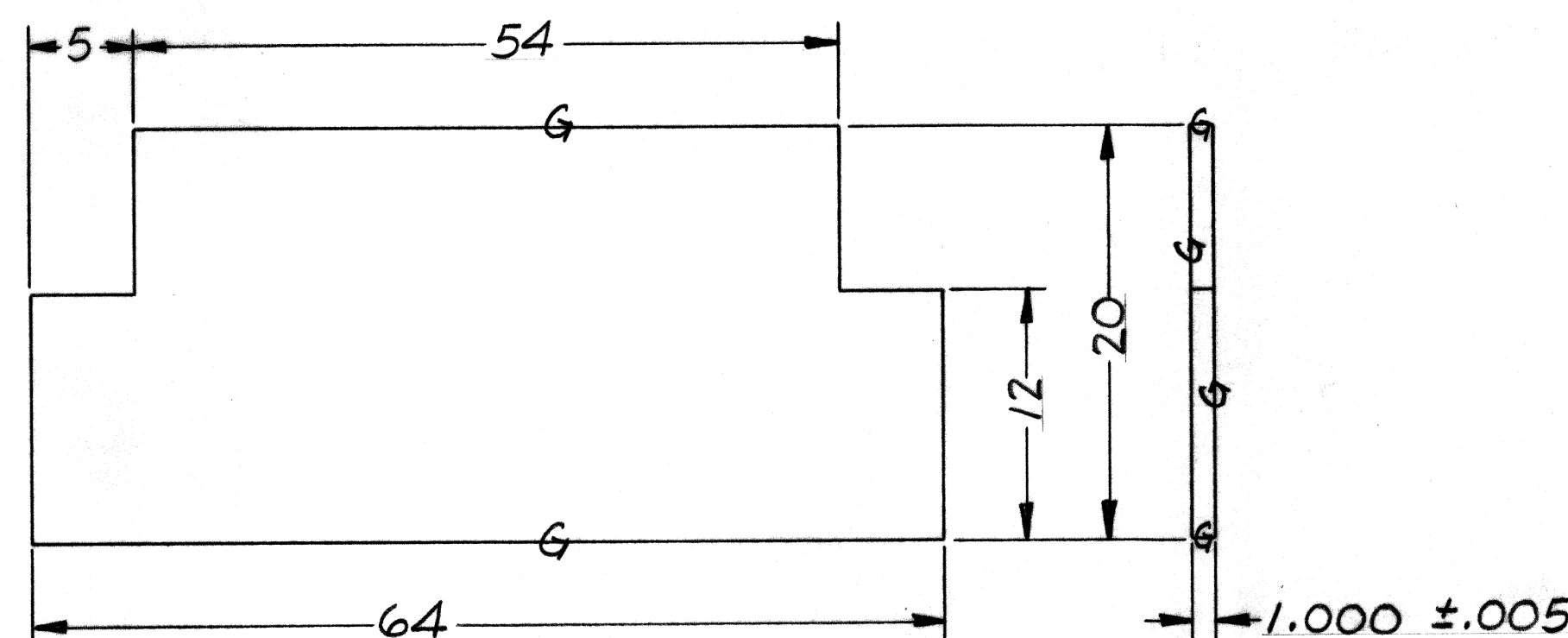
BOLSTER PLATE - 1 REQ'D - MILD STEEL PLATE - BLANCHARD GRIND
TOP, BOTTOM, & 2 LONG EDGES TO CLEAN-UP. MUST BE FLAT & PARALLEL.



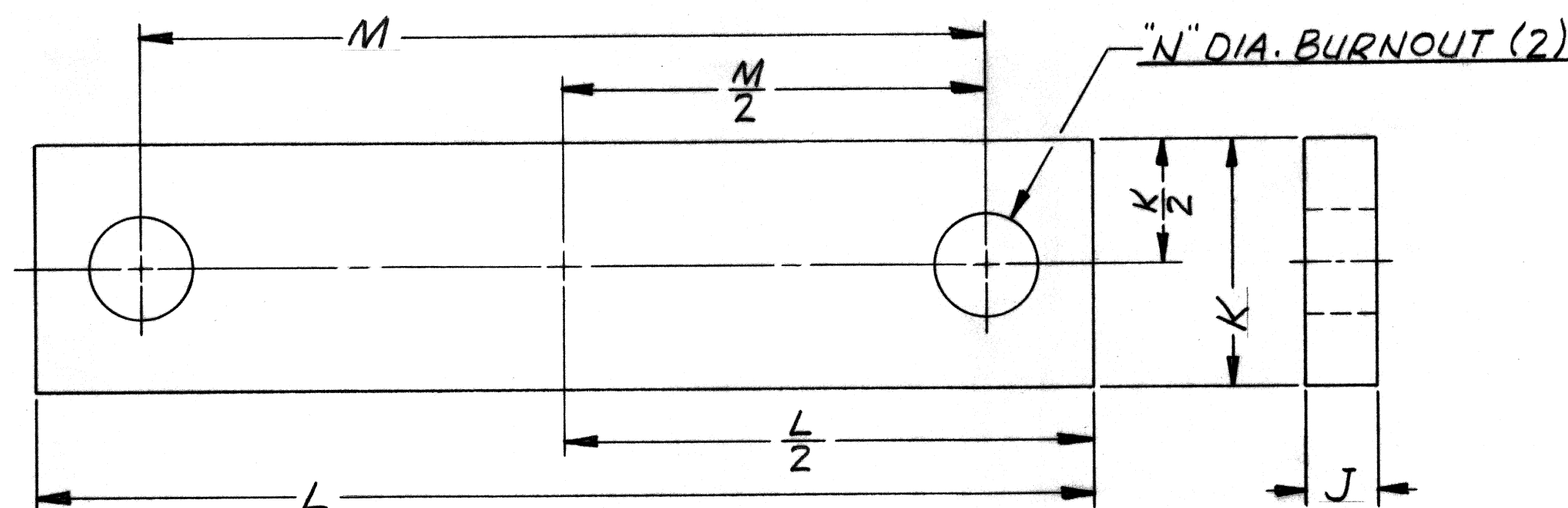
CYL. MT'G PLATE - 1 REQ'D - MILD STEEL PLATE - BLANCHARD GRIND
TOP, BOTTOM, & 2 LONG EDGES TO CLEAN-UP. MUST BE FLAT & PARALLEL.



BURN FROM MILD STEEL PLATE - BLANCHARD GRIND TOP, BOTTOM,
AND 2 LONG EDGES TO TOLERANCES SHOWN. MUST BE FLAT & PARALLEL.

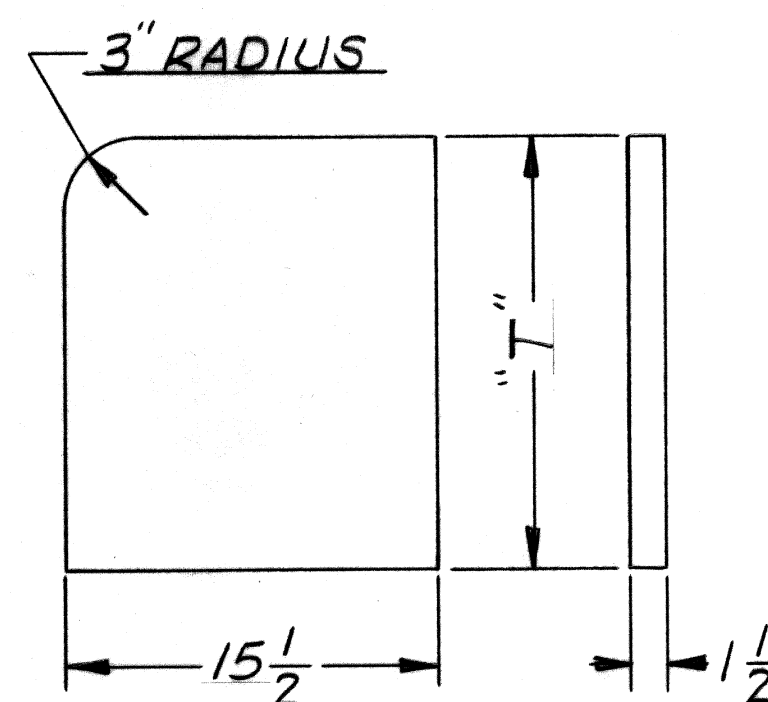


LIFT PLATE - 1 REQ'D - BURN FROM MILD STEEL PLATE
BLANCHARD GRIND TOP & BOTTOM ±.005
BLANCHARD GRIND 2 LONG EDGES TO CLEAN-UP
MUST BE FLAT & PARALLEL

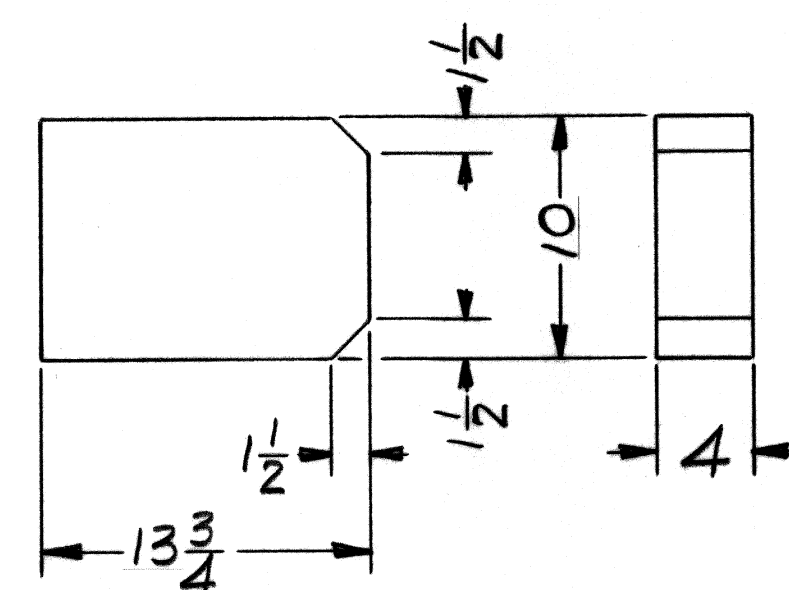


PART NAME	QUAN.	J	K	L	M	N
PRESSURE PLATE	1	4	12	84	68	5 3/4
ADAPTER PLATE	1	3	10	48	—	—
CYL. MT'G ASS'Y	1	1 1/2	24	49 1/2	—	—
CYL. MT'G ASS'Y	2	1 1/2	13 1/4	15	—	—

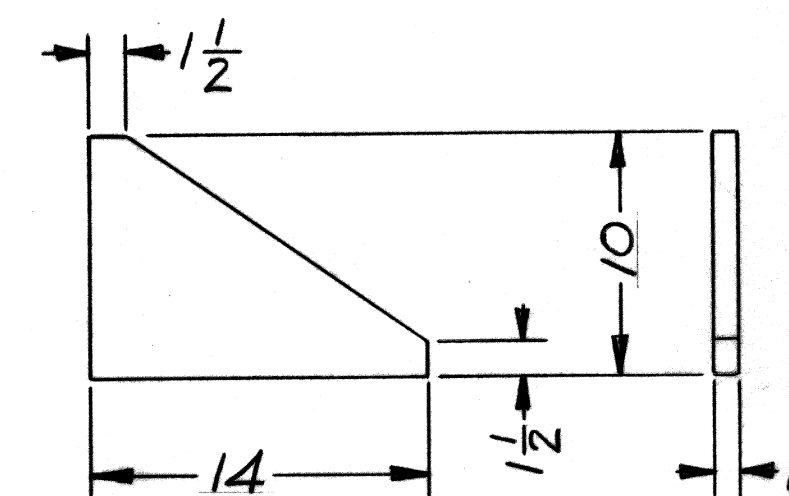
BURN FROM MILD STEEL PLATE
DO NOT GRIND



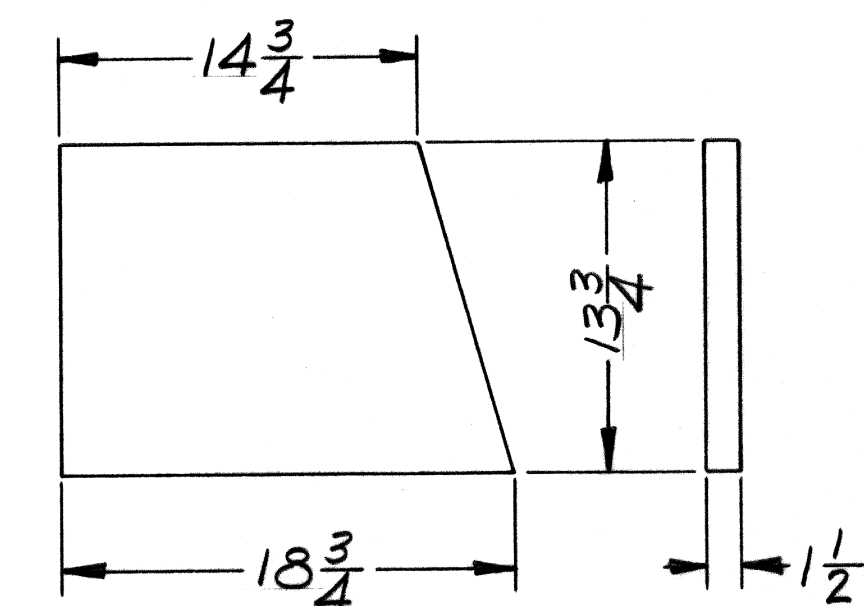
CYL. MT'G ASS'Y
2 REQ'D - "T" = 11 1/2
2 REQ'D - "T" = 18 1/4



CYL. MT'G ASS'Y - 2 REQ'D



CYL. MT'G ASS'Y - 4 REQ'D



BOLSTER SUPPORT - 3 REQ'D

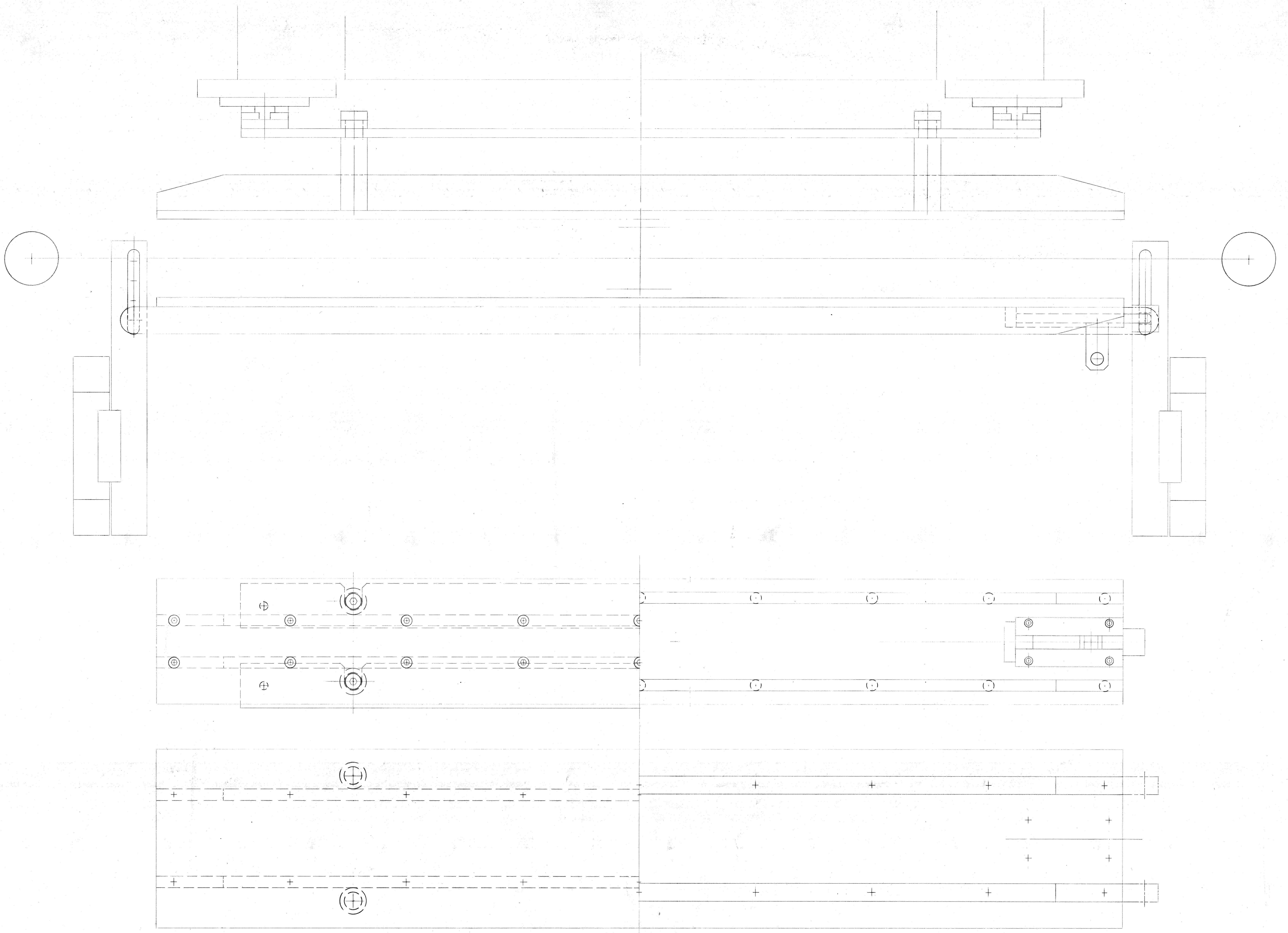
BURN FROM MILD STEEL PLATE
DO NOT GRIND

MARK ALL PIECES: S.O. 1921

OAK TOOLS DESIGNED AND BUILT BY BURR OAK TOOL AND GAUGE CO. STURGIS MICHIGAN					
SE-CL-M234 EXPANDER					
LOCATION DATE TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ±1/64	ALTERATION AUTHY DECIMALS 2 PLACE ±.010 3 PLACE ±.003	DFT ANGLES ±1°	CHECKER DRAWN 1-31-80 G. PIERCE PART NO.	DETAILED SCALE NONE	CHECKED D46923

12 11 10 9 8 7 6 5 4 3 2 1

A
B
C
D
E
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SCANNED
JUL 08 2011

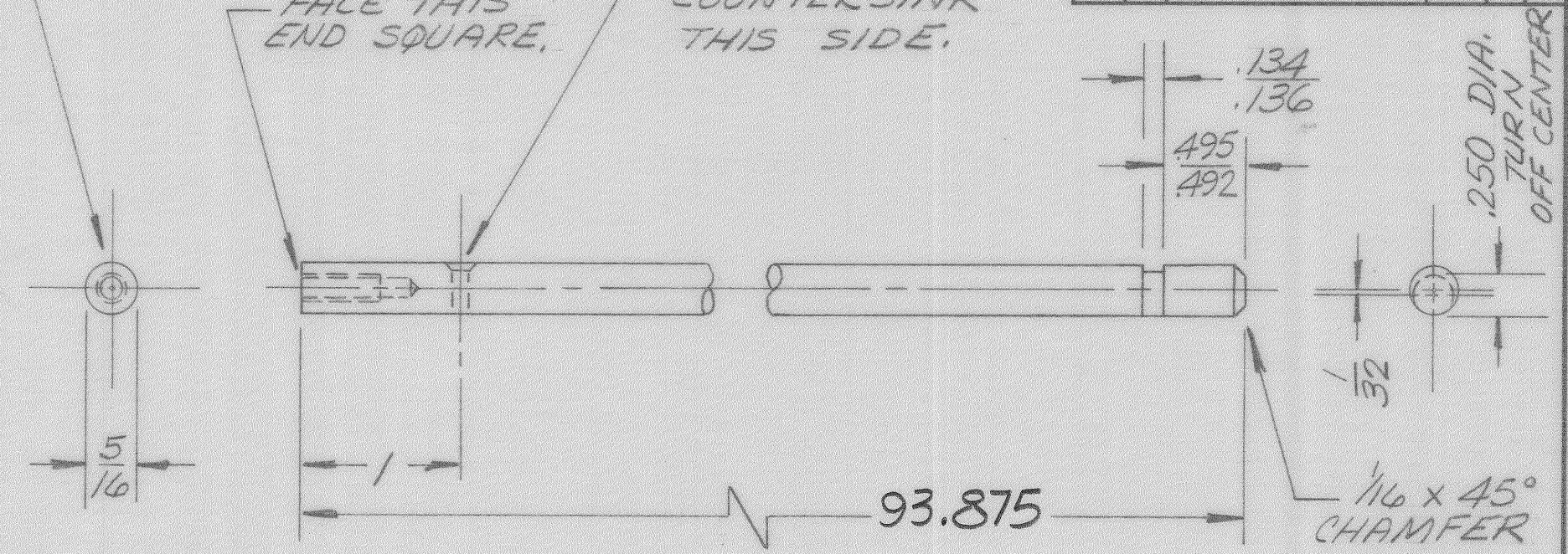
OAK TOOLS		DESIGNED AND BUILT BY BURR OAK TOOL AND GAUGE CO. STURGIS MICHIGAN	
HAPPEL SE-CL-M234		PIERCE	
DATE	ALTERATION	AUTHY	DPY
11/04			
TOLERANCES UNLESS OTHERWISE SPECIFIED		ANGLES	
FRACTIONS	DECIMALS	ANGLES	
1/64	2 PLACES .010	3 PLACES .005	
PART NO.		SCALE	
1/2		1/2	
DRAWING NO.		E47567	

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.

#6-32 NC TAP X
1/2" FULL THDS.
ON CENTER

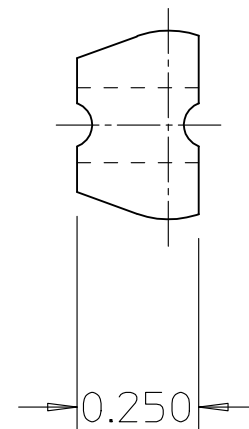
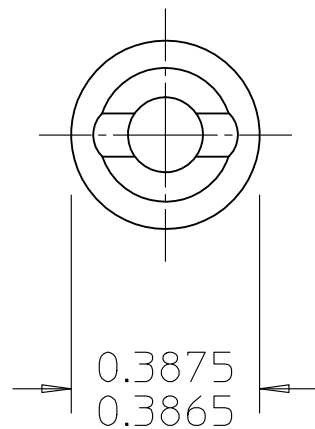
FACE THIS
END SQUARE.

3/32 DRILL THRU
COUNTERSINK
THIS SIDE.



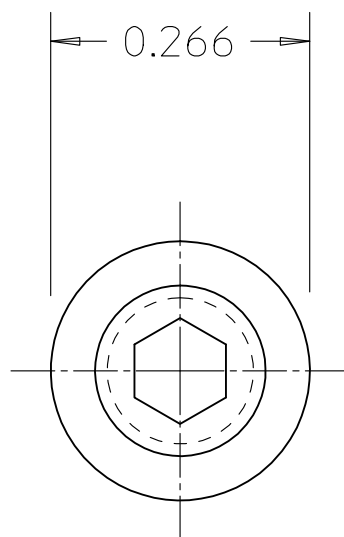
EXPANDER ROD
PCS REQ'D
5/16 DIA. STRESSPROOF
STEEL ROD.
HEAT TREAT GROOVED END.

TOLERANCES (EXCEPT AS NOTED)	BURROAK TOOL & GAUGE CO. STURGIS-MICHIGAN		
DECIMAL ±	SE-CL-M234 EXP. HAPPEL	SCALE 1"=1"	DRAWN BY PIERCE
FRACTIONAL ±	TITLE EXPANDER ROD FOR 10mm & 12mm DIA. TUBING		
ANGULAR ±	DATE 3-10-80	DRAWING NUMBER A-47306	

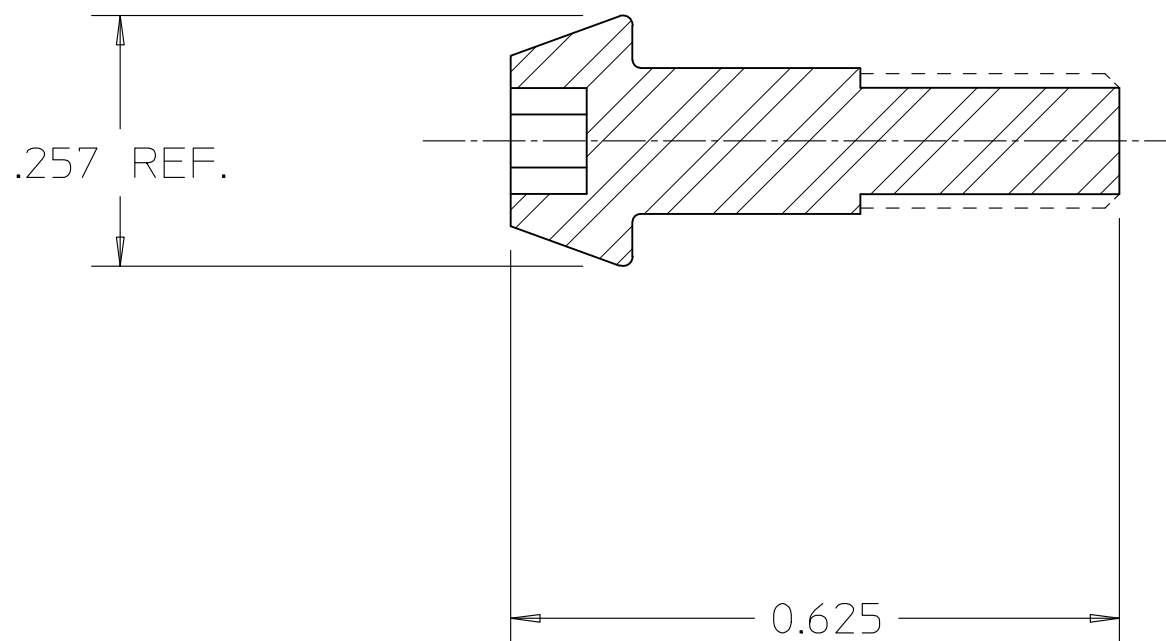


TAPER EXPANDER BULLET

THIS DRAWING AND ALL THE DATA CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.					Burr Oak Tool Inc. Sturgis, Michigan 49091		
				TOLERANCES (EXCEPT AS NOTED)	SE-CL-M234 EXPANDER GEA HAPPEL KLIMATECHNIK		
				DECIMALS 2 PLACE ±.010 3 PLACE ±.003			
				FRACTIONAL ±1/64	DRAWN GLS	DATE 28-Sep-93	CHECKED
				ANGULAR ±1°	PART NO. 6507	SCALE 2:1	DRAWING NO. A-46621-A
DATE	SYM	REVISION RECORD		AUTH			

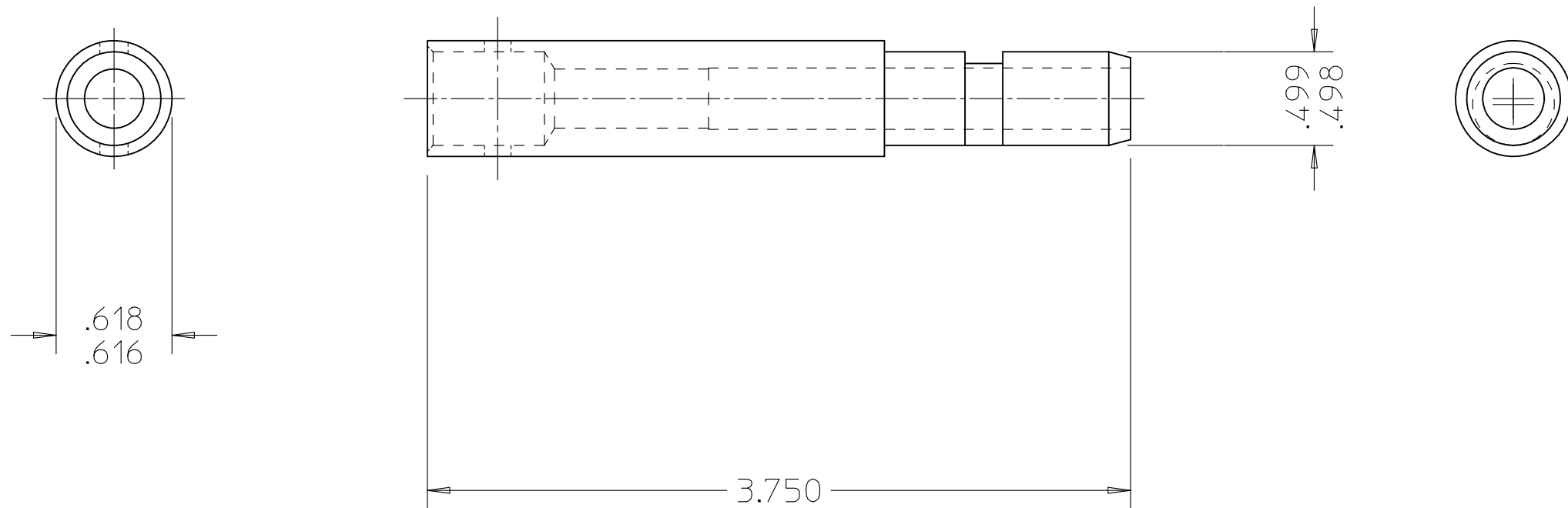


BROACH HEX



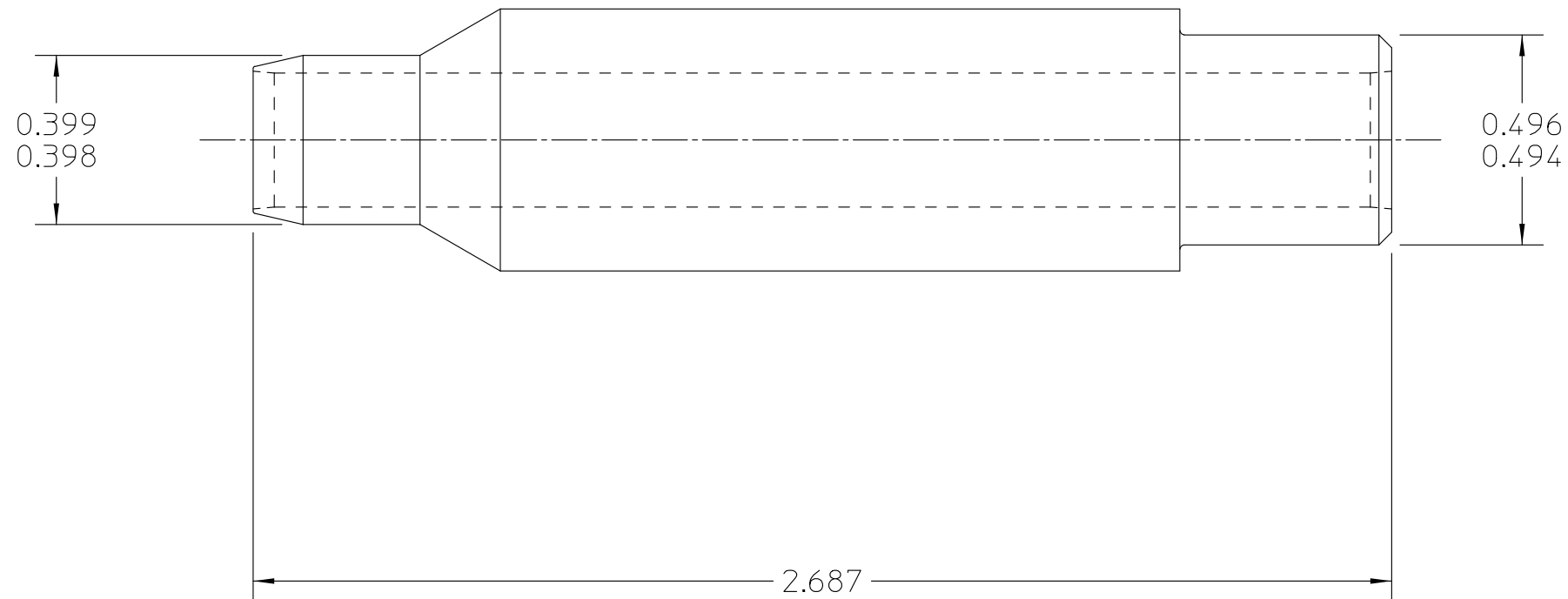
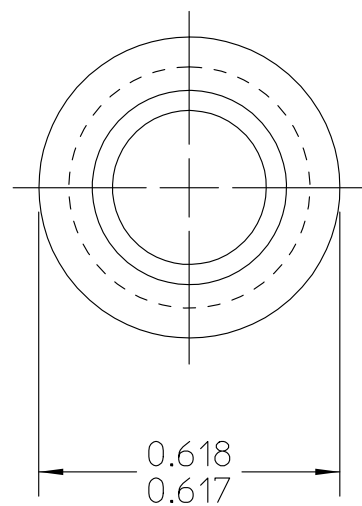
SPECIAL BULLET SCREW

THIS DRAWING AND ALL THE DATA CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.					Burr Oak Tool Inc. Sturgis, Michigan 49091		
				TOLERANCES (EXCEPT AS NOTED)	SE-CL-M234 EXPANDER GEA HAPPEL KLIMATECHNIK		
				DECIMALS 2 PLACE $\pm .010$ 3 PLACE $\pm .003$			
				FRACTIONAL $\pm 1/64$	DRAWN GLS	DATE 28-Sep-93	CHECKED
				ANGULAR $\pm 1^\circ$	PART NO. 6508	SCALE 4:1	DRAWING NO. A-47898-A
DATE	SYM	REVISION RECORD		AUTH			



EXPANDER PUSHER

THIS DRAWING AND ALL THE DATA CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.					<i>Burr Oak Tool Inc.</i> Sturgis, Michigan 49091		
				TOLERANCES (EXCEPT AS NOTED)	SE-CL-M234 EXPANDER GEA HAPPEL KLIMATECHNIK		
				DECIMALS 2 PLACE $\pm .010$ 3 PLACE $\pm .003$			
				FRACTIONAL $\pm 1/64$			
				ANGULAR $\pm 1^\circ$	DRAWN GEP	DATE 21-Nov-95	CHECKED
DATE	SYM	REVISION RECORD	AUTH		PART NO. 6509	SCALE 1:1	DRAWING NO. A-46624-A



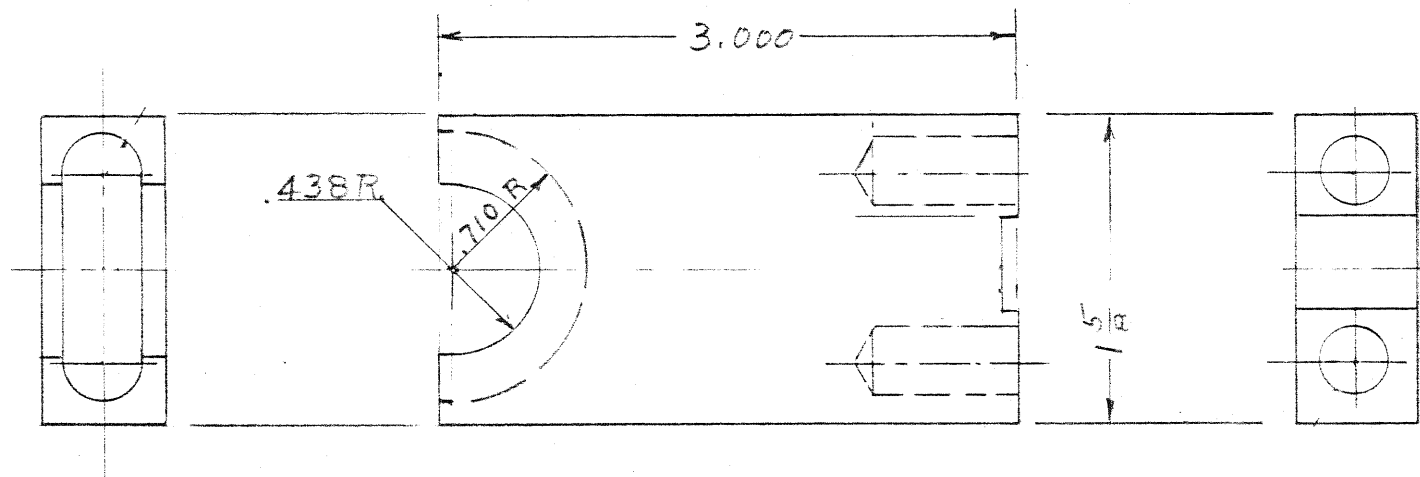
FINAL EXPANDER TIP

THIS DRAWING AND ALL THE DATA CONTAINED HEREIN IS THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.					Burr Oak Tool Inc. Sturgis, Michigan 49091		
				TOLERANCES (EXCEPT AS NOTED)	SE-CL-M234 EXPANDER HAPPEL, GERMANY		
				DECIMALS 2 PLACE ± 0.010 3 PLACE ± 0.003			
				FRACTIONAL $\pm 1/64$	DRAWN G SMITH	DATE 3-Jan-91	CHECKED
				ANGULAR $\pm 1^\circ$	PART NO. 6510	SCALE 2:1	DRAWING NO. A-46623
DATE	SYM	REVISION RECORD		AUTH			

[illegible]

USE TRUARC RING #5108-78

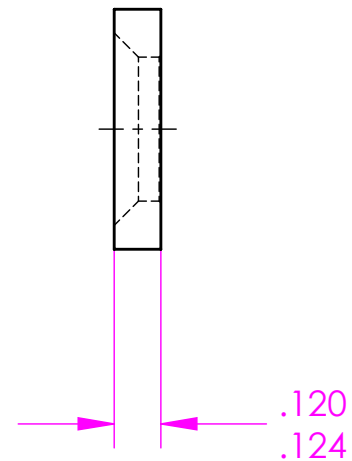
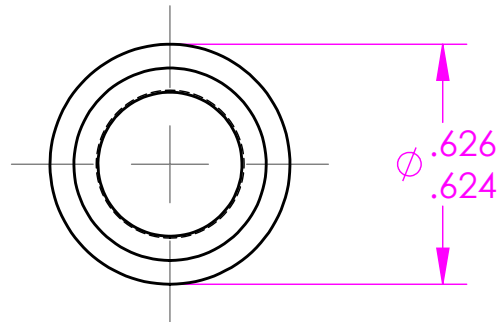
MADE IN U. S. A.
28993



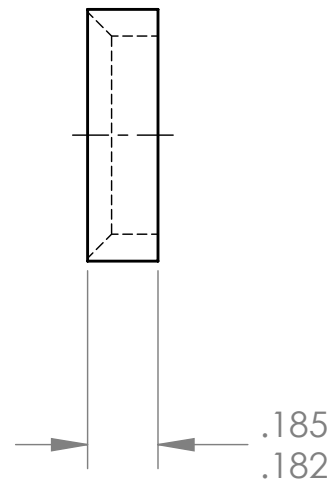
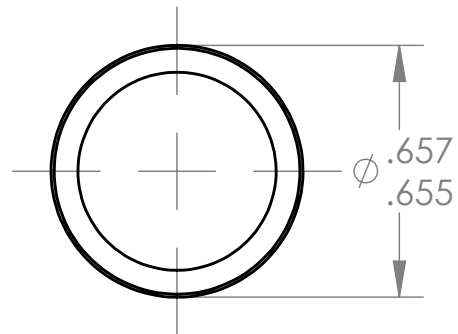
HAIRPIN RECEIVER

FILE

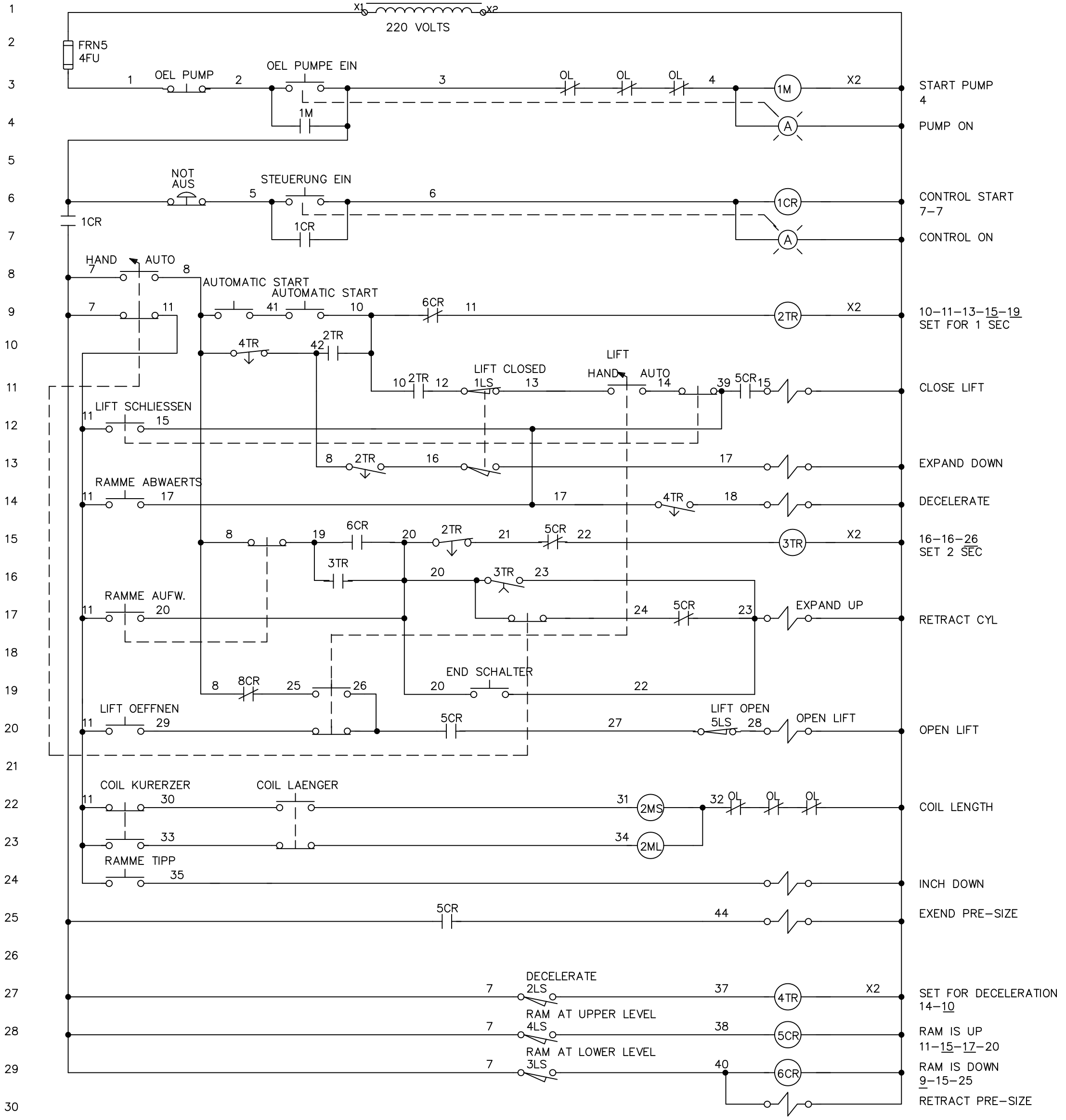
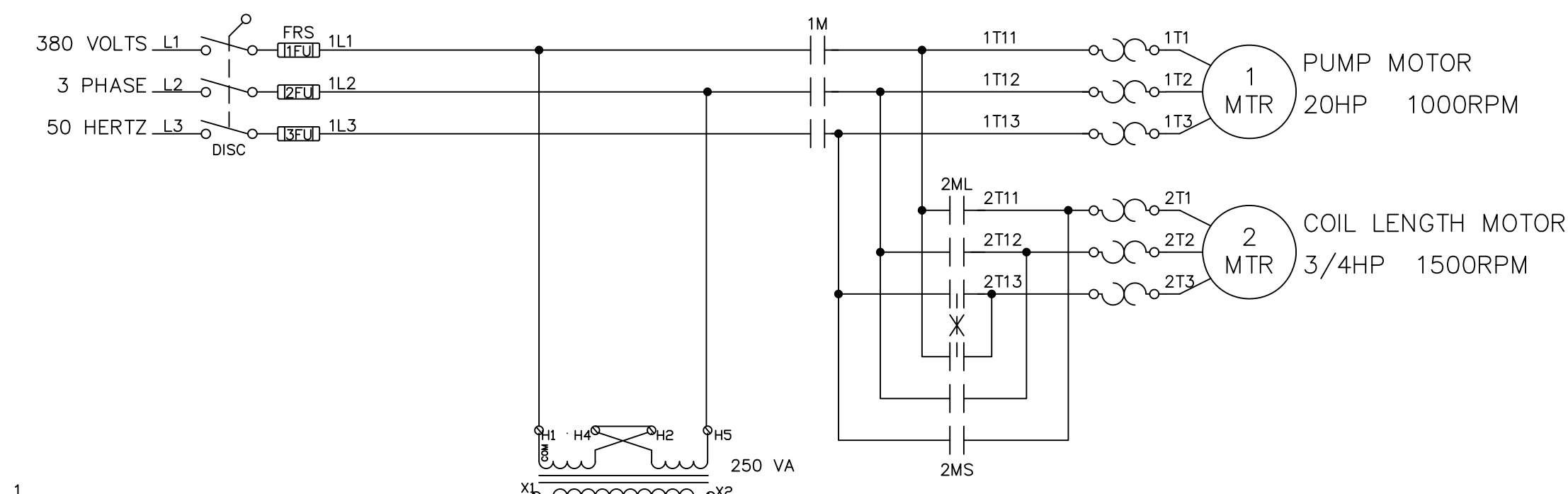
				TOLERANCES (EXCEPT AS NOTED)	Burr Oak Tool & Gauge Co.		
				DECIMAL	Sturgis, Michigan 49091		
				± .003	HE-M 123 EXPANDER		
				FRACTIONAL	HAPPEL		
				± 1/64	DRAWN P	DATE Nov '79	CHECKED
				ANGULAR	PART NO.	SCALE FULL	DRAWING NO. A-46620
DATE	SYM	REVISION RECORD	AUTH.	± 1°			



DEPT. EXP	SOP #	QTY.	 Burr Oak Tool Inc. Sturgis, Michigan U.S.A.	
UNLESS OTHERWISE SPECIFIED	MACH #			
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: $\pm 1/64$ ANGULAR: $\pm 1^\circ$ TWO PLACE DECIMAL: $\pm .010$ THREE PLACE DECIMAL: $\pm .003$ FOUR PLACE DECIMAL: $\pm .0005$	MATERIAL	RING LOCK - ROD .312 DIA. EXPANDER ROD MACHINE TOOLING		
PROPRIETARY AND CONFIDENTIAL THIS DRAWING AND ALL THE DATA CONTAINED HEREIN ARE THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.	NOTES	PRINT DRAWN BY SCALE: 2:1 DETAIL NO. 6515	Rocky Smith SIZE A	12/28/2004 DRAWING NO. 39111

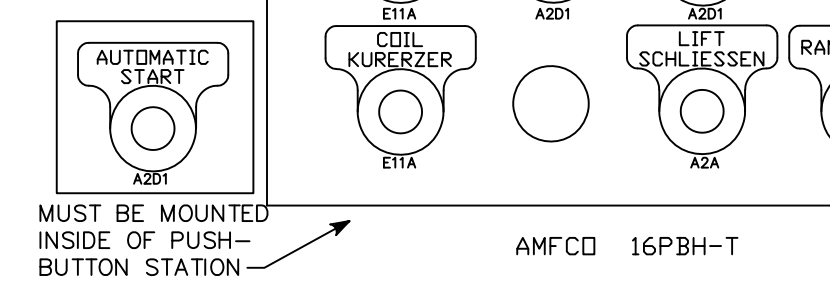


DEPT.	EXP	SOP #	QTY.		Burr Oak Tool Inc.	
UNLESS OTHERWISE SPECIFIED		MACH #			Sturgis, Michigan U.S.A.	
DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL: $\pm 1/64$ ANGULAR: $\pm 1^\circ$ TWO PLACE DECIMAL: $\pm .010$ THREE PLACE DECIMAL: $\pm .003$ FOUR PLACE DECIMAL: $\pm .0005$		MATERIAL		RING LOCK - PUSHER .656 OD, .516 ID, .183 TH MACHINE TOOLING		
PROPRIETARY AND CONFIDENTIAL THIS DRAWING AND ALL THE DATA CONTAINED HEREIN ARE THE EXCLUSIVE PROPERTY OF BURR OAK TOOL INC. AND MAY NOT BE DISCLOSED TO OTHERS WITHOUT WRITTEN CONSENT.		NOTES		PRINT DRAWN BY	Rocky Smith	6/10/2004
				SCALE: 2:1	SIZE	DRAWING NO.
				DETAIL NO.	A	33048
				6516		



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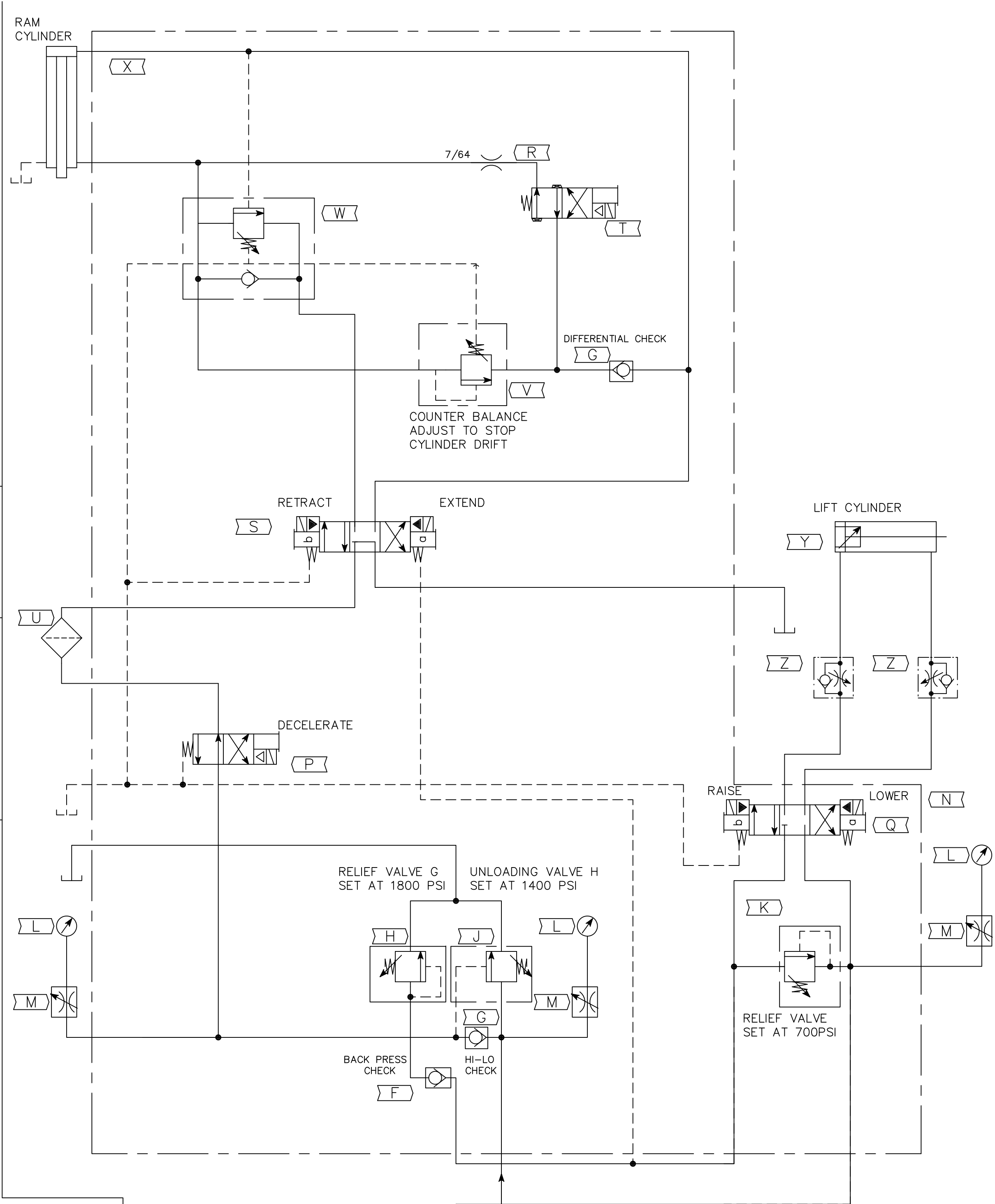
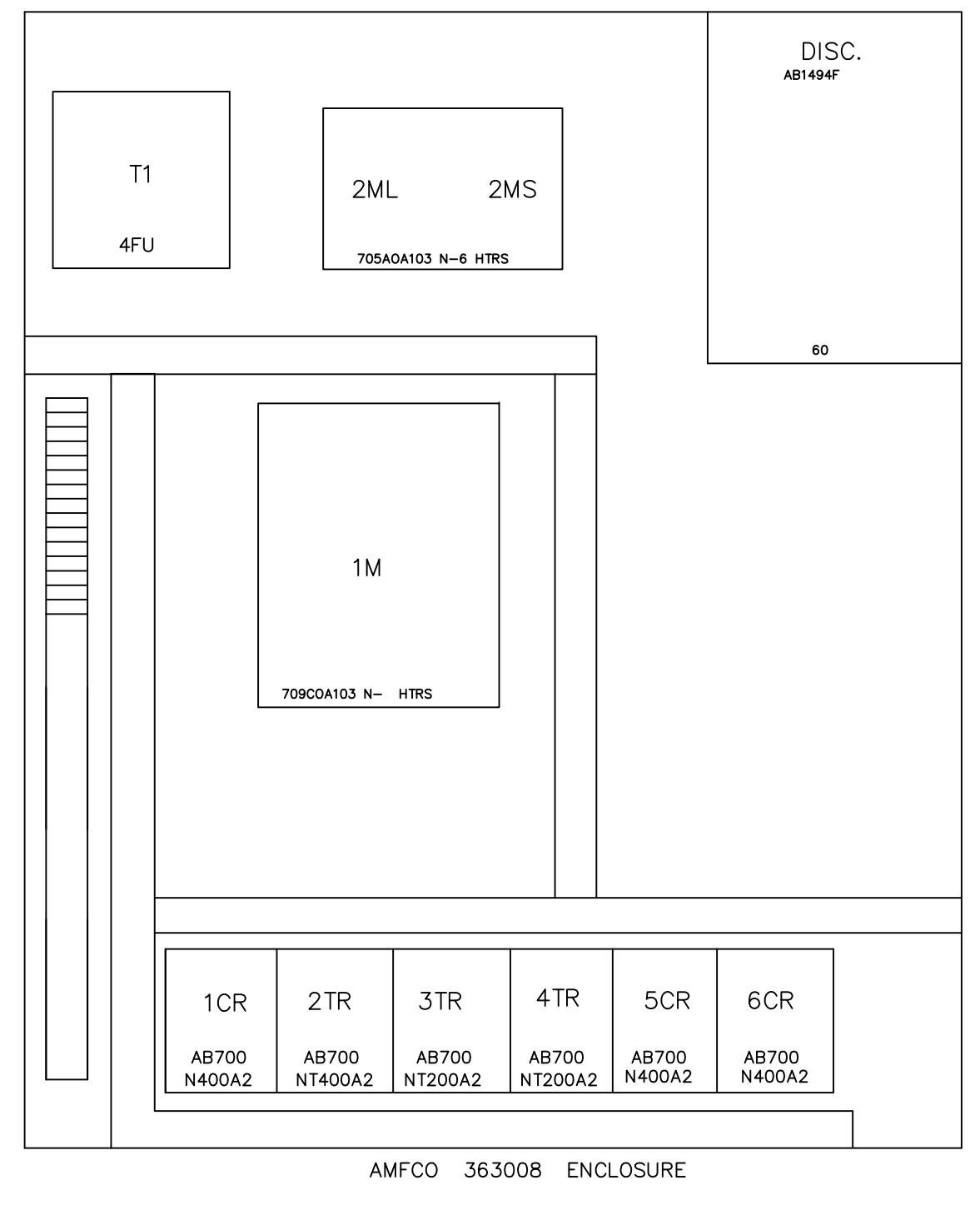
SEQUENCE OF OPERATIONS
1. PRESS PUMP START PUSHBUTTON STARTING PUMP MOTOR-1MTR.
2. PRESS CONTROL START PUSHBUTTON ENERGIZING 1CR
3. TURN HAND-AUTO SELECTOR SWITCH TO AUTO
4. TURN LIFT SELECTOR SWITCH TO AUTO
5. PRESS CYCLE START PUSHBUTTON ENERGIZING 2TR
6. LIFT CLOSES BY 2TR
7. RAM MOVES DOWN BY 1LS
8. RAM MOVES DOWN AT SLOW SPEED AS BULLETS APPROACH COIL BY 2LS & TIMER 4TR
9. RAM MOVES DOWN AT NORMAL SPEED AFTER BULLETS ENTER COIL
WHEN 2LS IS RELEASED & 4TR TIMES OUT
10. RAM AT LOWER LEVEL TRIPS 2LS, DE-ENERGIZING 2TR WHICH TIMES OUT & ENERGIZES 3TR
11. RAM TRAVELS UP BY 3TR AFTER DELAY
12. RAM STOPS AT UPPER LEVEL BY 4LS
13. LIFT OPENS BY 4LS COMPLETING CYCLE.



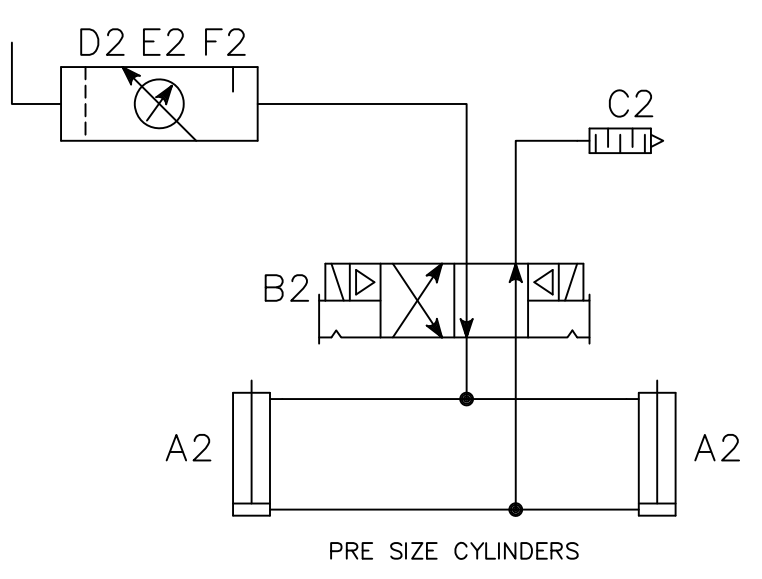
LIMIT SWITCHES
1LS 11-13 LIFT CLOSED
2LS 27 DECELERATE RAM
3LS 29 RAM IS AT LOWER LEVEL
4LS 28 RAM IS AT UPPER LEVEL
5LS 19 LIFT IS OPEN

TIMER SETTINGS
2TR-DELAY STOPPING DOWNWARD TRAVEL AFTER LOWER LIMIT IS TRIPPED TO INSURE FULL EXTENSION OF RAM CYLINDER
3TR-DELAY RAM RETRACT FOR HYDRAULIC DECOMPRESSION AT EXTENDED POSITION
4TR-SET FOR LENGTH OF DECELERATION REQUIRED

NOTE: RAM MUST BE AT UPPER LEVEL (TRIPPING 4LS) TO OPEN LIFT IN "HAND"



PLANT AIR SUPPLY
80 TO 100PSI



DET	HYDRAULIC MATERIAL LIST	QTY
A	HYDRAULIC RESERVOIR 1 0 GALLONS	1
B	FILTER 50FC-1F-10	1
C	ELECTRIC MOTOR 380/190 3PH 50HZ DP	1
D	VANE PUMP 2520 V21 A14 1CC-10-181	1
E	PUMP FLANGES FLI-8-08P-10,FLI-10-10P-10,FLI-24-24P-10	1
F	CHECK VALVE C5G-815-58	1
G	CHECK VALVE C5G-815	2
H	RELIEF VALVE CG-06-C-40	1
J	UNLOADING VALVE RG-06-F4-22	1
K	RELIEF VALVE CG-06-B-40	1
L	PRESSURE GAUGE 0-3000PSI TYPE 5 2 1/2"FACE	3
M	NEEDLE VALVE 133-1/4B	3
N	MANIFOLD DWG NO.	1
P	DECELERATION VALVE DG5S4-069A-8-M-W-D-51	1
Q	DIRECTIONAL VALVE DG5S4-068C-M-W-D-51	1
R	PIPE PLUG IN GENERAL MANIFOLD WITH ORFICE HOLE	2
S	DIRECTIONAL VALVE DG5S4-068CE-M-W-D-51	1
T	INCH DIRECTIONAL VALVE DG4S4-012A-W-D-51	1
U	PRESSURE LINE FILTER KF30-1K25-P-D	1
V	COUNTERBALANCE VALVE RG-06-D2-22	1
W	SEQUENCE VALVE RCG-06-D3-22	1
X	CYLINDER N2C 8"BORE X 75"STROKE	1
Y	CYLINDER N2C 4"BORE X 18"STROKE 2 1/2"ROD	1
Z	FLOW CONTROL VALVE F-30-S	2
A1		
B1		

OIL SPECIFICATIONS
VISCOSITY: GRADES:150-315 SUS @ 100 F
RUNNING: 70-250 SUS
AT START UP:4000 SUS MAX.
OIL TYPE: ANTIWEAR HYDRAULIC OILS OR
AUTOMOTIVE CRANKCASE OIL
HAVING LETTER DESIGNATION
"SC","SD" OR "SE" PER SAE
TECHNICAL REPORT J-183-A

DET	PNEUMATIC PARTS LIST	QTY
A2	CYLINDER LR2B 6"BORE X 5"STROKE 1 3/8"ROD	2
B2	4 WAY VALVE 333E012	1
C2	MUFFLER BB-	1
D2	FILTER F11-300-M3TA	1
E2	REGULATOR 11-002-043 W/0-160PSI GAUGE	1
F2	LUBRICATOR L11-300-OPLA 3/8"	1



DESIGNED AND BUILT BY BURR OAK TOOL AND GAUGE CO.
STURGIS, MICHIGAN U.S.A.
EXPANDER WITH LIFT
SE-CL-M234 HAPPEL
DRAWN: WAB III
DATE: 2-8-80
SHEET OF: 1
DWG. NO.: D-46722