



X1-V3 Transmission Design - Parts List

Part Number	Part Description	Qty (1 Assy)
X1-V3-001	Gearbox Side Plate	2
X1-V3-002	Pneumatic Mount Plate	1
X1-V3-003	Pneumatic Coupler Plate	1
X1-V3-004	Pneumatic Coupler Bracket	1
X1-V3-005	Input Shaft	1
X1-V3-006	Shifter Shaft	1
X1-V3-007	Internal Shaft	1
X1-V3-008	Output Shaft, Inside Spacer	1
X1-V3-009	Output Shaft, Outside Spacer	1
X1-V3-010	Input Shaft Spacer	1
X1-V3-011	Shifter Dog	1
X1-V3-012	Motor Pinion - 12T, 20DP	2
X1-V3-013	High Input Gear - 50T, 20DP	1
X1-V3-014	Low Input Gear - 36T, 20DP	1
X1-V3-015	High Shifter Gear - 36T, 20DP	1
X1-V3-016	Low Shifter Gear - 50T, 20DP	1
X1-V3-017	Output Sprocket - 10T, #35	1
X1-V3-018	Small Shifter Bushing	1
X1-V3-019	Large Shifter Bushing	1
X1-V3-020	Shifter Pin	1
X1-V3-021	Input Shaft Key	1
X1-V3-022	Output Shaft Key	1
X1-V3-023	Pinion Key	2

Unmodified COTS Components (No Part Details Shown)

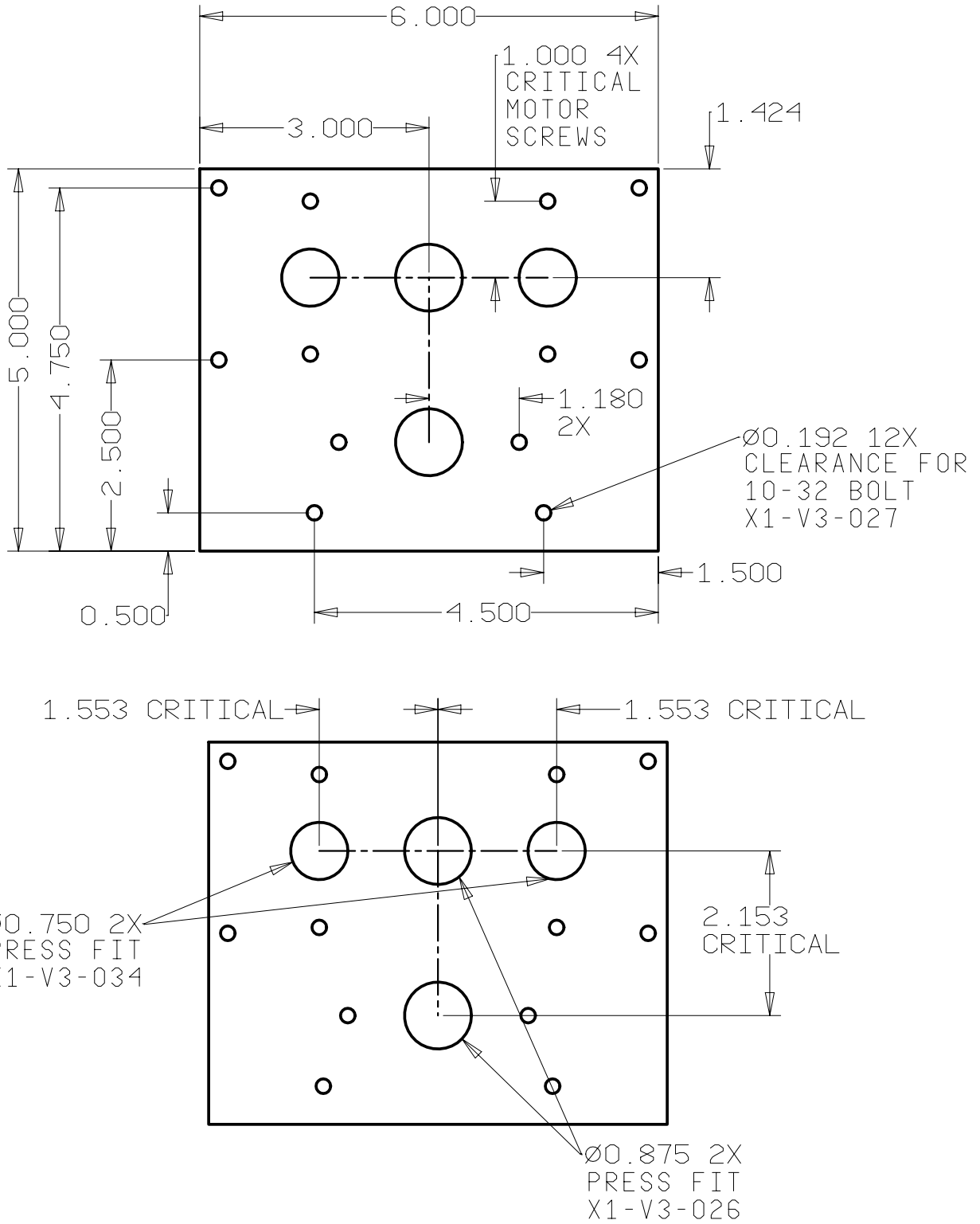
X1-V3-024	Gearbox Spacer	6
X1-V3-025	Pneumatic Spacer	2
X1-V3-026	Gearbox Bearing - .375 ID Flanged	4
X1-V3-027	Gearbox Screw - 10-32 Button Head	20
X1-V3-028	Gearbox Set-Screw - 8-32	4
X1-V3-029	Shifter Screw - 6-32 Button Head	2
X1-V3-030	Cylinder Nut - .625-18 Jam Nut	1
X1-V3-031	Coupler Nut - .25-28 Jam Nut	1
X1-V3-032	Input Washer - .375" ID, 0.0625" thk	1
X1-V3-033	Pneumatic Cylinder	1
X1-V3-034	Drive Motor - Chiaphua	1
X1-V3-035	Drive Motor - AM Planetary	1
X1-V3-036	Drive Motor - FP	1

Additional Drawings - Assembly & Exploded Views

Drawing Number	Drawing Description
X1-V3-037	Full Transmission Assembly Views 1 (Isometric)
X1-V3-038	Full Transmission Assembly Views 2 (Isometric)
X1-V3-039	Full Transmission Assembly Views 3 (Orthographic)
X1-V3-040	Full Transmission Assembly Views 4 (Orthographic)
X1-V3-041	Full Transmission Assembly Views 5 (Orthographic)
X1-V3-042	Full Transmission Gearing Views 1 (Isometric)
X1-V3-043	Full Transmission Gearing Views 2 (Orthographic)
X1-V3-044	Full Transmission Gearing Views 3 (Iso - Ratios)
X1-V3-045	Full Transmission Explosion View
X1-V3-046	Motor Assy Drawing
X1-V3-047	Plate Assy Drawing
X1-V3-048	Shifter Gear Assy
X1-V3-049	Input Shaft Assy Views
X1-V3-050	Input Shaft Explosion Views
X1-V3-051	Shifter Shaft Assy Views
X1-V3-052	Shifter Shaft Explosion Views
X1-V3-053	Pneumatic Shifter Assy Views
X1-V3-054	Pneumatic Shifter Explosion Views
X1-V3-055	Shifting Motion

Notes:

- 1. Material: 1/4" Thick Aluminum Plate as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-001.stp"



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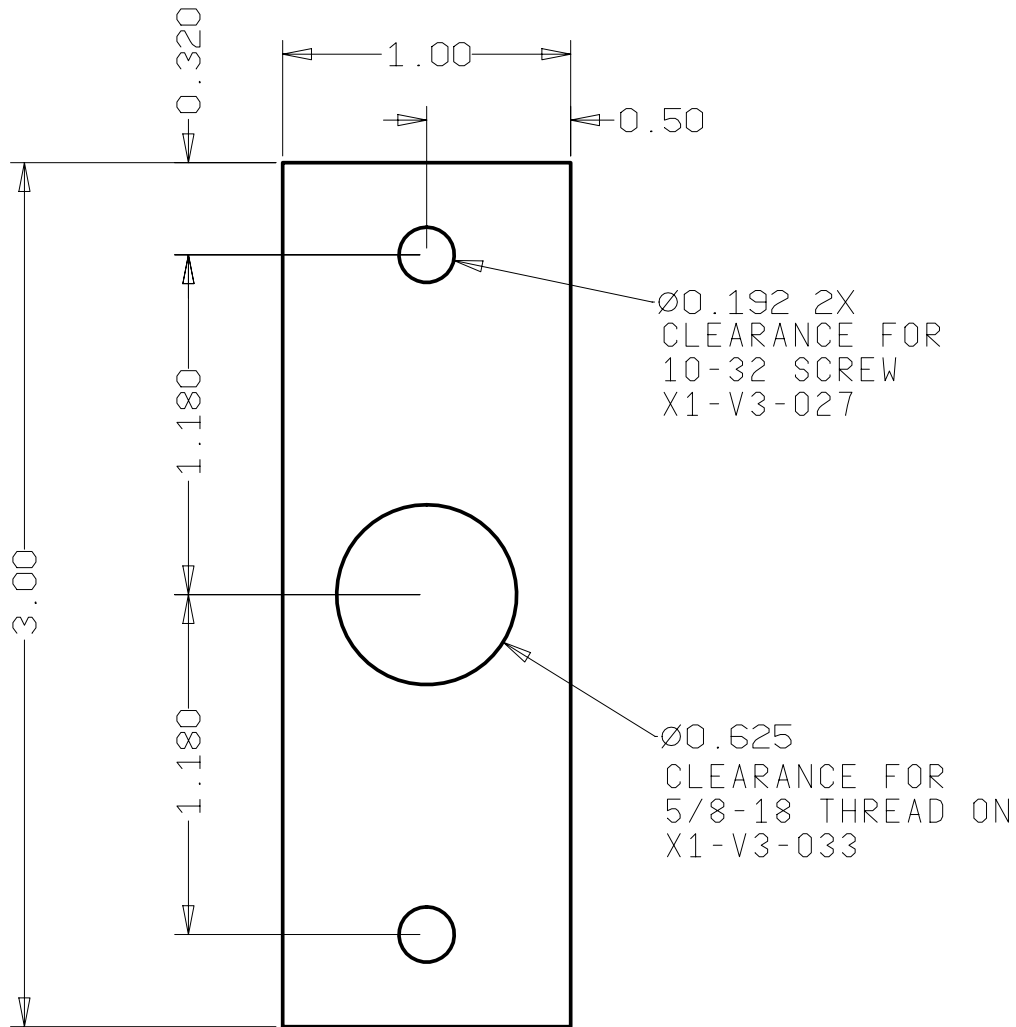
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DWG	X1-V3-001	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Gearbox Side Plate
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Notes:

- 1. Material: 1/8" Thick Aluminum Plate as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-002.stp"



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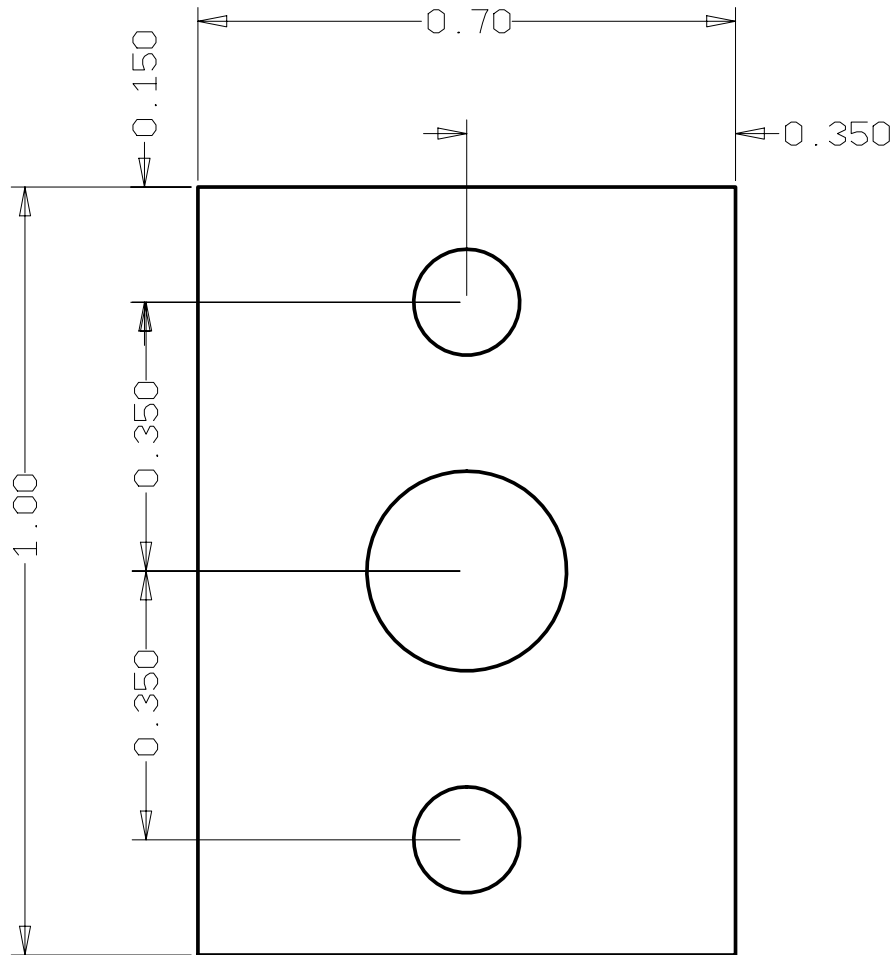
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DWG **X1-V3-002** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Pneumatic Mount Plate**

Notes:

- 1. Material: 1/8" Thick Aluminum Plate as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-003.stp"



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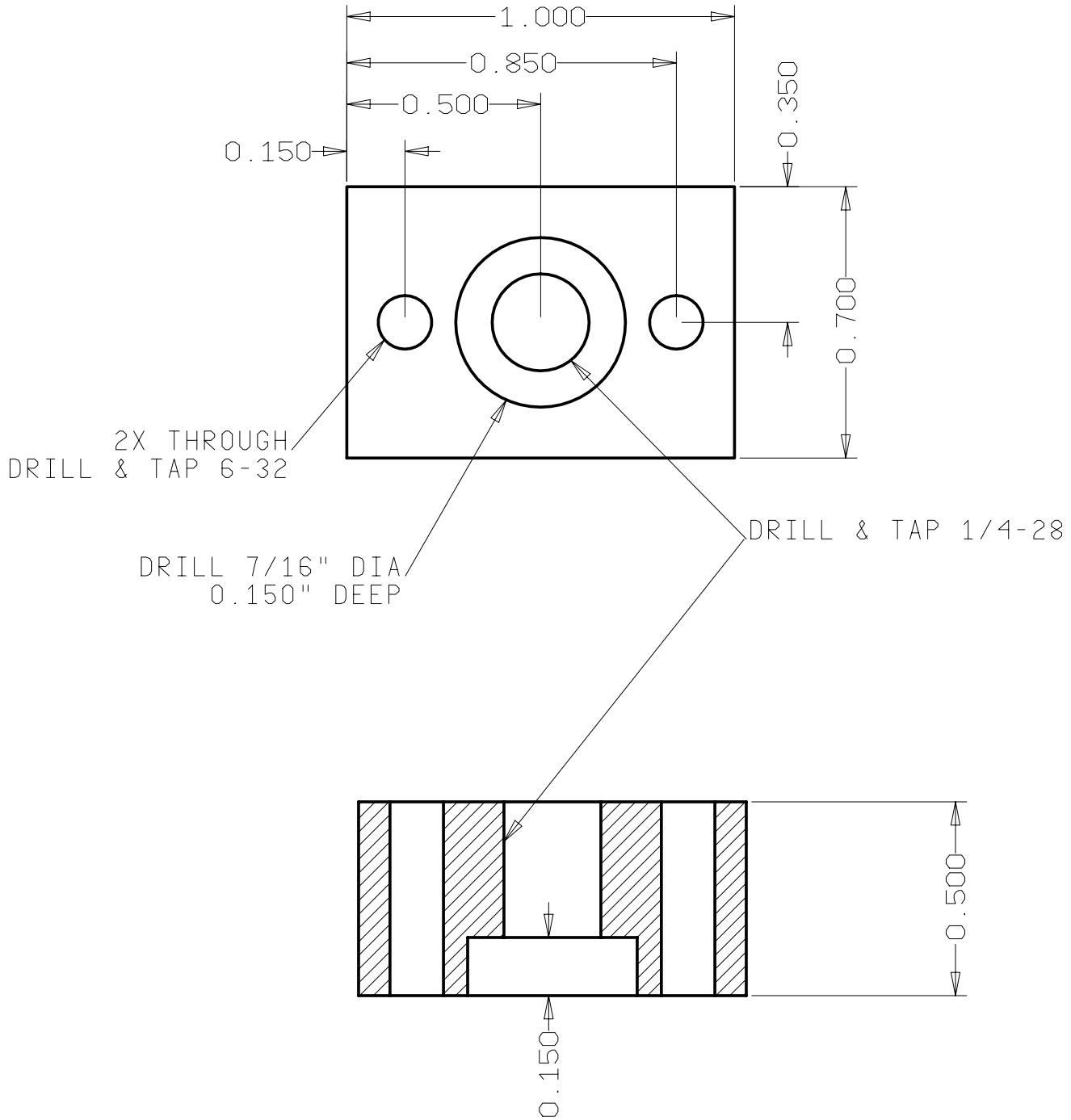
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DWG **X1-V3-003** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Cylinder Coupler Plate**

Notes:

- 1. Material: 1/2" Thick Aluminum Plate as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-004.stp"



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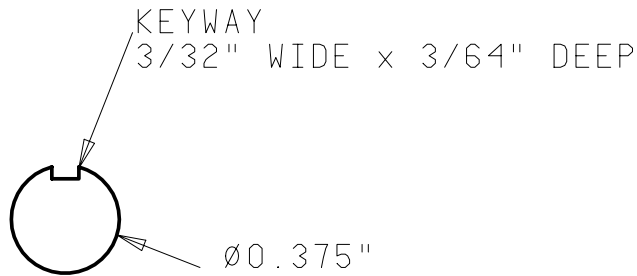
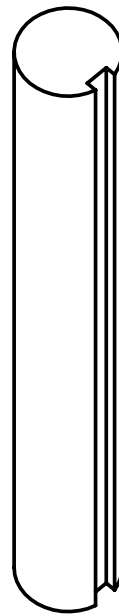
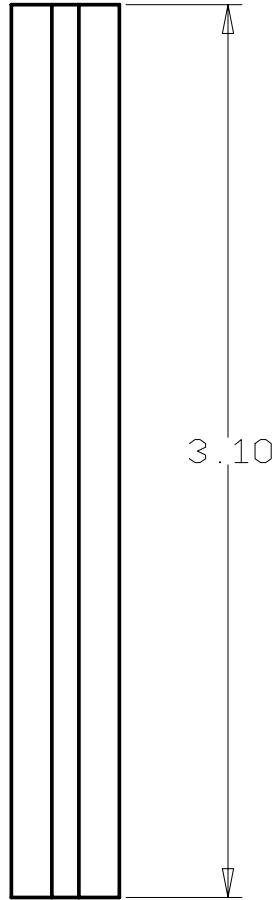
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DWG	X1-V3-004	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - Cylinder Coupler Bracket
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Notes:

- 1. Material: 3/8" Dia Pre-Keyed 4140 Steel Shaft as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-005.stp"



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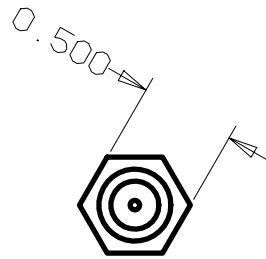
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DWG **X1-V3-005** DATE **2004 Dec 18** DRAWN BY **JVN**

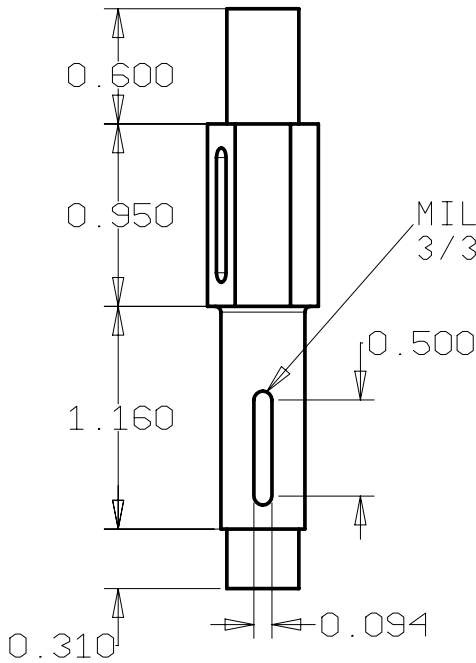
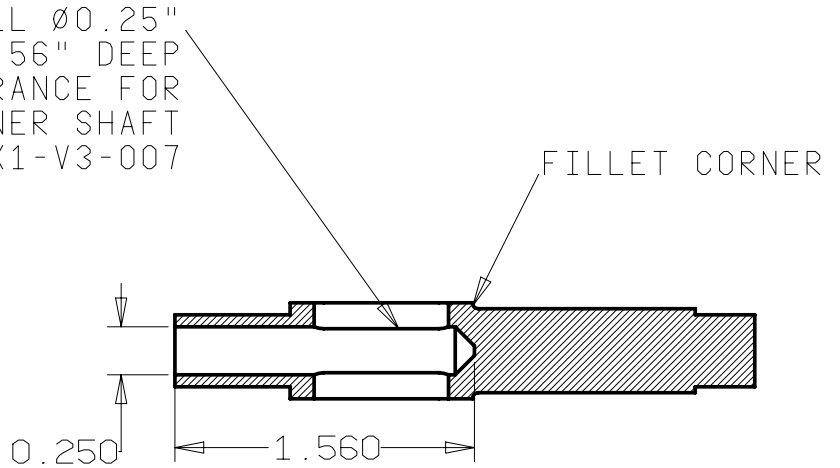
TITLE **X1-V3 Transmission - Input Shaft**

Notes:

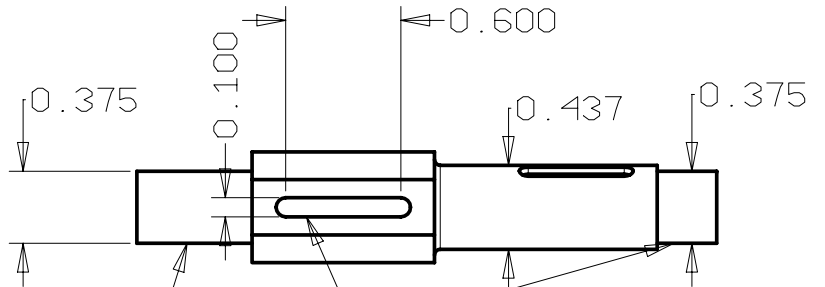
1. Material: 1/2" Dia 4140 Steel Hexagonal Rod as Listed in BOM
3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-006.stp"
6. Heat Treat For Max Strength



DRILL Ø0.25"
1.56" DEEP
CLEARANCE FOR
INNER SHAFT
X1-V3-007



MILL KEYWAY
3/32" W x 3/64" D



TURN ENDS FOR
FIT IN 3/8" ID
BEARING X1-V3-026

MILL SLOT
THROUGH SHAFT



NOTE: SMOOTH FINISH ALL SURFACES

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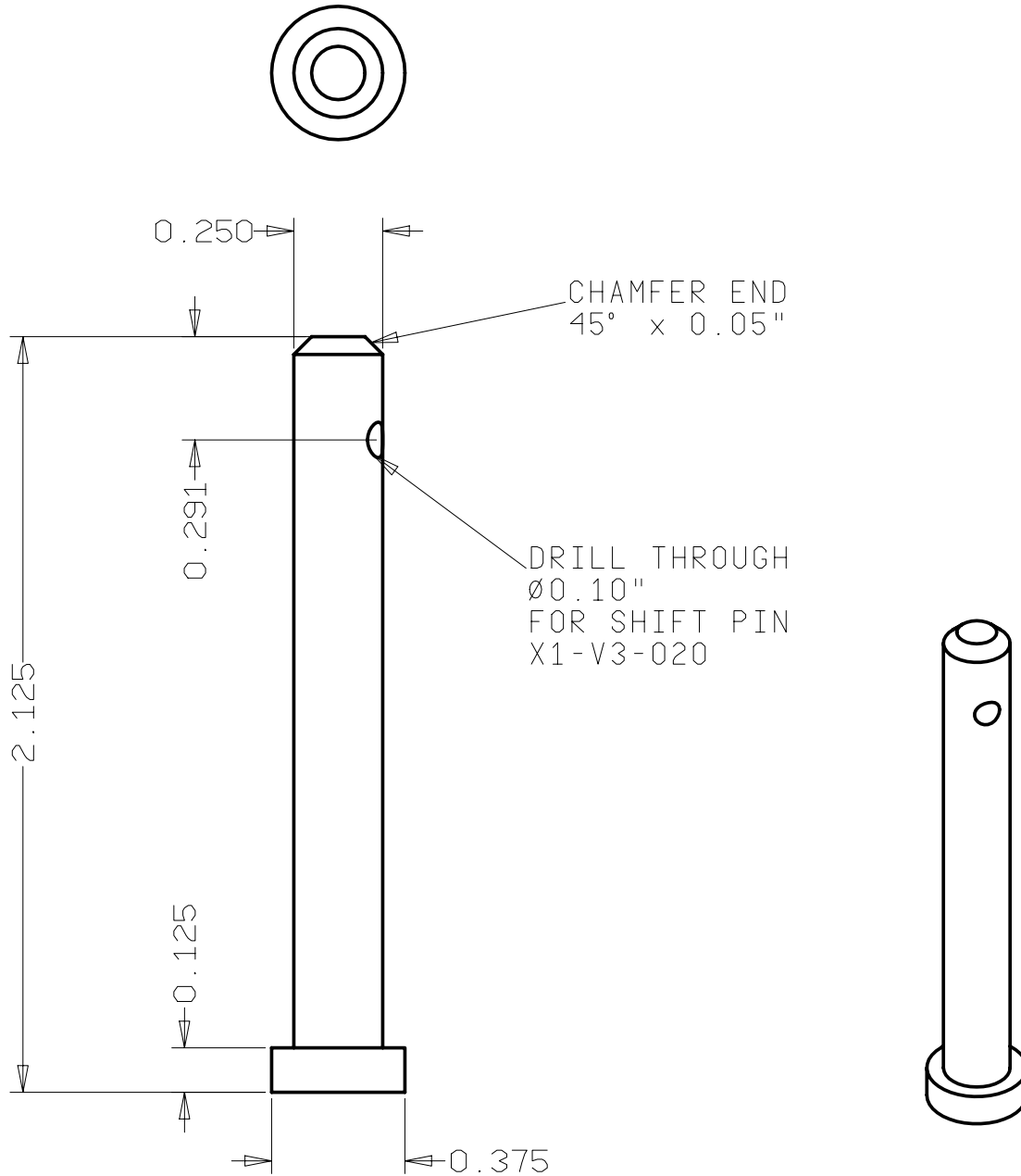
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DWG	X1-V3-006	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Shifter Shaft
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Notes:

- 1. Material: 7/16" Dia Steel Round Stock as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-007.stp"



NOTE: SMOOTH FINISH ALL SURFACES

Clarkson FIRST - 229

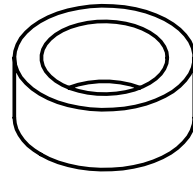
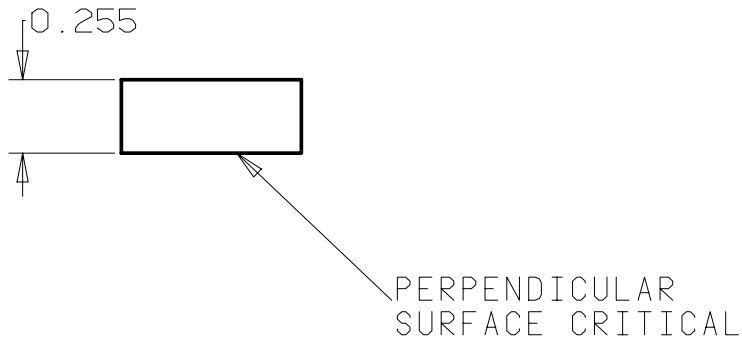
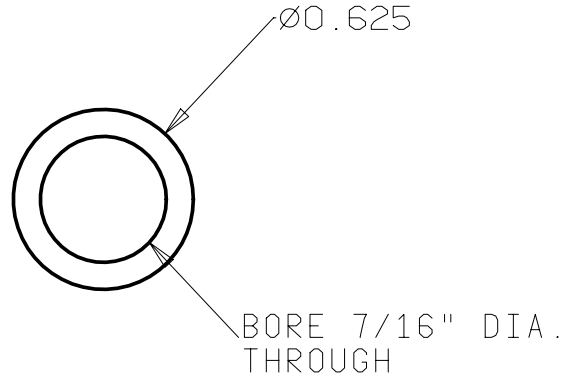
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DWG **X1-V3-007** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Internal Shaft**

Notes:

- 1. Material: 5/8" Dia. Delrin Rod as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-008.stp"



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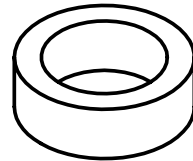
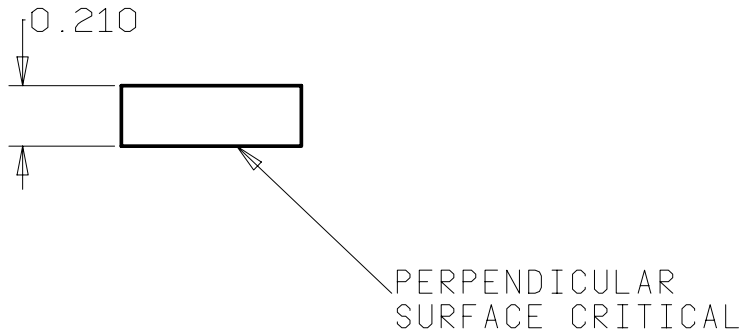
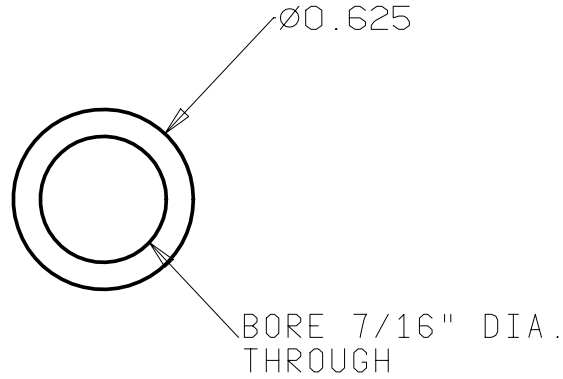
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DWG **X1-V3-008** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Output Shaft, Inside Spacer**

Notes:

- 1. Material: 5/8" Dia. Delrin Rod as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-009.stp"



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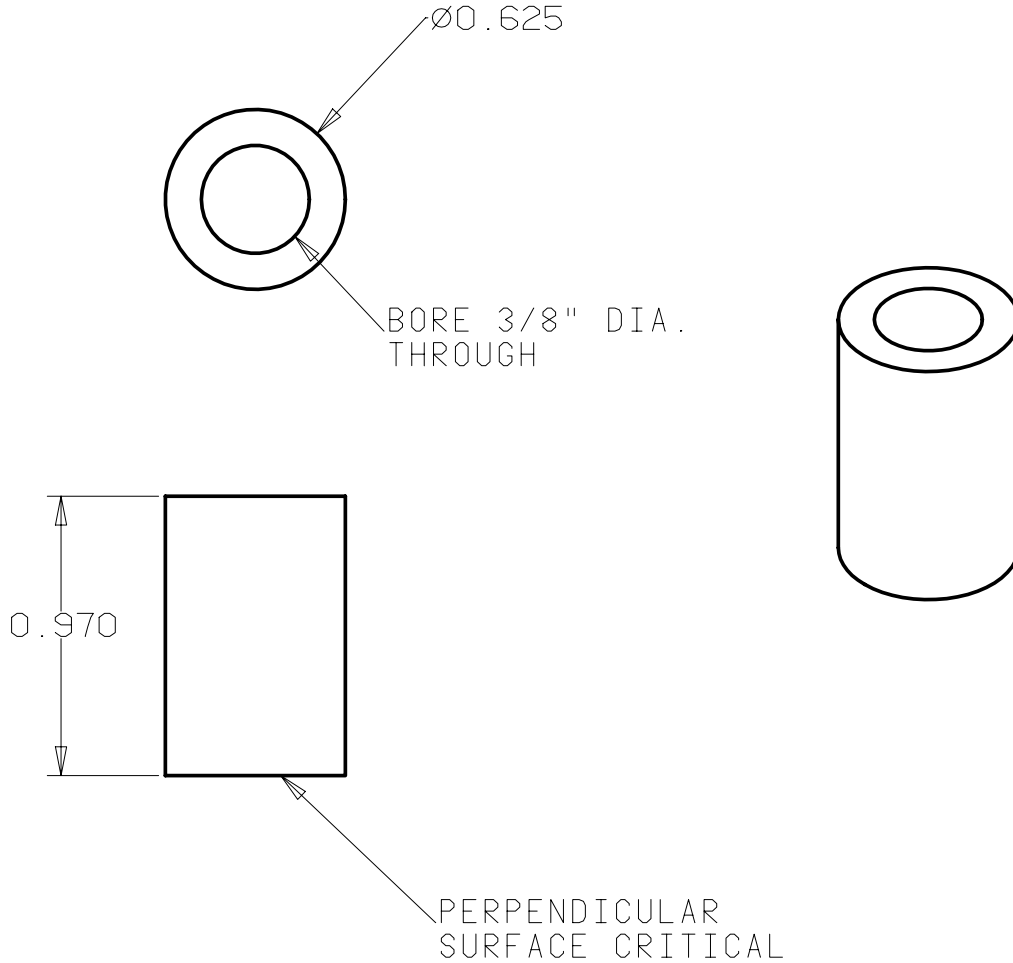
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DWG **X1-V3-009** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Output Shaft, Outer Spacer**

Notes:

- 1. Material: 5/8" Dia. Delrin Rod as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-010.stp"



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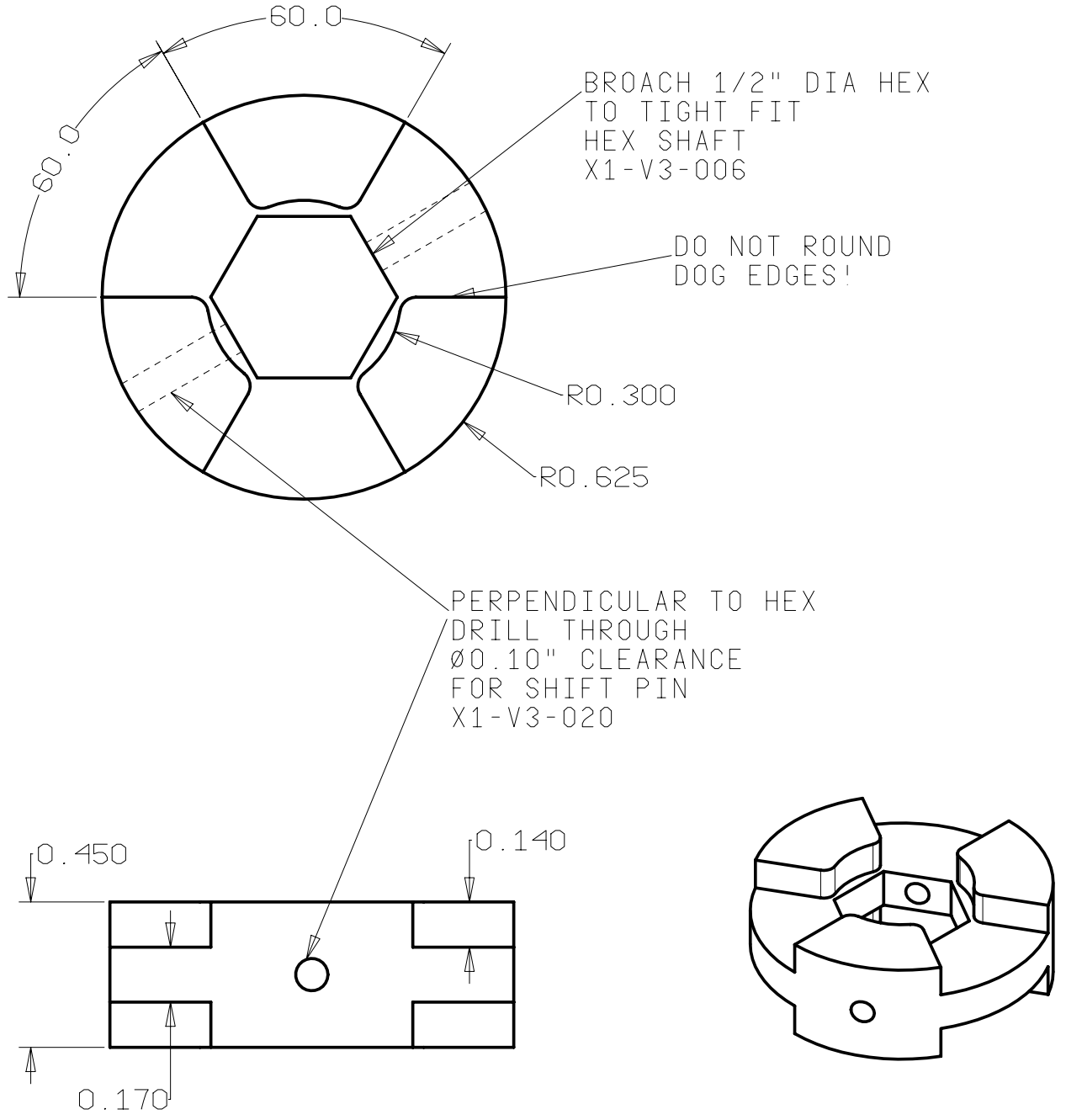
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DWG **X1-V3-010** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Input Shaft Spacer**

Notes:

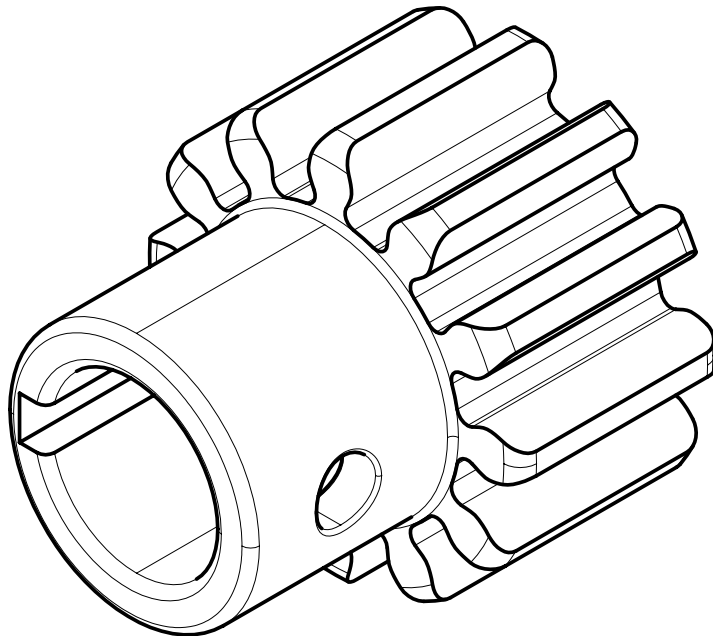
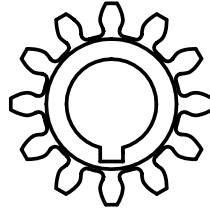
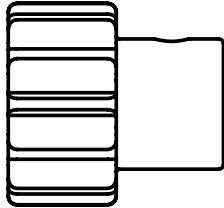
1. Material: 1-1/4" Dia. Steel Rod as Listed in BOM
3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-011.stp"



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DWG	X1-V3-011	DATE	2004 Dec 18	DRAWN BY	JVN
TITLE	X1-V3 Transmission - Shifter Dog				

Notes:

- 1. Material: 20DP, 12 Tooth Spur Gear as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-012.stp"



DRILL AND TAP FOR 8-32 SETSCREW
BROACH KEYWAY 2mm WIDE x 1mm DEEP

Clarkson FIRST - 229

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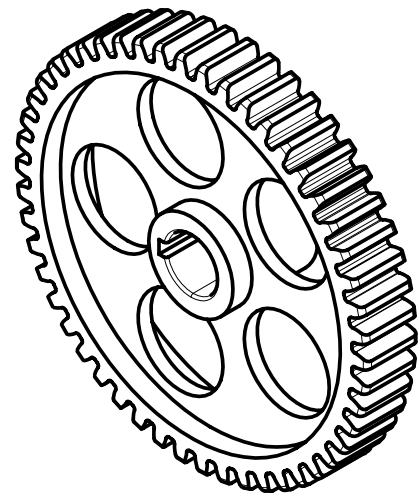
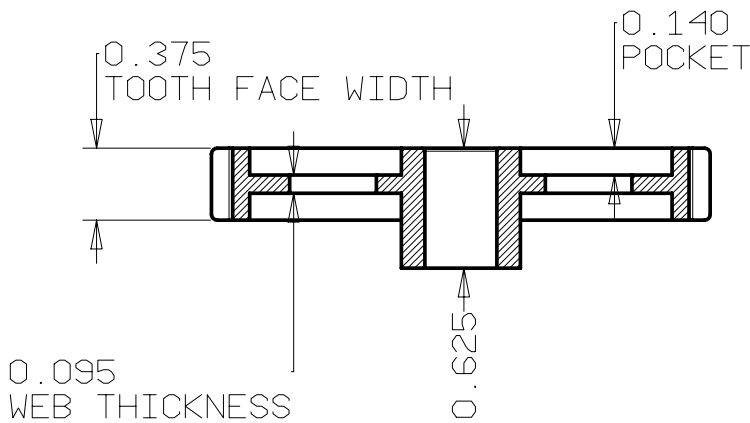
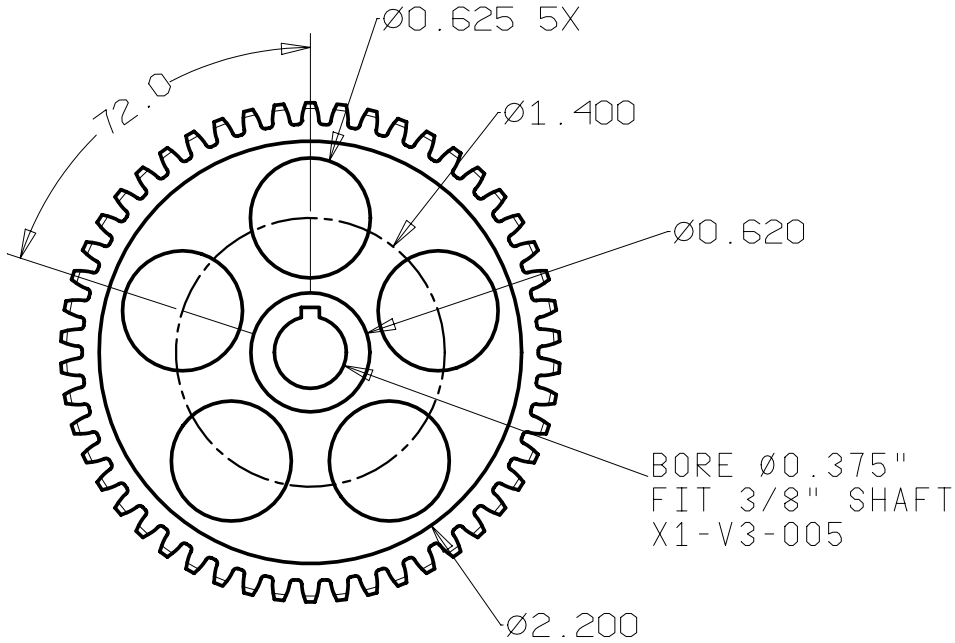
DWG **X1-V3-012** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Motor Pinion**

<http://www.team229.org>

Notes:

1. Material: 20DP, 50 Tooth Steel Spur Gear as Listed in BOM
3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-013.stp"



DRILL AND TAP FOR 8-32 SETSCREW
 BROACH KEYWAY 3/32" WIDE x 3/64" DEEP

Clarkson FIRST - 229

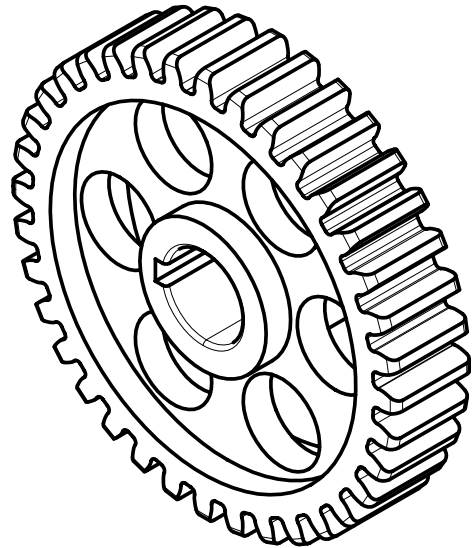
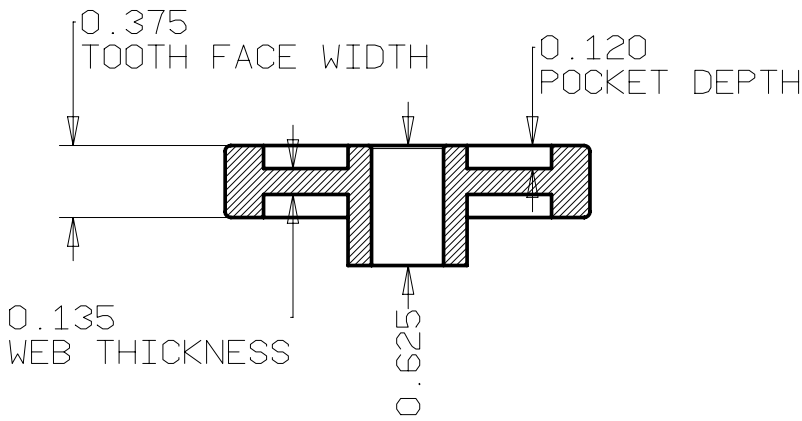
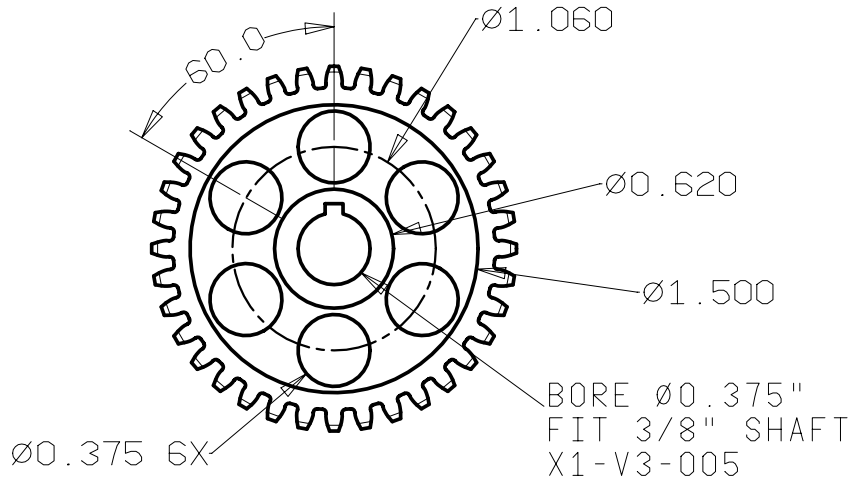
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DWG	X1-V3-013	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - 50 Tooth Input Gear
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Notes:

1. Material: 20DP, 36 Tooth Steel Spur Gear as Listed in BOM
3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-014.stp"



DRILL AND TAP FOR 8-32 SETSCREW
 BROACH KEYWAY 3/32" WIDE x 3/64" DEEP

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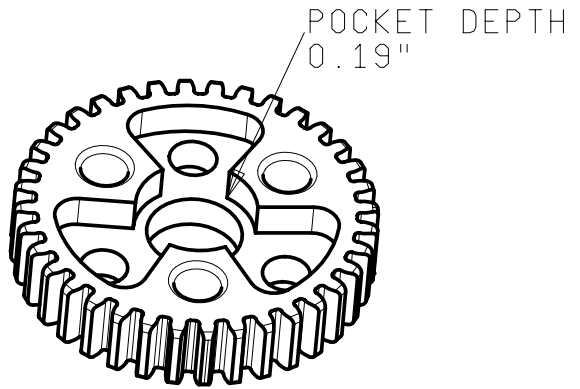
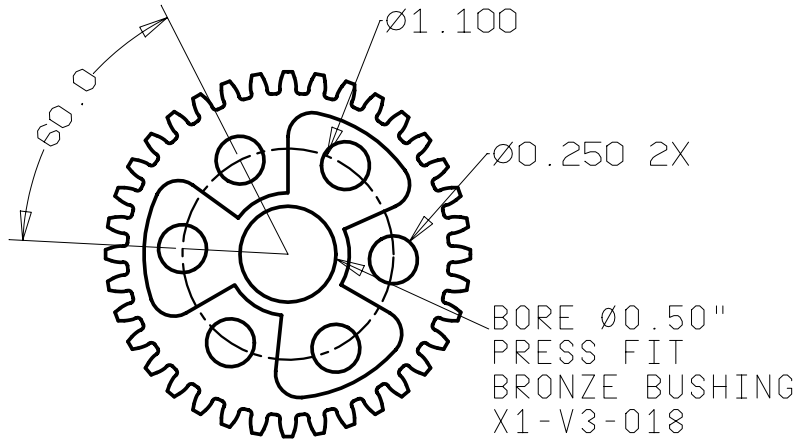
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DWG	X1-V3-014	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - 36 Tooth Input Gear
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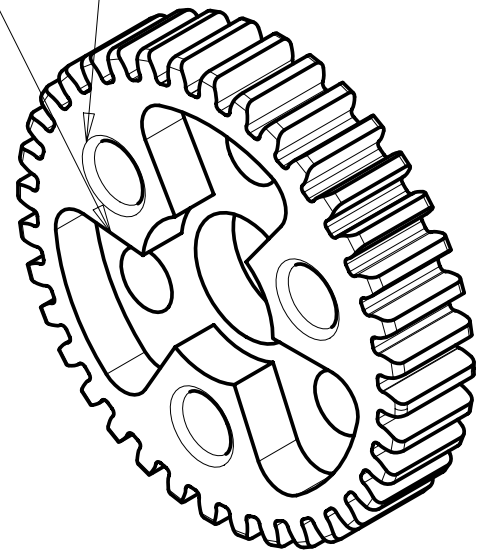
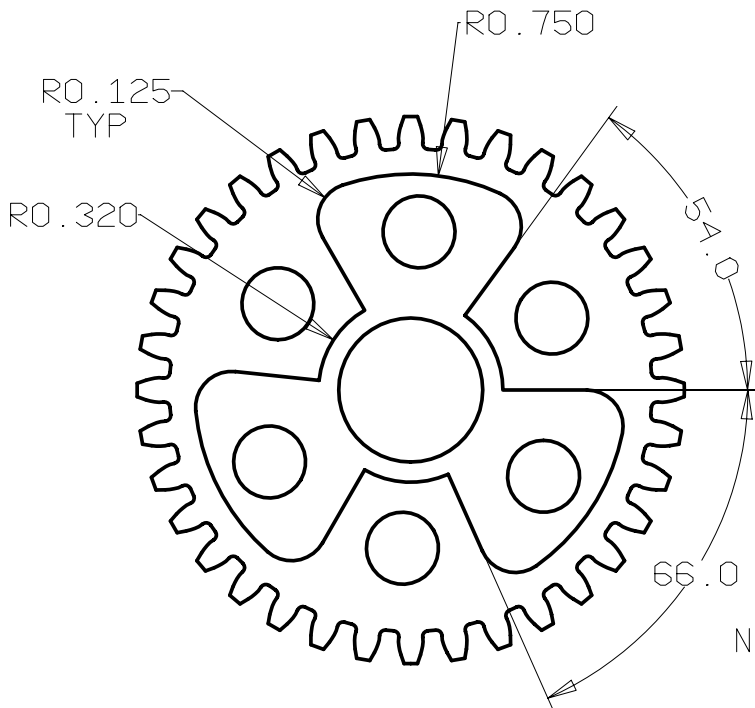
Notes:

1. Material: 20DP, 36 Tooth Steel Spur Gear as Listed in BOM
3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-015.stp"



ROUND EDGE 3X

LEAVE DOG
EDGES SHARP!



NOTE: 66° POCKET ALLOWS
6° OF SHIFTER FREEDOM

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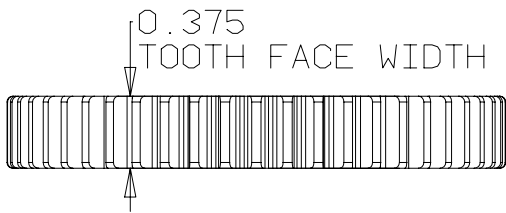
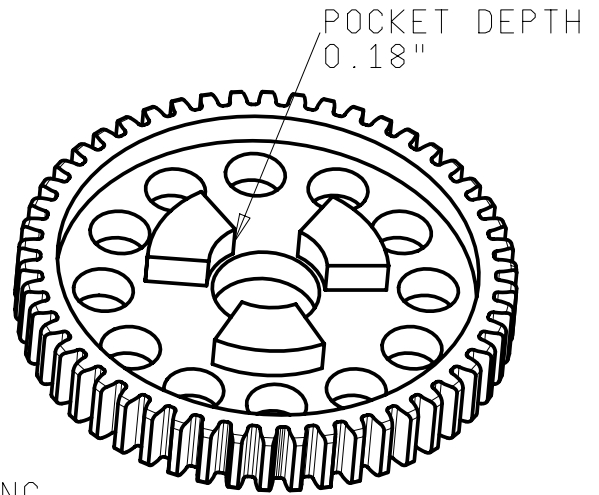
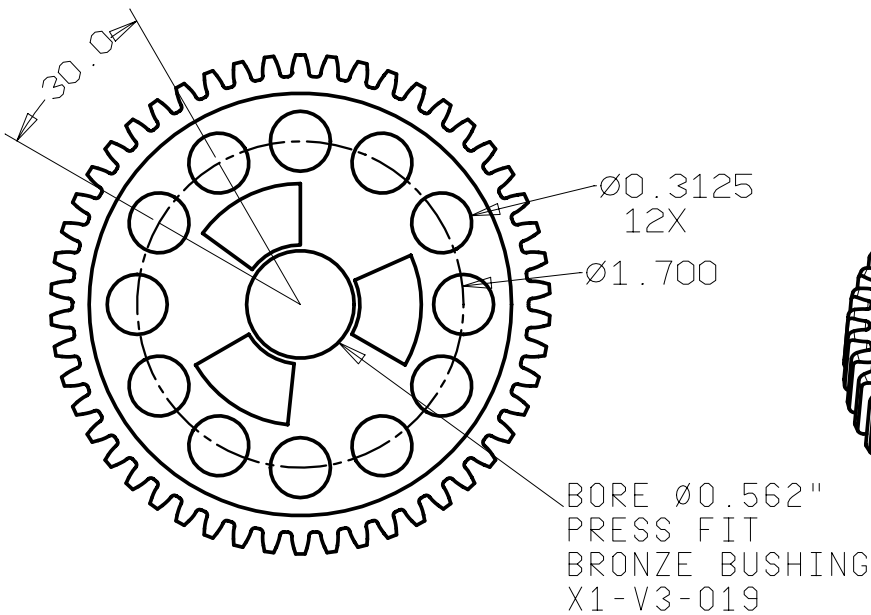
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DWG	X1-V3-015	DATE	2004 Dec 18	DRAWN BY	JVN
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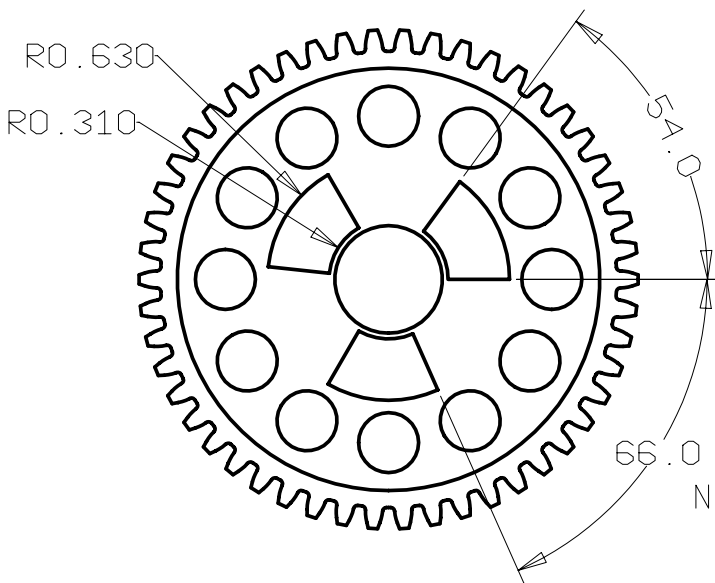
TITLE	X1-V3 Trans - 36 Tooth Shifter Gear
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Notes:

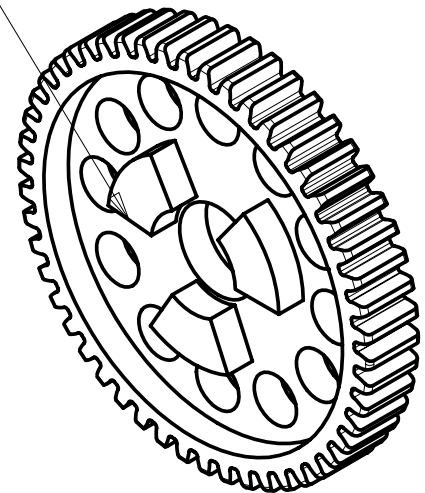
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3. Deburr: No burrs or sharp edges.
4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
5. Dimensions: As Shown in Inches & per "X1-V3-016.stp"



LEAVE DOG
EDGES SHARP!



NOTE: 66° POCKET ALLOWS
6° OF SHIFTER FREEDOM



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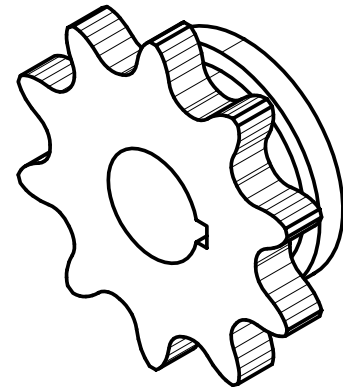
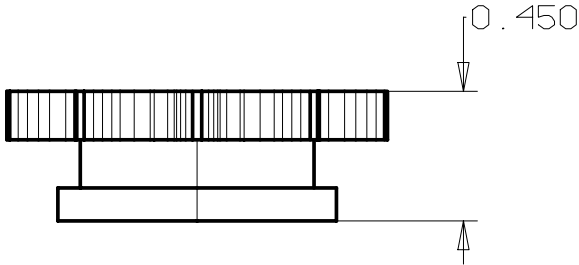
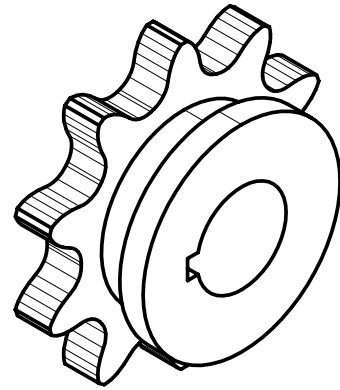
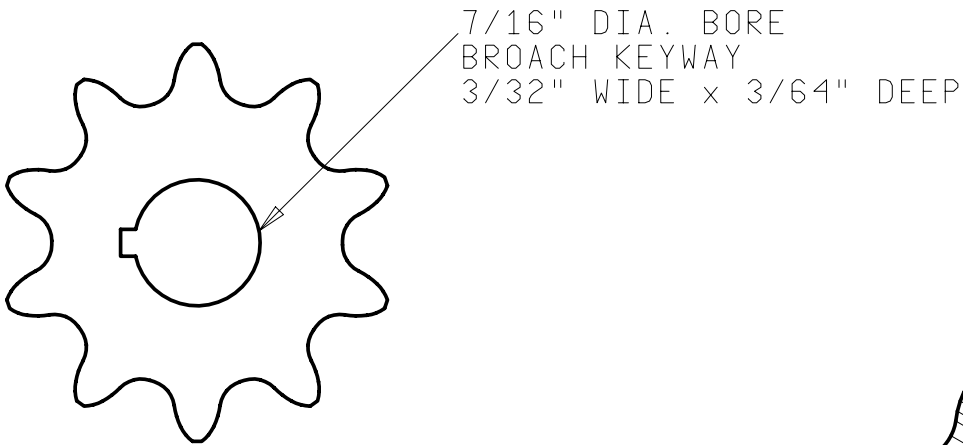
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DWG	X1-V3-016	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - 50 Tooth Shifter Gear
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Notes:

- 1. Material: 10 Tooth Steel Sprocket for #35 (3/8") Chain, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-017.stp"



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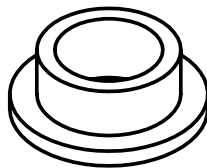
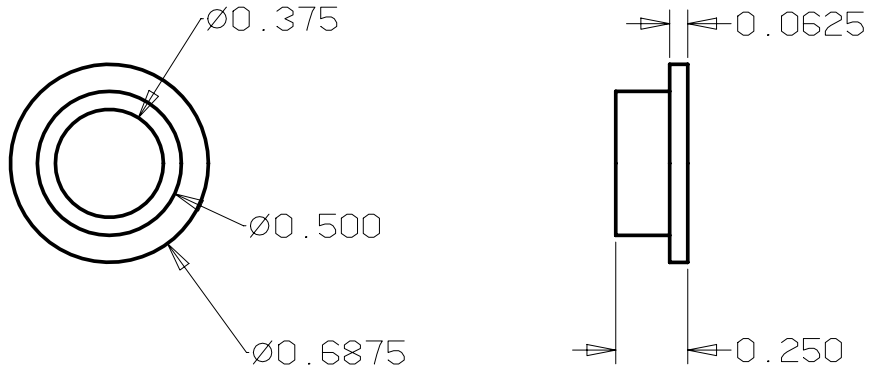
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DWG **X1-V3-017** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - 10 Tooth Output Sprocket**

Notes:

- 1. Material: Bronze Bushing 3/8" ID, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-018.stp"



Clarkson FIRST - 229

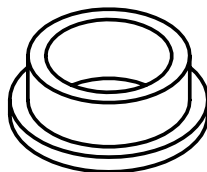
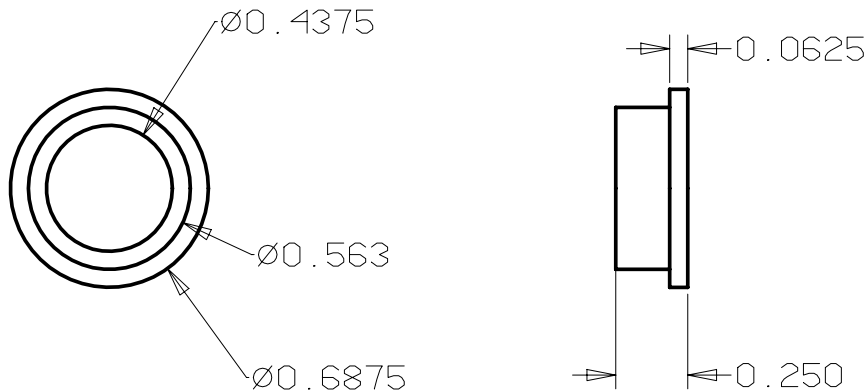
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-018** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Small Shifter Bushing**

Notes:

- 1. Material: Bronze Bushing 7/16" ID, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-019.stp"



Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-019** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Large Shifter Bushing**

Notes:

- 1. Material: ~Ø0.10" Welding Wire, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-020.stp"

INSERT WIRE THROUGH
DOG-SHIFTER ASSEMBLY
CUT TO LENGTH (~ 1.5" LONG)
BEND OVER TO SECURE IN PLACE



Clarkson FIRST - 229

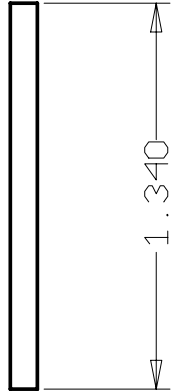
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-020	DATE	2004 Dec 18	DRAWN BY	JVN
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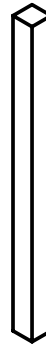
TITLE	X1-V3 Transmission - Shifter Pin
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Notes:

- 1. Material: 3/32" Square Keystock, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-021.stp"



CUT KEYSTOCK TO LENGTH
FILE OFF ALL BURRS FOR GOOD FIT



Clarkson FIRST - 229

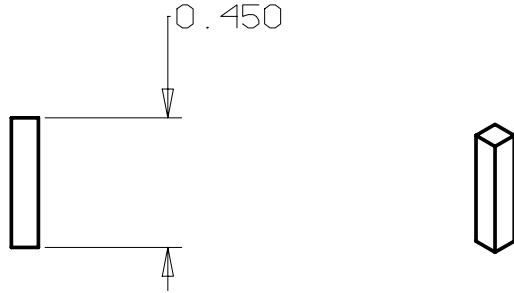
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-021	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - Input Shaft Key
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Notes:

- 1. Material: 3/32" Square Keystock, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-022.stp"



CUT KEYSTOCK TO LENGTH
FILE OFF ALL BURRS FOR GOOD FIT

Clarkson FIRST - 229

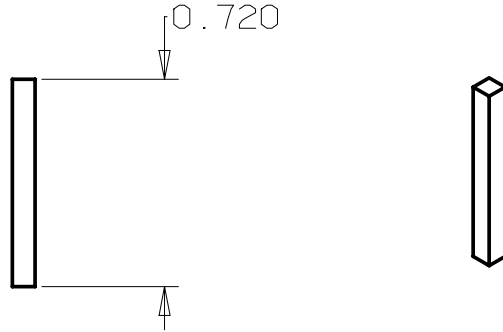
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-022** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Output Shaft Key**

Notes:

- 1. Material: 2mm Metric Square Keystock, as Listed in BOM
- 3. Deburr: No burrs or sharp edges.
- 4. Tolerances: +/- 0.01 Unless Otherwise Noted Critical
- 5. Dimensions: As Shown in Inches & per "X1-V3-023.stp"



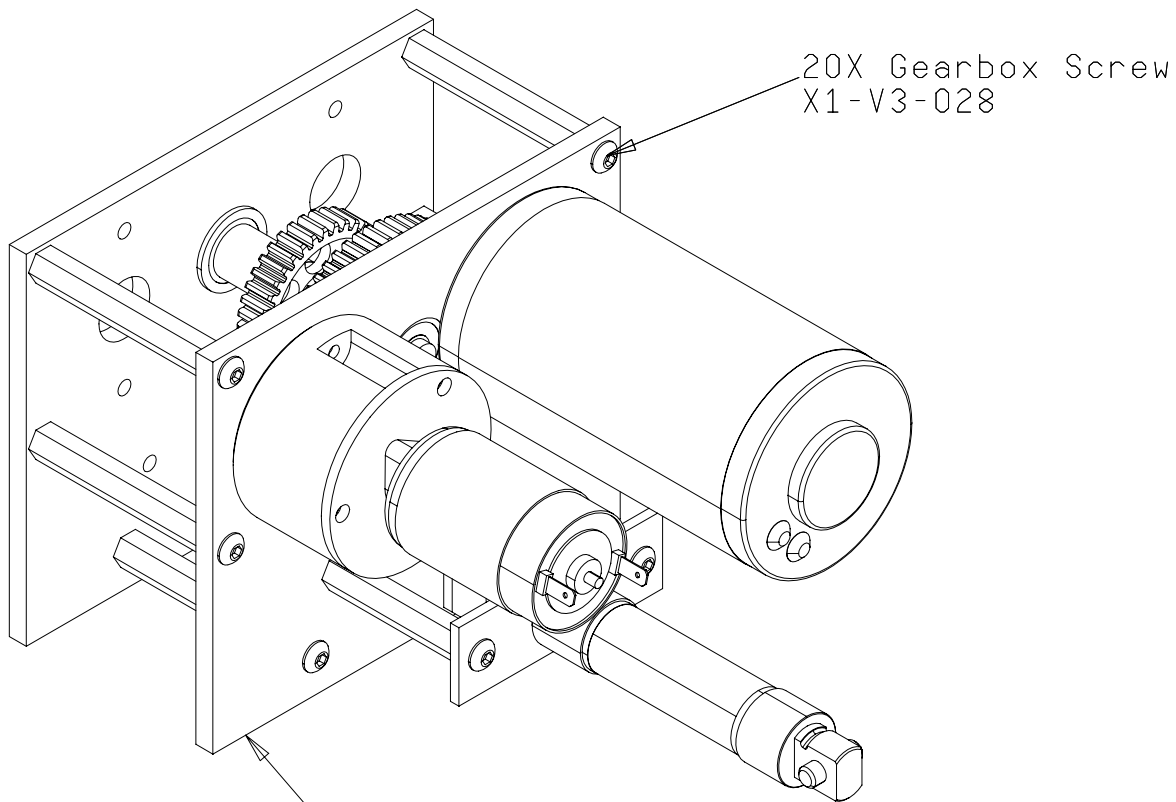
CUT KEYSTOCK TO LENGTH
FILE OFF ALL BURRS FOR GOOD FIT

Clarkson FIRST - 229

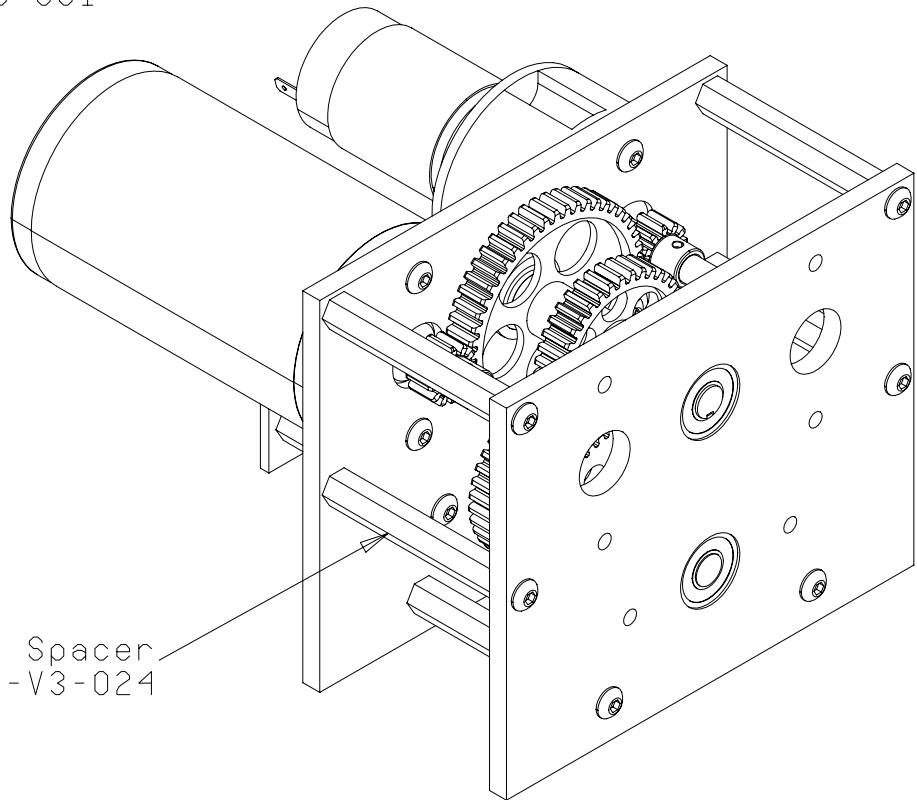
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-023** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Motor Pinion Key**



2X Gearbox Plate
X1-V3-001

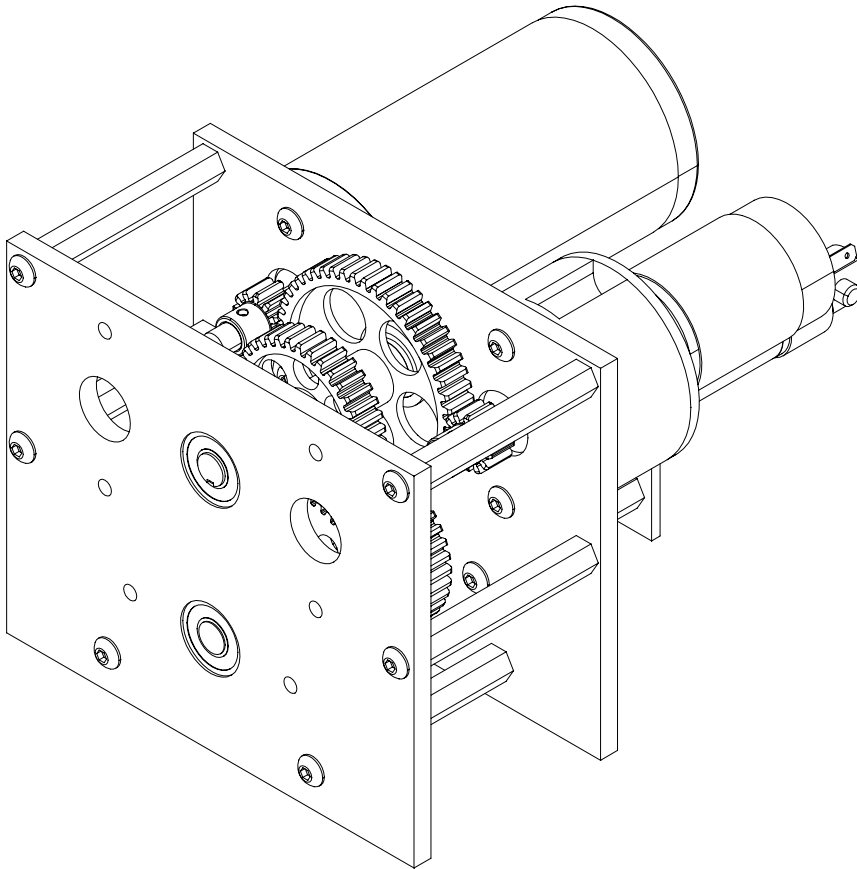
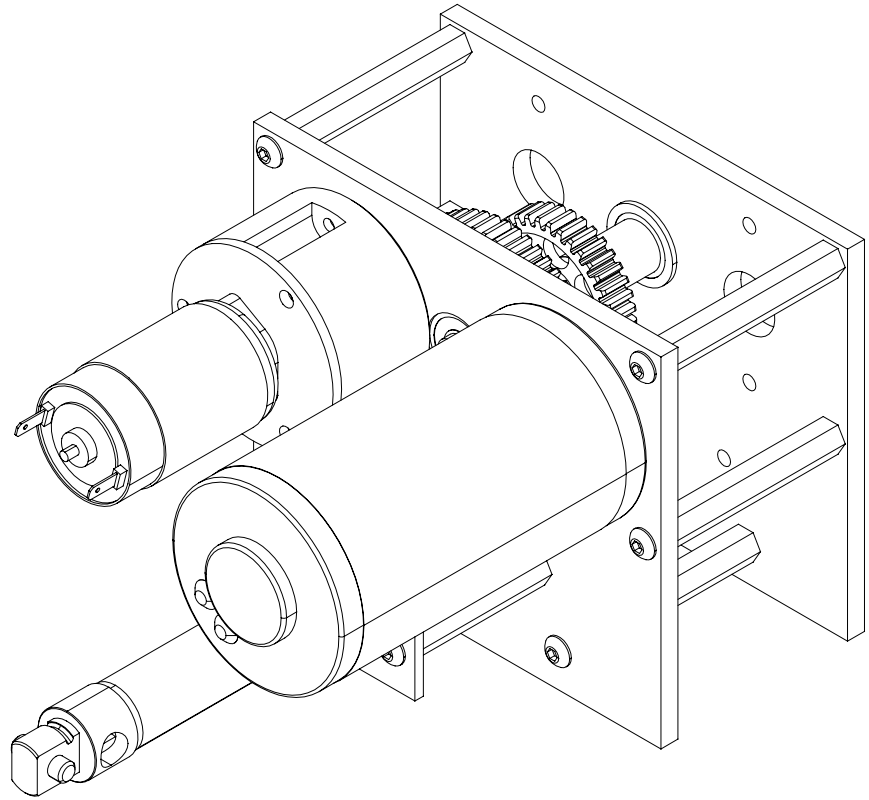


Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-037	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Assembly Views 1
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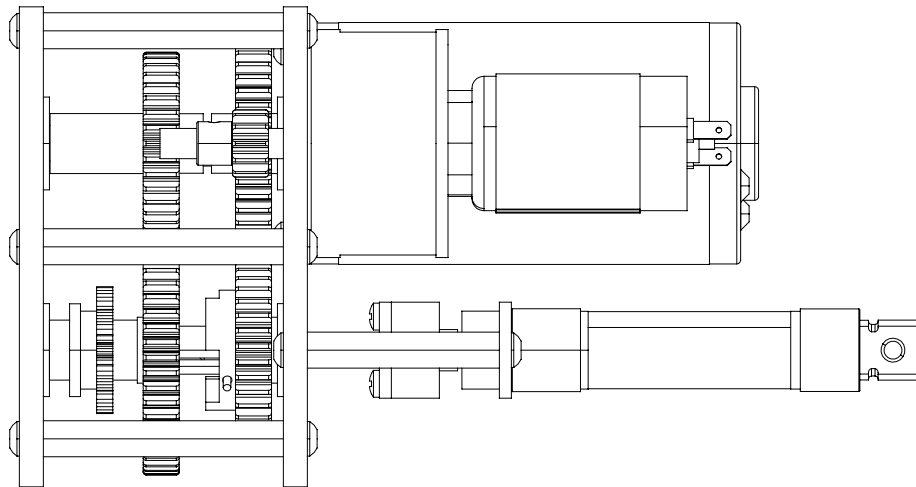
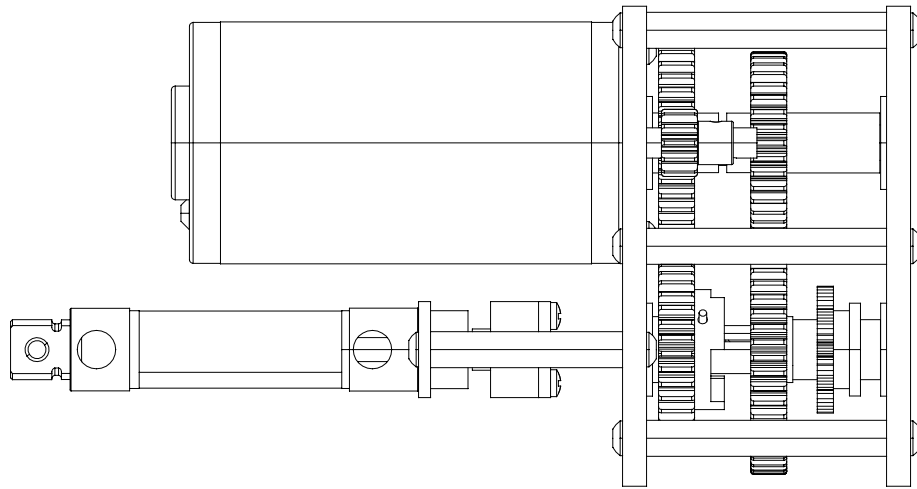
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-038** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Assembly Views 2**

<http://www.team229.org>

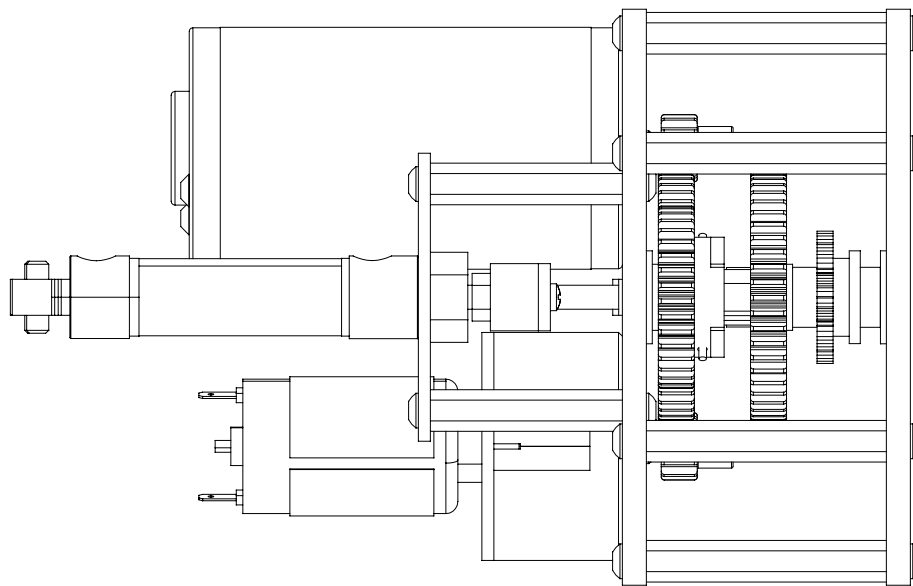
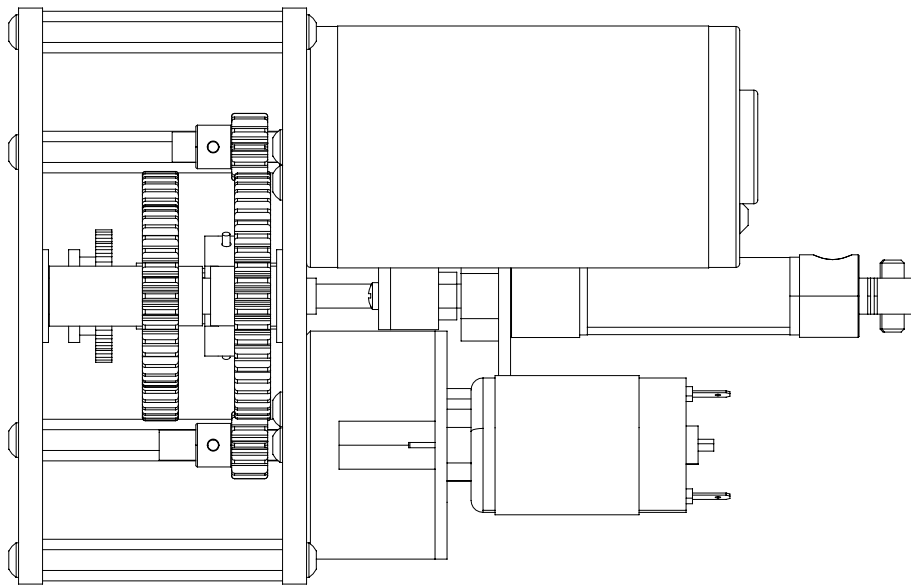


Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-039	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Assembly Views 3
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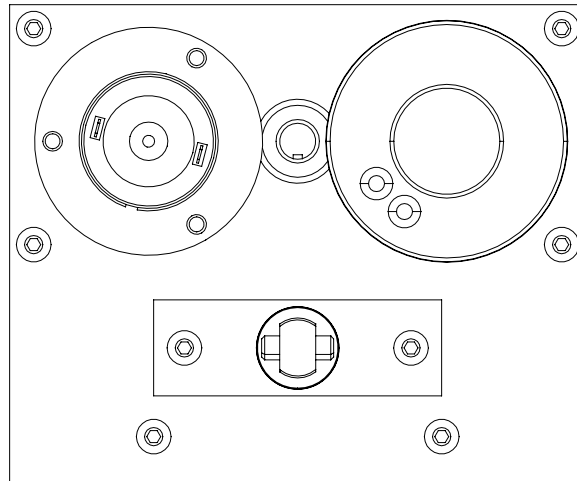
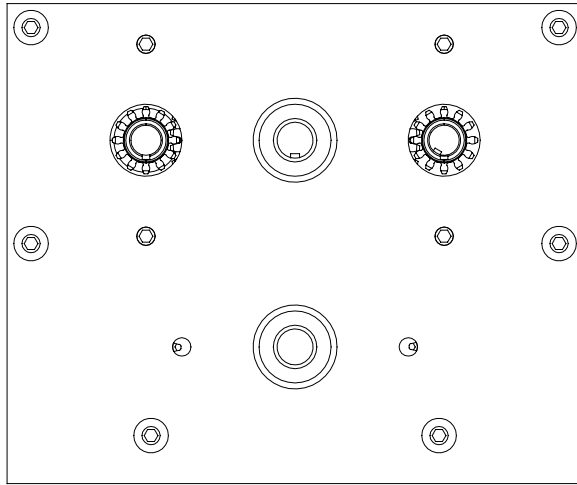


Clarkson FIRST - 229

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DWG **X1-V3-040** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Assembly Views 4**

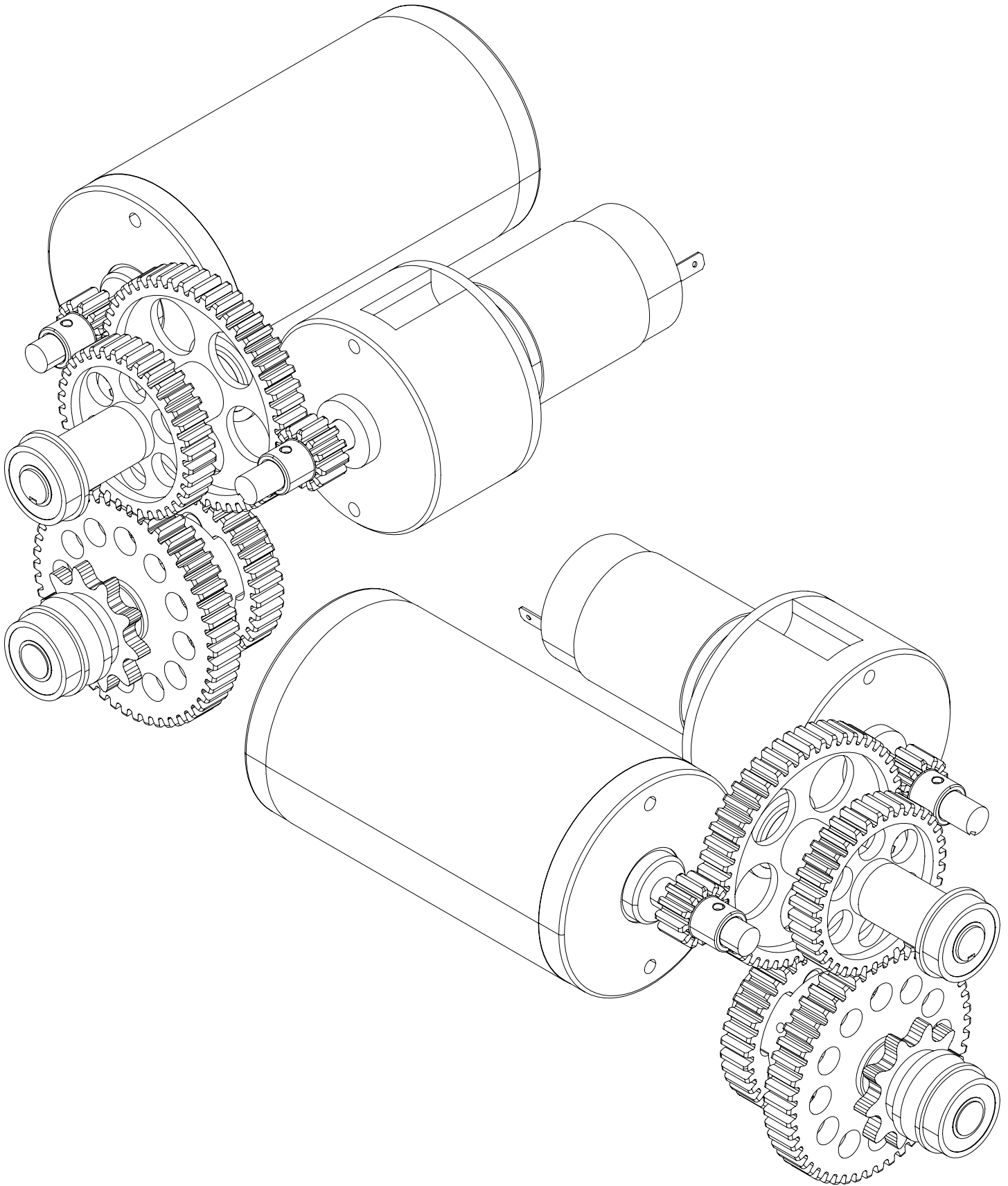


Clarkson FIRST - 229

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DWG **X1-V3-041** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Assembly Views 5**

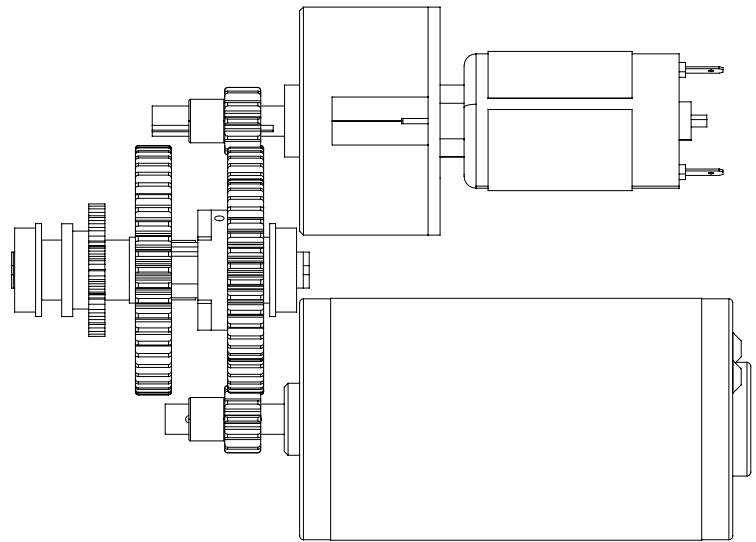
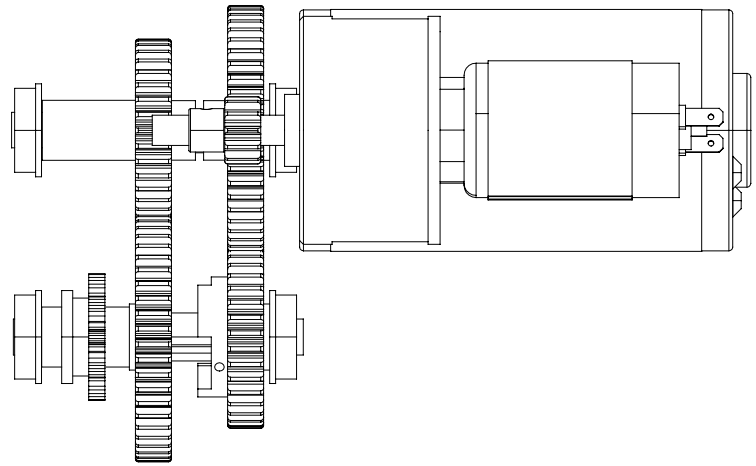
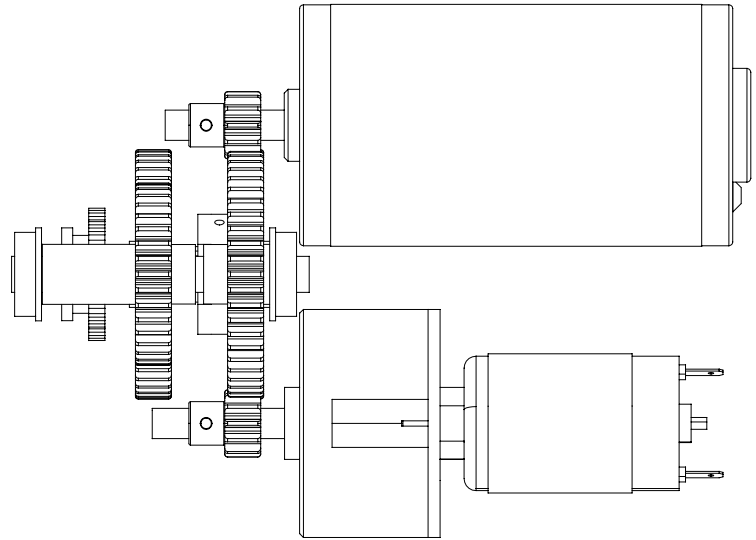
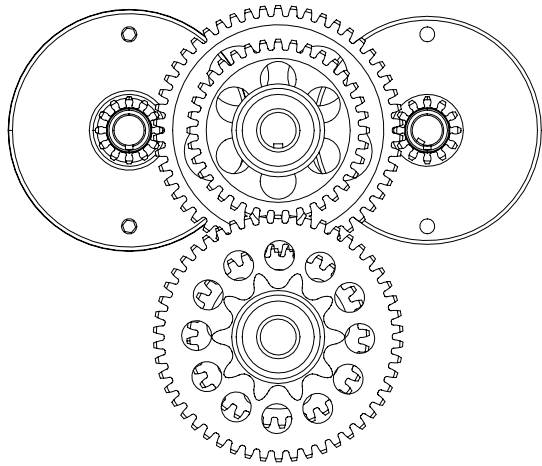


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Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-042** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Gearing Views 1**

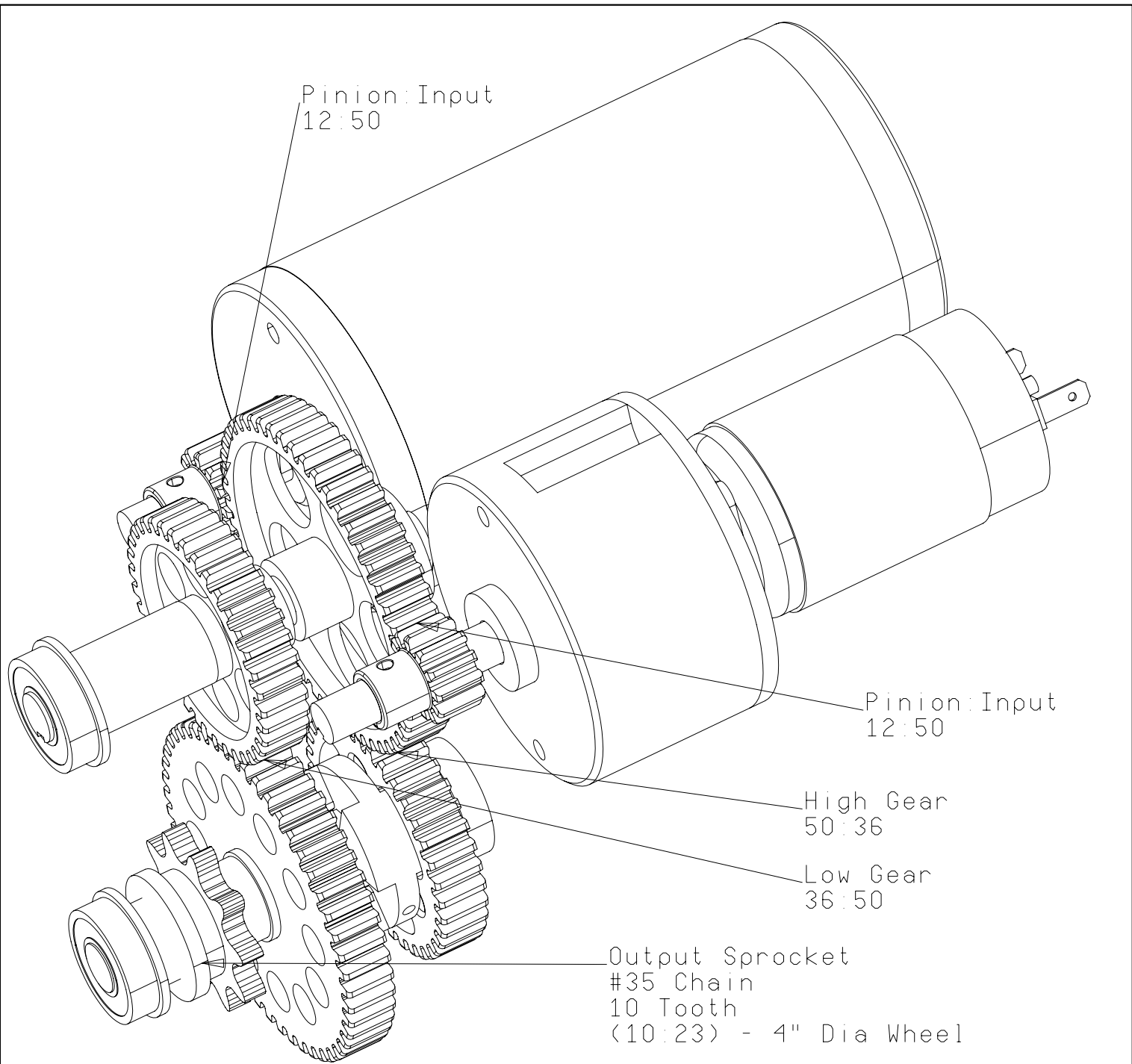


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DWG **X1-V3-043** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Gearing Views 2**



High Gear:
Overall Reduction = 12:35, ~3:1
Output Speed = 1885 RPM

Low Gear:
Overall Reduction = 21:125, ~6:1
Output Speed = 924 RPM

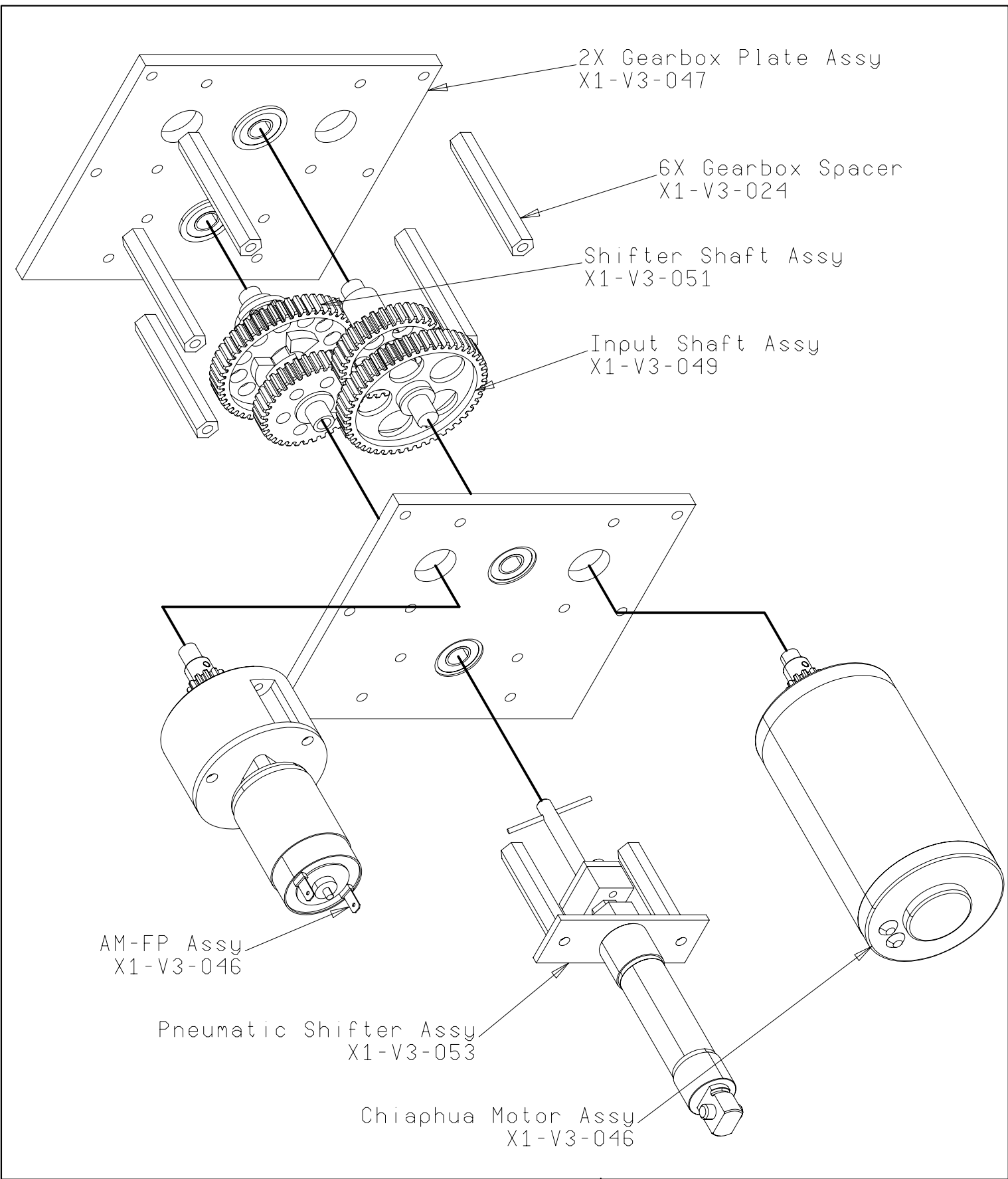
Reduction Difference = ~2:1
10:23 Sprocket Reduction - 4" Dia Wheel
High Gear = 11.8 fps
Low Gear = 6.1 fps

Clarkson FIRST - 229

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DWG	X1-V3-044	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Gearing Views 3
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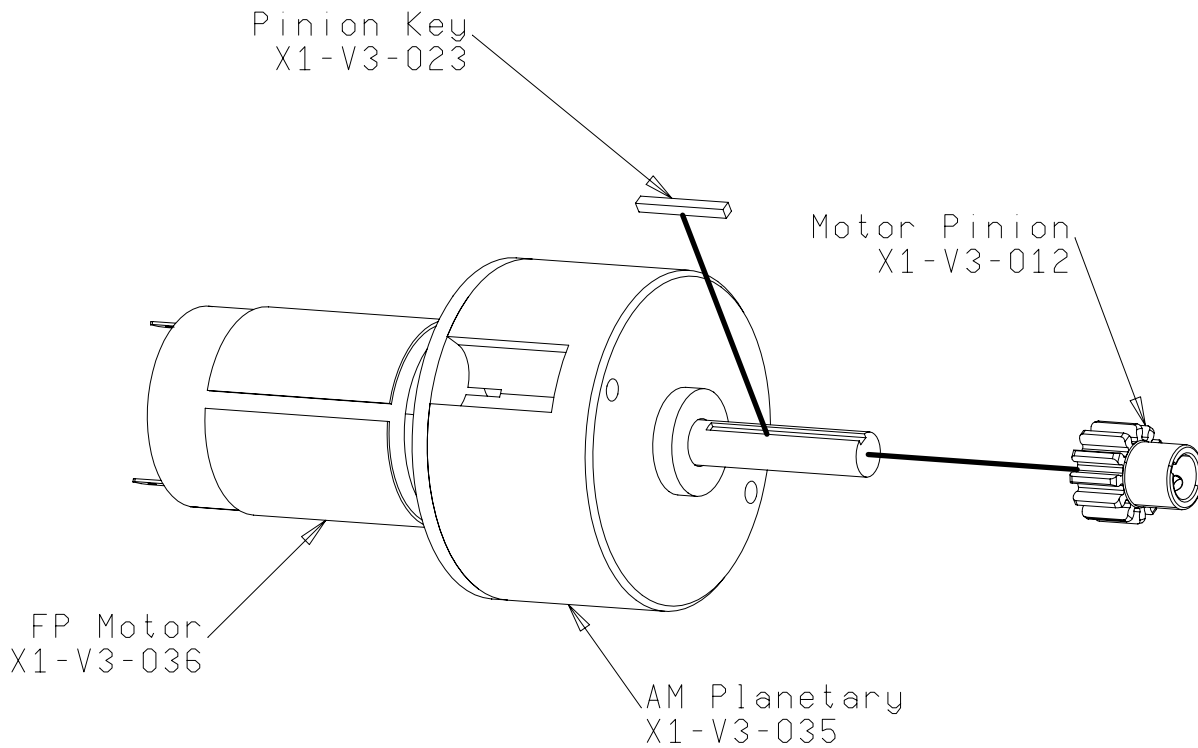
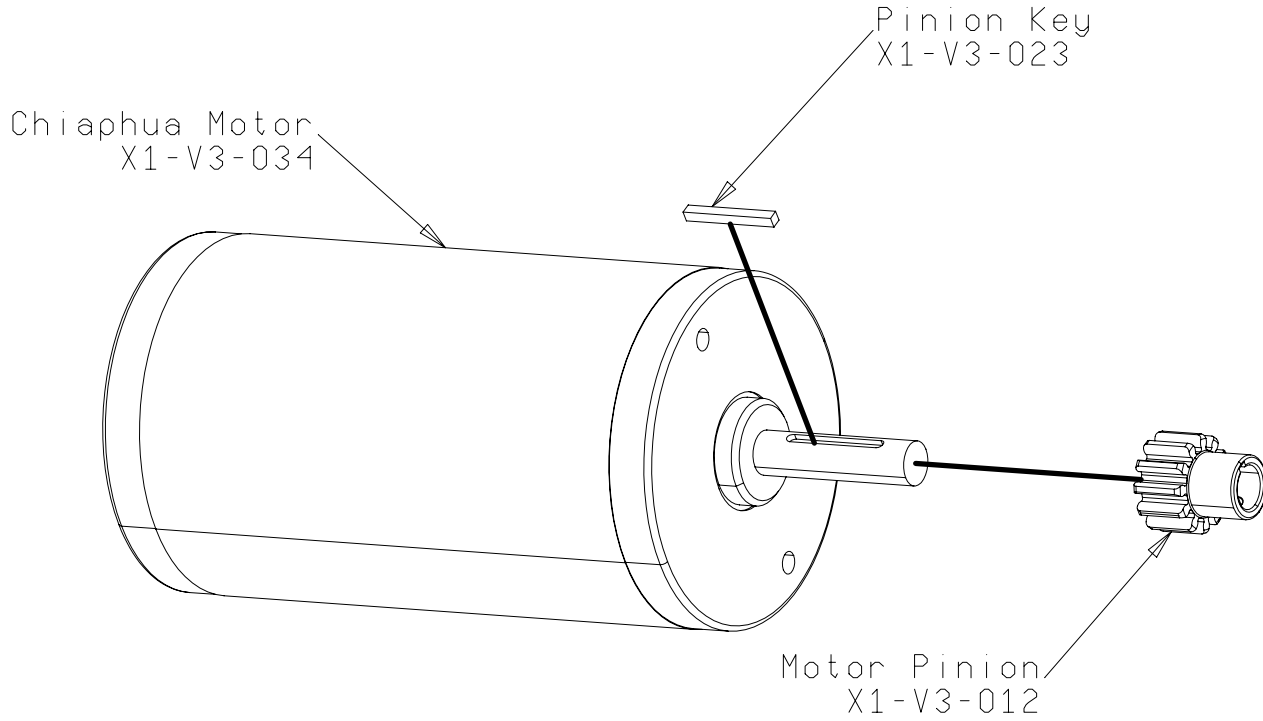
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-045	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Explosion View
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Insert Key into Motor Shaft Keyway
 Slide Motor Pinion into Place
 Setscrew in Place



To Insert FP Motor into AM Planetary,
 follow Assy Instructions Provided by AndyMark, Inc.

Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

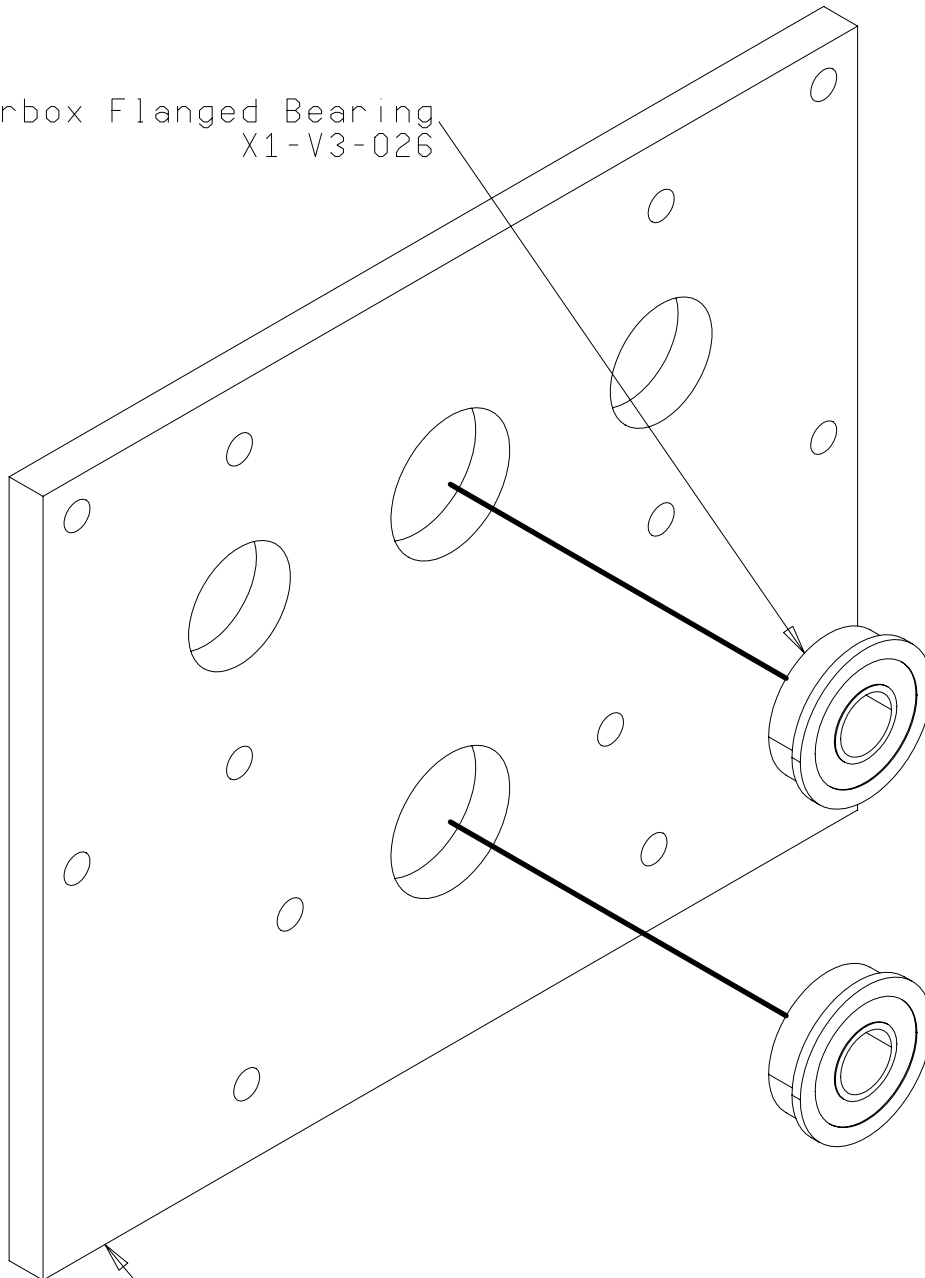
DWG **X1-V3-046** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Motor Assy**

<http://www.team229.org>

Press Fit Bearings into Plate
Locktite in Place using Threadlocker-Red or Stronger Adhesive
Ensure Bearing Flanges are Flush Against Plate

2X Gearbox Flanged Bearing
X1-V3-026



Gearbox Side Plate
X1-V3-001

Clarkson FIRST - 229

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DWG **X1-V3-047** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Plate Assy**

<http://www.team229.org>

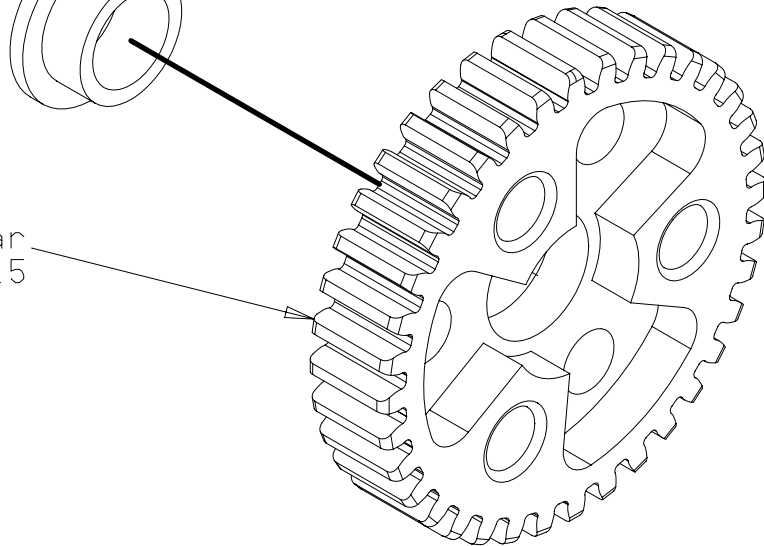
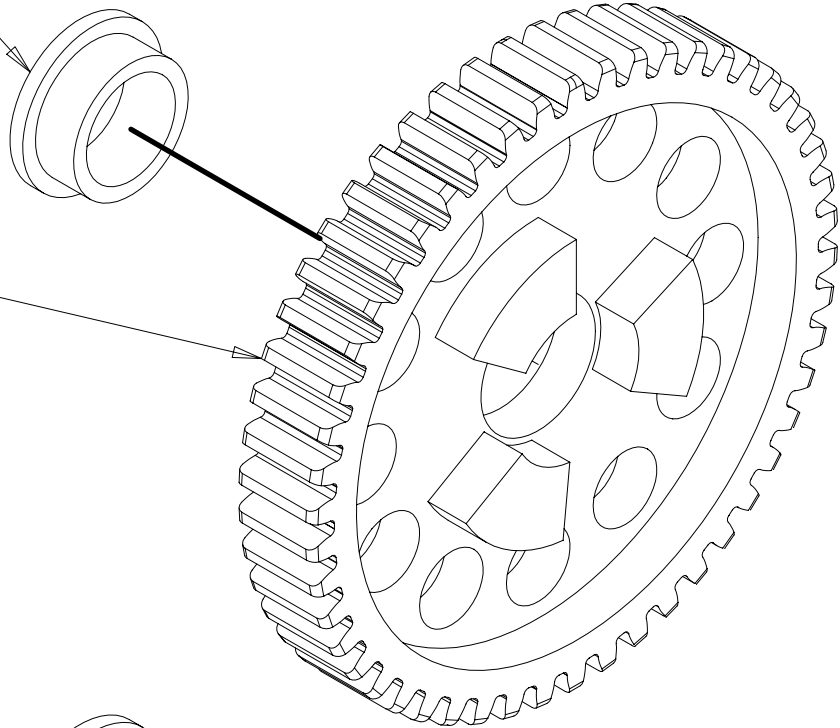
Press Fit Bushings into Gears
Locktite in Place using Threadlocker-Red or Stronger Adhesive
Ensure Bushing Flanges are Flush Against Gear Hub

Large Shifter Bushing
X1-V3-019

50 Tooth Shifter Gear
X1-V3-016

Small Shifter Bushing
X1-V3-018

36 Tooth Shifter Gear
X1-V3-015



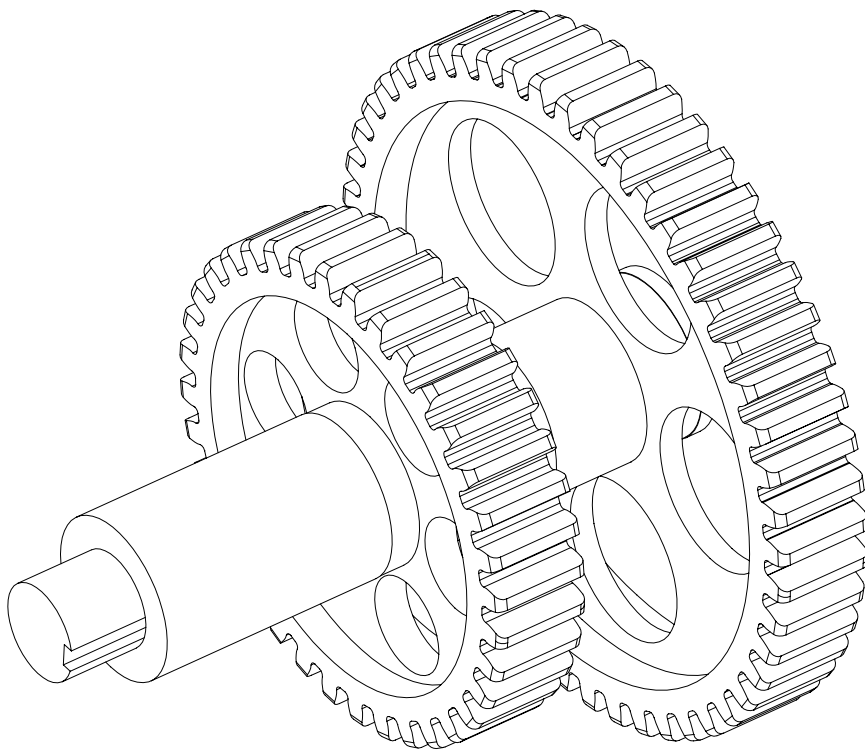
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-048** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Transmission - Shifter Gear Assy**

<http://www.team229.org>



Input Shaft Spacer
X1-V3-010

Input Shaft
X1-V3-005

Input 36 Tooth Gear
X1-V3-014

Input 50 Tooth Gear
X1-V3-013

Input Washer
X1-V3-032

Not Visible:
Input Shaft Key - X1-V3-021

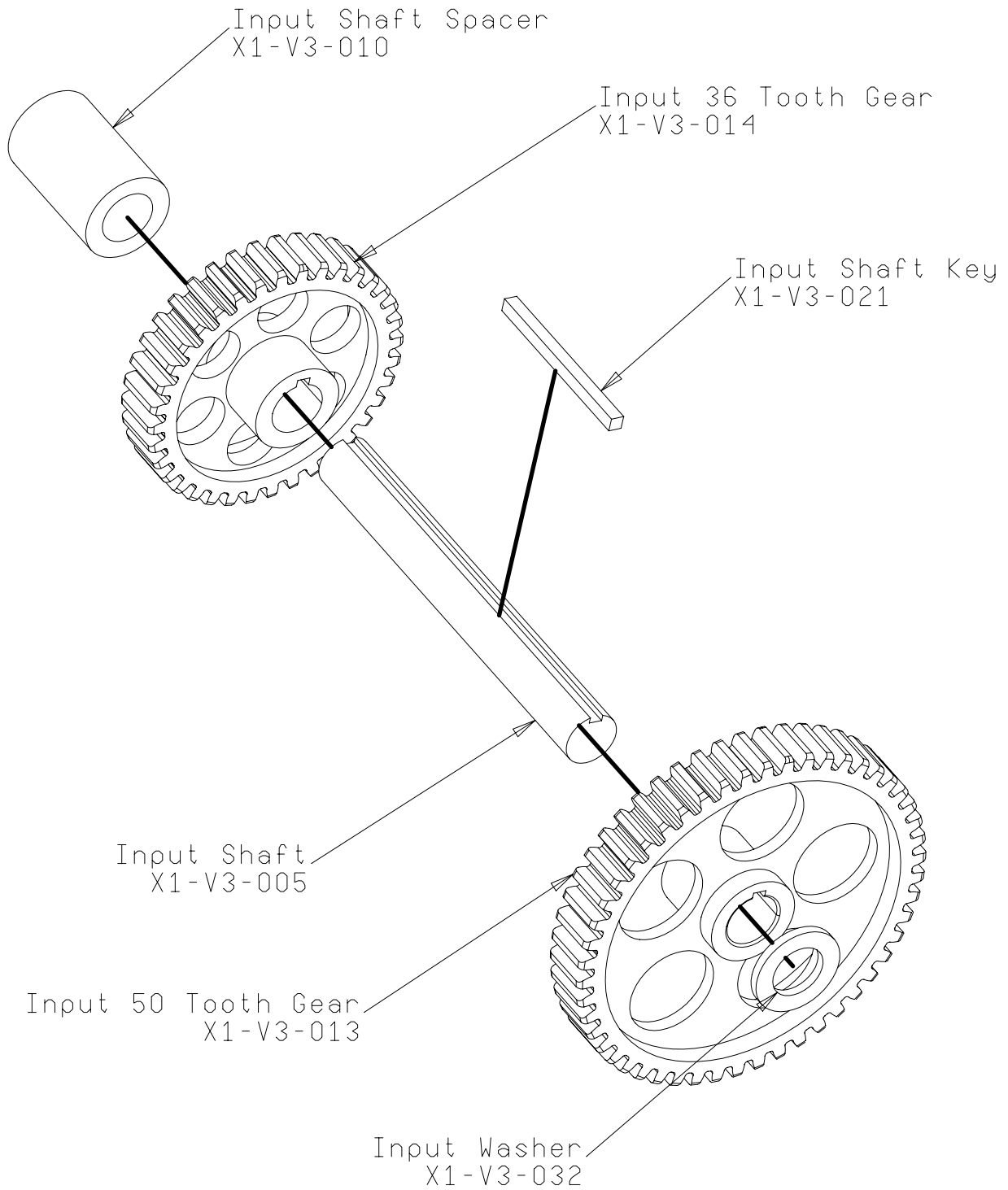
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-049	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - Input Shaft Assy Views
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Insert Key into Input Shaft Keyway
 Slide Gears into Position
 Setscrew Gears in Place
 Slide on Spacer and Washer

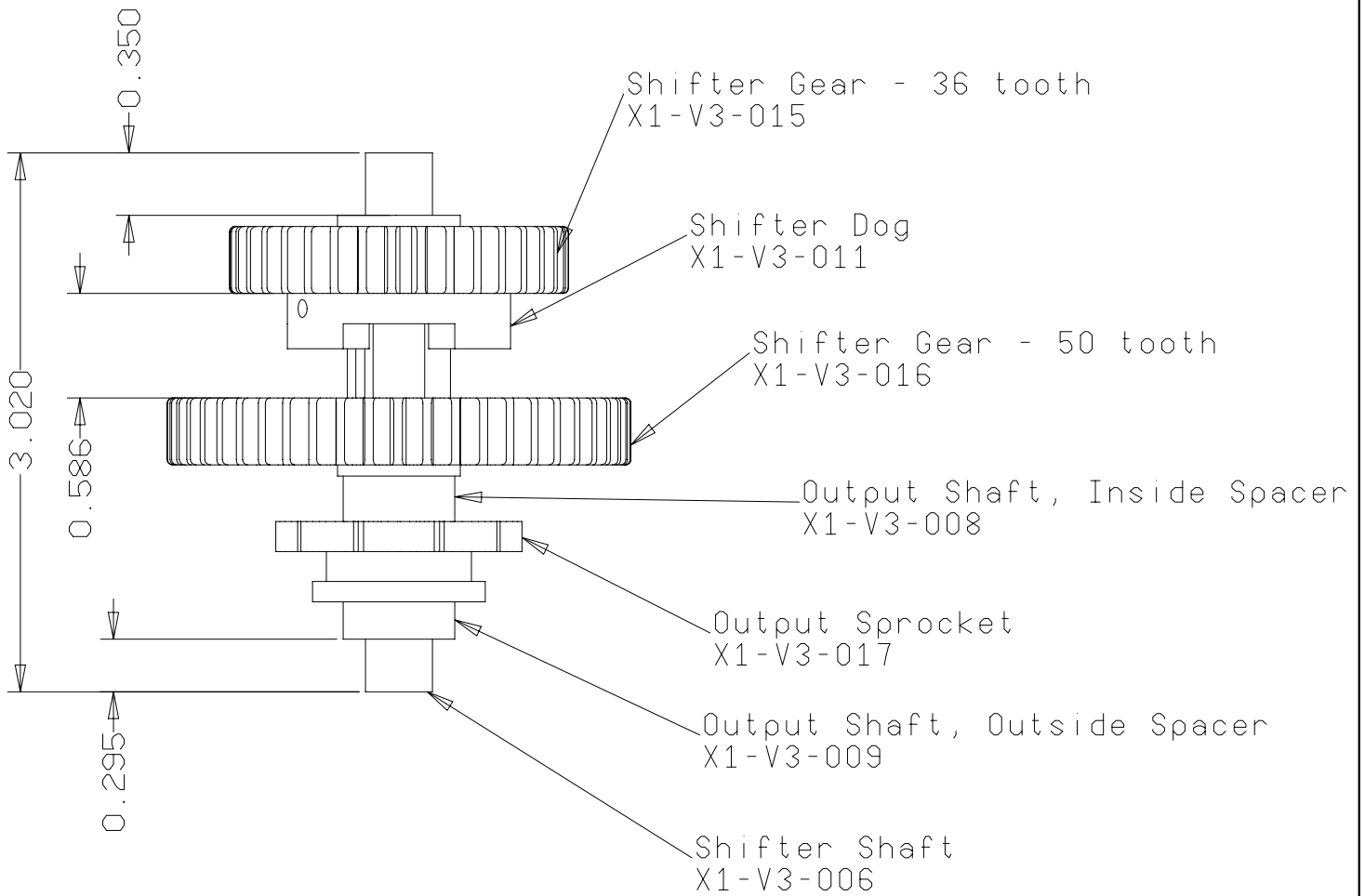


Clarkson FIRST - 229

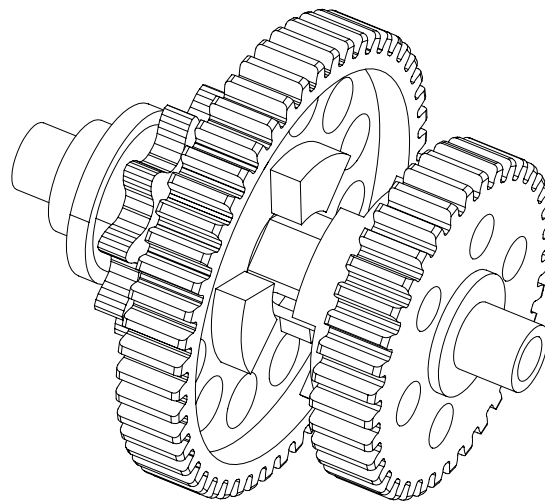
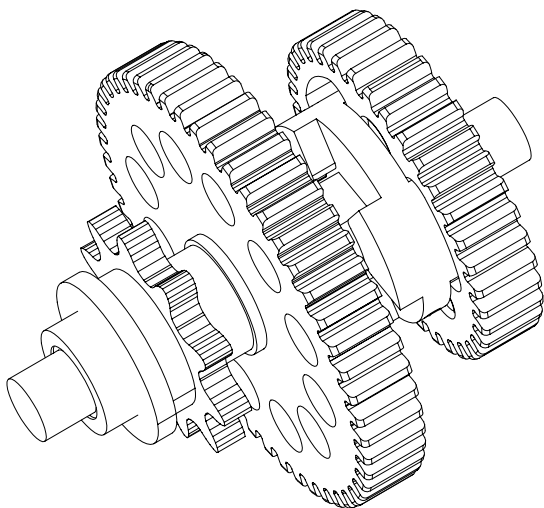
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-050	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans - Input Shaft Explosion Views				
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Also see X1-V3-048
for gear/bushing assembly



Note: Output Shaft Key
Not Visible - X1-V3-022

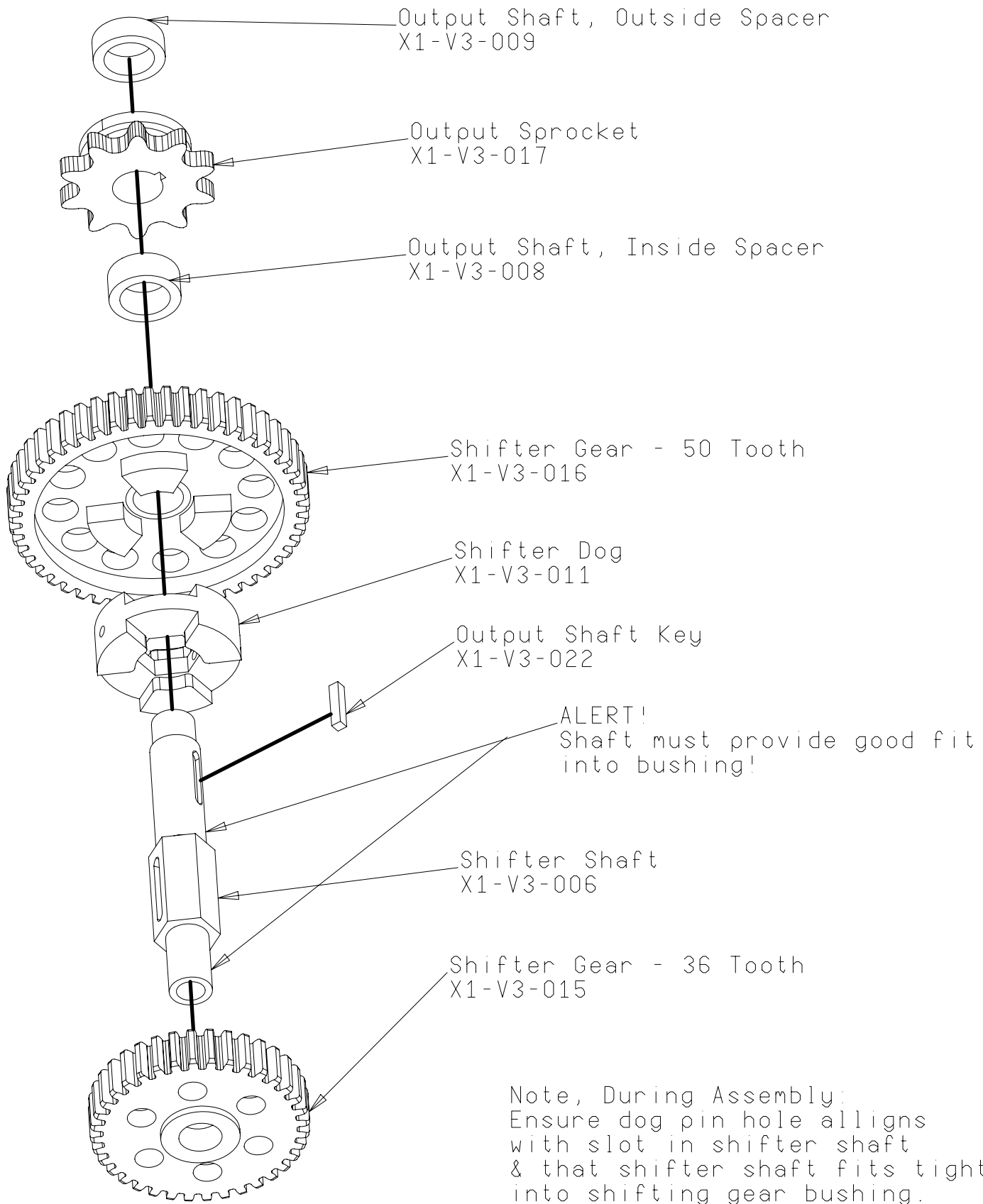
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-051** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans - Shifter Shaft Assy Views**

<http://www.team229.org>

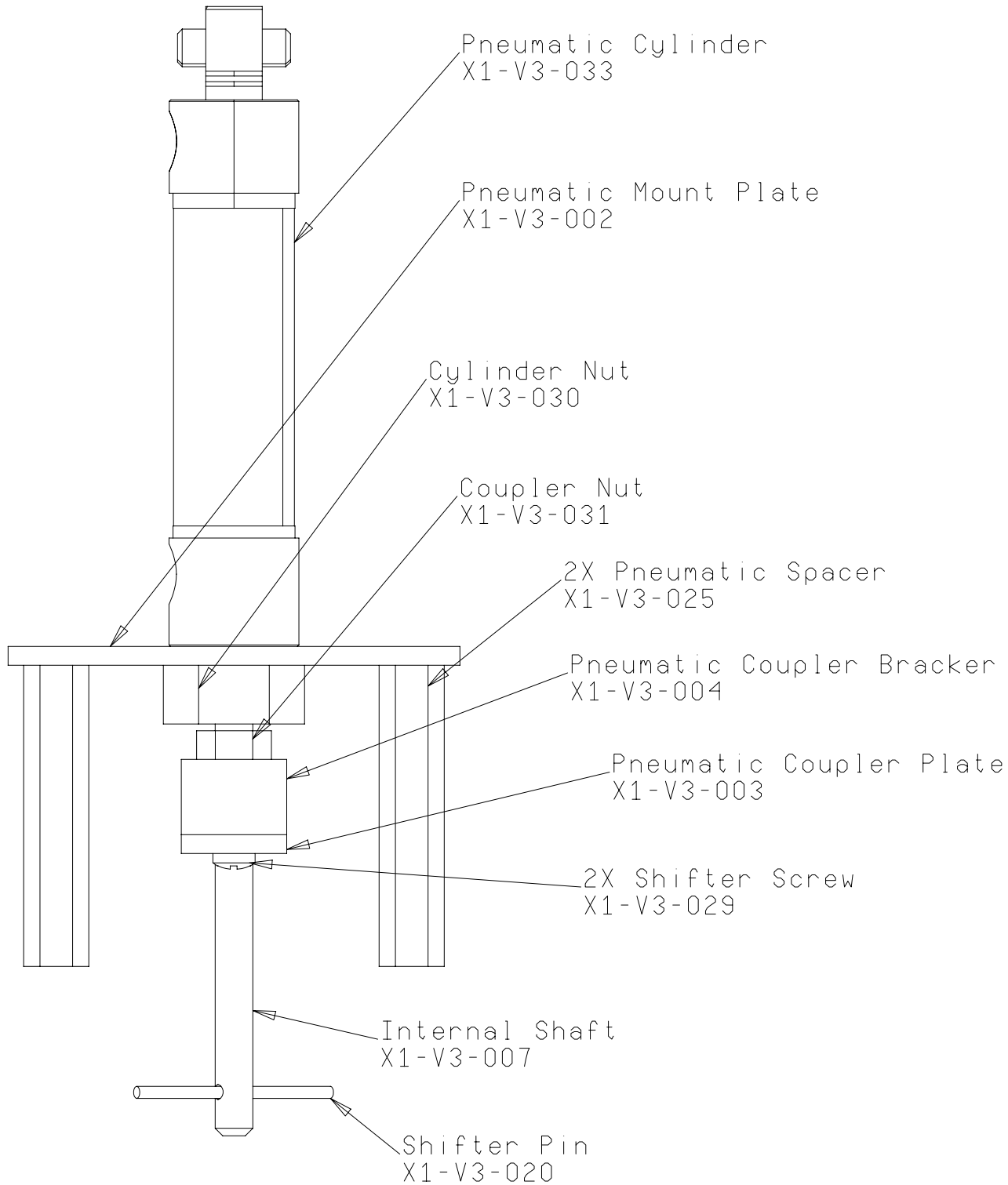


Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG **X1-V3-052** DATE **2004 Dec 18** DRAWN BY **JVN**

TITLE **X1-V3 Trans-Shifter Shaft Exploded Views**



Note: Shift pin is shown here installed. In actual assembly, this happens later.

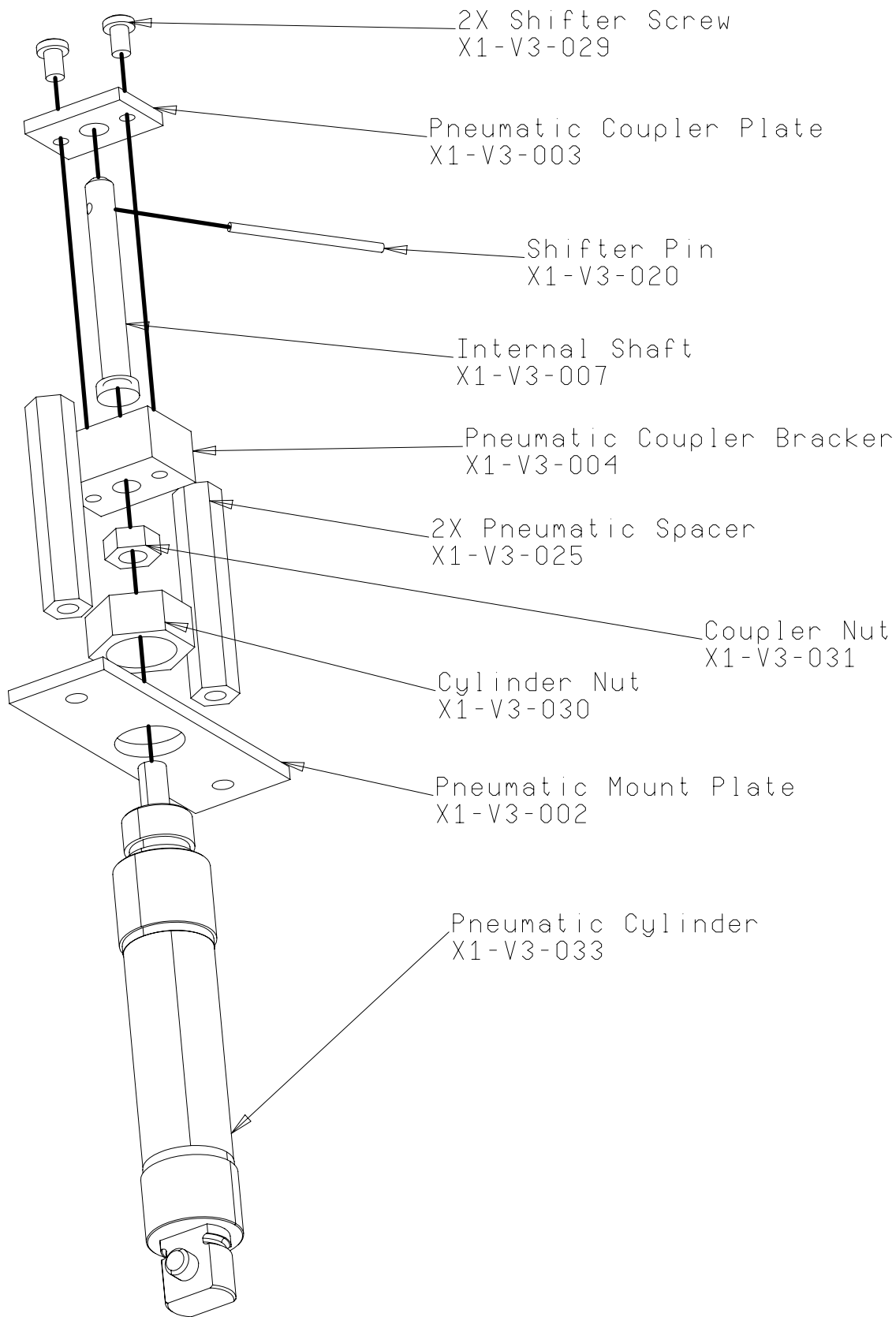
Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-053	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Trans-Pneum. Shifter Assy Views
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<http://www.team229.org>

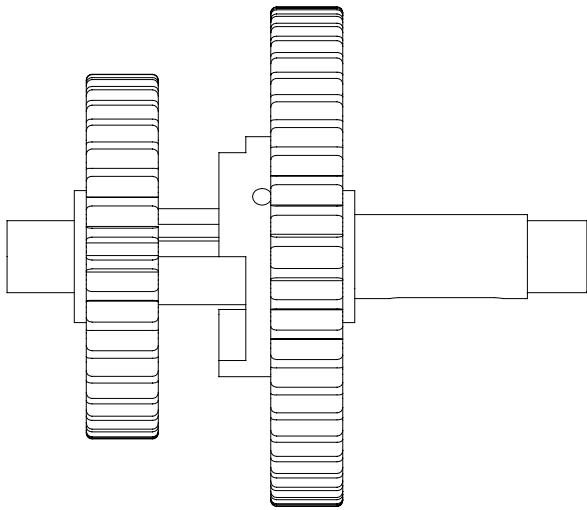


Clarkson FIRST - 229

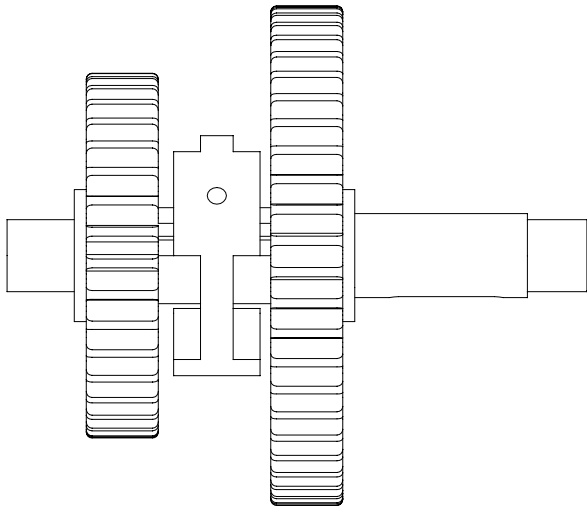
Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-054	DATE	2004 Dec 18	DRAWN BY	JVN
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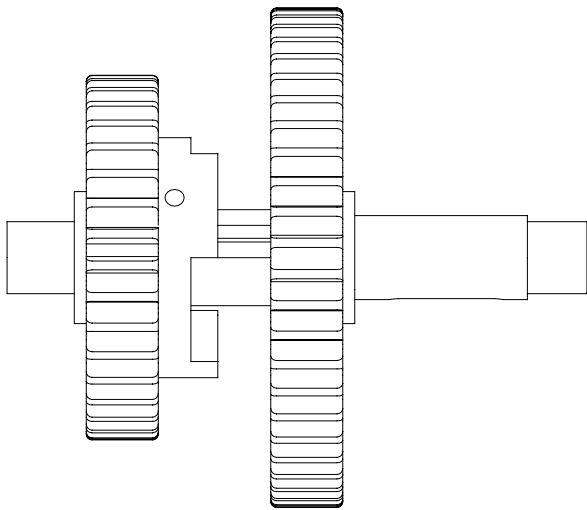
TITLE	X1-V3 Trans-Pneum. Exploded Views
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Low Gear (50 Tooth Gear Engaged)



Neutral (No Gear Engaged)



High Gear (36 Tooth Gear Engaged)

Clarkson FIRST - 229

Clarkson University - FIRST Team 229 - "Division By Zero"

DWG	X1-V3-055	DATE	2004 Dec 18	DRAWN BY	JVN
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TITLE	X1-V3 Transmission - Shifting Motion
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