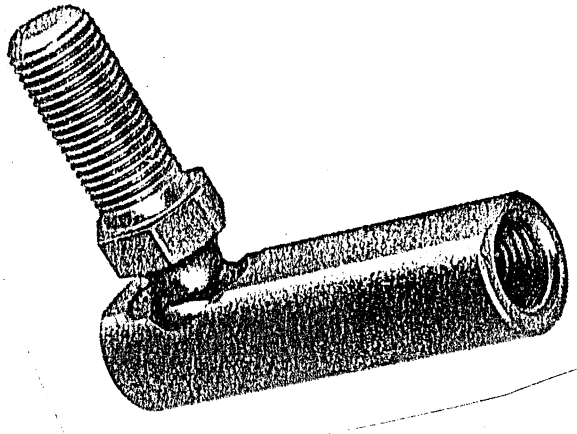
BALL JOINTS

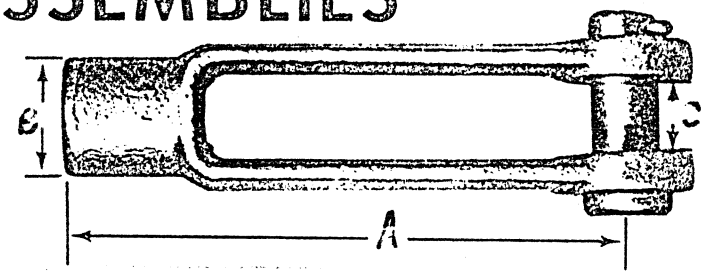
S.A.E. THREADS

MALE & FEMALE THREADS SAME SIZE



PKG QTY	NOMINAL SIZE	THREADS	FTL PART NUMBER	DORMAN
	NO. 10	32	23-0910 3-00 1	
	NO. 12	32	23-0910 3-00 2	
5	3/16			115-001
5	1/4	28	23-0910 3-00 3	115-002
5	5/16	24	23-0910 3-00 4	115-003
5	3/8	24	23-0910 3-00 5	115-004
5	7/16	20	23-0910 3-00 6	115-005
5	1/2	20	23-0910 3-00 7	115-006

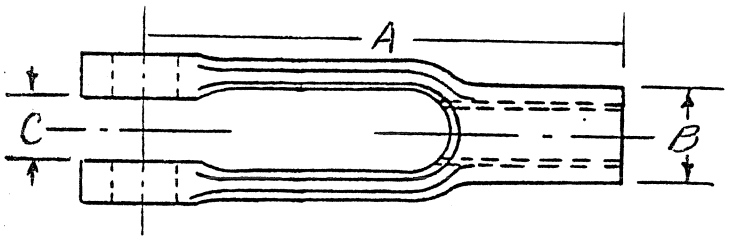
CLEVIS ASSEMBLIES



S.A.E. THREADS

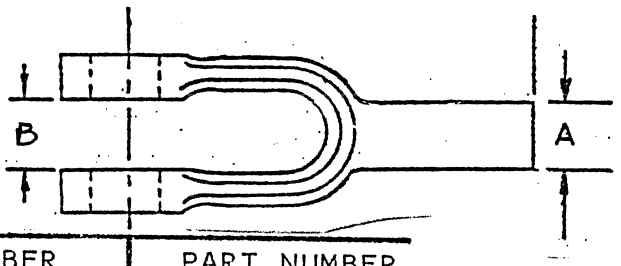
DROP FORGED STEEL

SIZE	LENGTH 'A'	THROAT WIDTH 'B'	YOKE WIDTH C	LIGHT DUTY	HEAVY DUTY
1Ø-32	1- 9/16	5/16	3/16	23-Ø9Ø14-ØØØ	
1/4 -28	2	7/16	9/32	23-Ø9Ø14-ØØ4	
5/16-24	2- 1/4	1/2	11/32	23-Ø9Ø14-ØØ5	
3/8 -24	2- 1/2	5/8	7/16	23-Ø9Ø14-ØØ6	
7/16-2Ø	2- 7/8	25/32	1/2	23-Ø9Ø14-ØØ7	
1/2 -2Ø	3	13/16	9/16	23-Ø9Ø14-ØØ8	
1/2 -2Ø	4- 3/16	13/16	9/16		23-Ø9156-ØØ4
5/8 -18	4-15/16	1-1/16	11/16		23-Ø9156-ØØ5
3/4 -16	6- 1/16	1-1/4	13/16		23-Ø9156-ØØ6
7/8 -14	7- 1/8	1-7/16	15/16		23-Ø9156-ØØ7
1 -14	8	1-5/8	1- 1/16		23-Ø9156-ØØ8



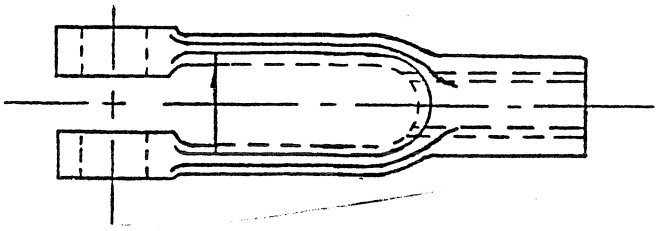
CLEVIS, ROD END ADJUSTABLE YOKE

THREAD	A DIM	B DIM	C DIM	LIGHT DUTY PART NUMBER	HEAVY DUTY PART NUMBER
#10-32 UNF	1- 9/16	3/16	5/16	23-09014-000	--
1/4 -28 UNF	2	9/32	7/16	23-09014-004	--
5/16-24 UNF	2- 1/4	11/32	1/2	23-09014-005	--
3/8 -24 UNF	2- 1/2	7/16	5/8	23-09014-006	--
7/16-20 UNF	2- 7/8	1/2	23/32	23-09014-007	--
1/2 -20 UNF	3	9/16	13/16	23-09014-008	--
1/2 -20 UNF	4- 3/16	9/16	13/16		23-09156-004
5/8 -18 UNF	4-15/16	11/16	1-1/16		23-09156-005
3/4 -16 UNF	6- 1/16	13/16	1-1/4		23-09156-006
7/8 -14 UNF	7- 1/8	15/16	1-7/16		23-09156-007
1 -14 UNF	8	1- 1/16	1-5/8		23-09156-008



CLEVIS, ROD END PLAIN YOKE

A DIM.	B DIM.	PART NUMBER LIGHT DUTY	PART NUMBER HEAVY DUTY
#10	1-1/4	23-09159-000	
1/4	1-3/4	23-09159-004	
5/16	2	23-09159-005	
3/8	2-1/8	23-09159-006	
7/16	2-1/4	23-09159-007	
1/2	2-1/2	23-09159-008	
1/2	2-1/2		23-09175-004
5/8	2-7/8		23-09175-005
3/4	3-5/8		23-09175-006
7/8	4		23-09175-007
1	4-1/2		23-09175-008



CLEVIS, CYLINDER

THREAD	PART NUMBER
1/2	23-09044-001
5/8	23-09044-002
3/4	23-09044-003
7/8	23-09044-004
1	23-09044-005

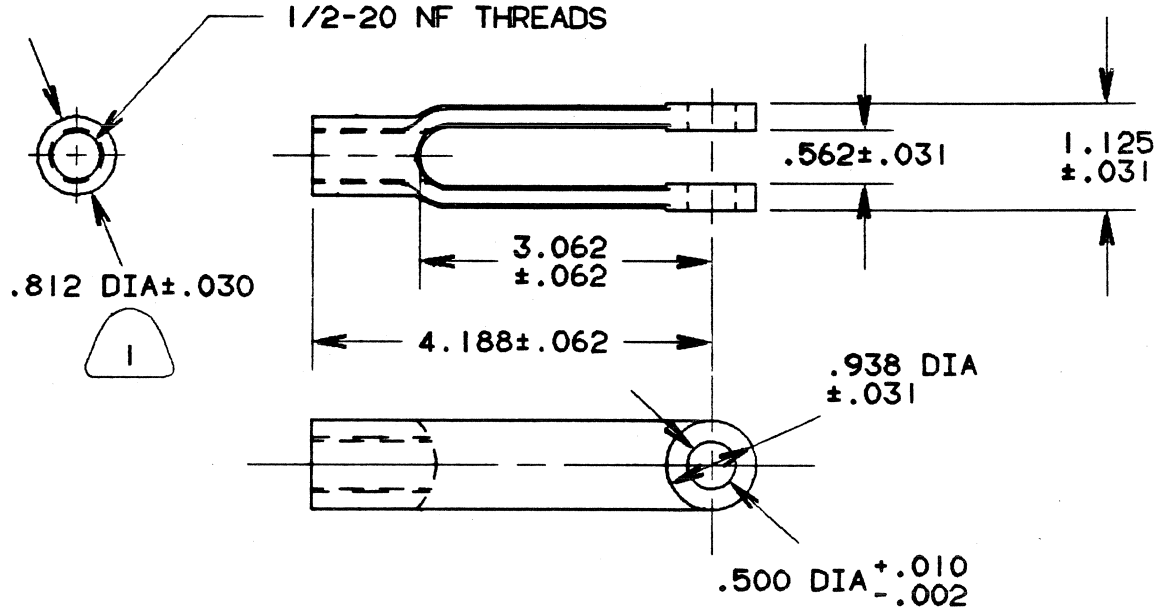
23-09004

ORIGINAL JOB NO.		TITLE	PART NO.
5828C		ROD END - SAE STANDARD HEAVY - ADJUSTABLE	23-09004
LAST CHG LTR	D		SHEET 1 OF 1

LTR	JOB NO.	BY	DATE	CHANGE INFORMATION

LTR	JOB NO.	BY	DATE	CHANGE INFORMATION
C	5828C	BT	05-17-85	REVISED & REDRAWN
D	8955D	BT	07-31-86	+.010/-.062 TO ±.030

SKETCH:



SPECIFICATION:

1. TOLERANCE ALSO APPLIES TO CASTING FLASH.

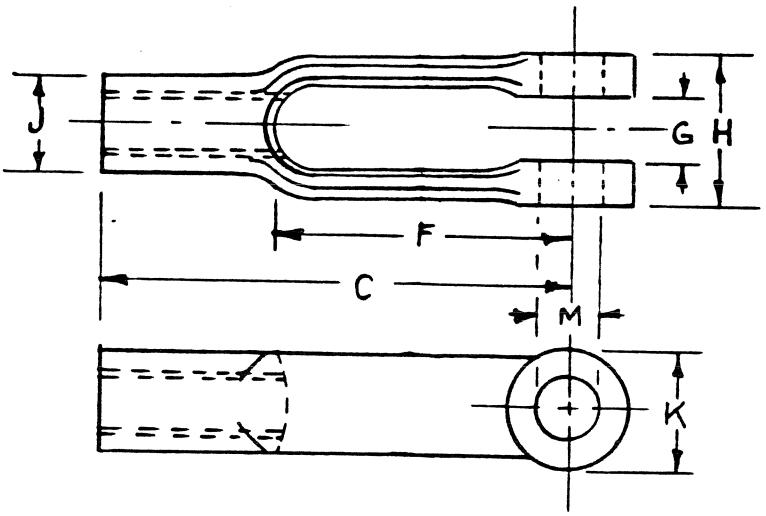
2. ALL UNSPECIFIED DIMENSIONS OR SPECIFICATION. MUST MEET SAE STANDARD J493 FOR 1/2 INCH HEAVY ADJUSTABLE YOKES.

COMPILED	BT	DATE DRAWN	CADAM ORIGINAL	UNIT OF MEASURE	MASTER NUMBER	
APPROVED	LAD	05-17-85		EA	04100	041D1

General Use Part

PRINT ISSUED	TITLE	PART NO
5/18/71	ROD END ADJUSTABLE YOKE LIGHT DUTY	23-09014
LAST CHG LTR: D		SHEET 1 OF 1

SKETCH



PART NUMBERS

B THREAD	C	F	G	H	J	K	M	FREIGHTLINER PART NUMBER
10 - 32 UNF	1-9/16	1	3/16	7/16	5/16	3/8	3/16	23-9014-000
1/4 - 28 UNF	2	1-1/4	9/32	9/16	7/16	1/2	1/4	-004
5/16 - 24 UNF	2-1/4	1-7/16	11/32	3/4	1/2	19/32	5/16	-005
3/8 - 24 UNF	1-3/4	1-3/16	7/16	7/8	5/8	11/16	3/8	-009
3/8 - 24 UNF	2-1/2	1-5/8	7/16	7/8	5/8	11/16	3/8	-006
7/16 - 20 UNF	2-7/8	1-7/8	1/2	1	23/32	13/16	7/16	-007
1/2 - 20 UNF	3	1-7/8	9/16	1-1/8	13/16	15/16	1/2	-008

ENGINEERING NOTES

1. Material: SAE 1010 or SAE 1111
2. Meets SAE Standard J493
3. Ref. Clevis Pin 23-9041.
4. -004 was 23-9090;-008 was 07-7022; others are new.

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS
B	HJR	4-19-71	Status X2
			Revised & Redrawn
C	FHF	8-18-86	3/8 to 5/8 on -004
D	PCK	6-21-88	ADDED 23-09014-009
			JOB NO. P*F 101-75

COMPILED	HJR	DATE DRAWN		MATERIAL	
APPROVED		4-28-71		(1)	04100 00001

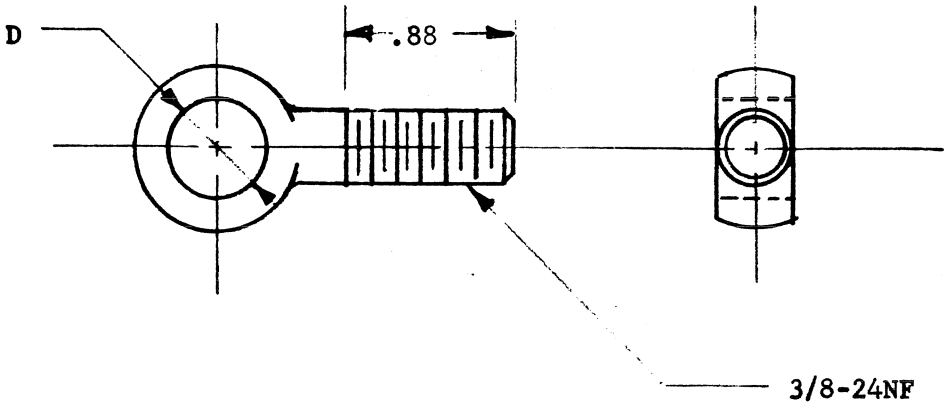
Portland FREIGHTLINER CORPORATION Oregon 97208

23-9029

PRINT ISSUED	TITLE	PART NO.
1-7-69	ROD ENDS EYE TYPE SPECIAL	23-9029
LAST CHG. LTR. B		SHEET OF

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS
B	PRJ	12-23-68	B Size Drawing



DASH NUMBER	D DIA
-000	.504 .498
-001	.566 .562

(1) Williams #3F unfinished rod end head 3/4 dia. x 3/8, Shank 3/8 dia. x 1-1/8 or equivalent

COMPILED	PRJ	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	T.J.A	12-23-68		(1)	VEHICLE

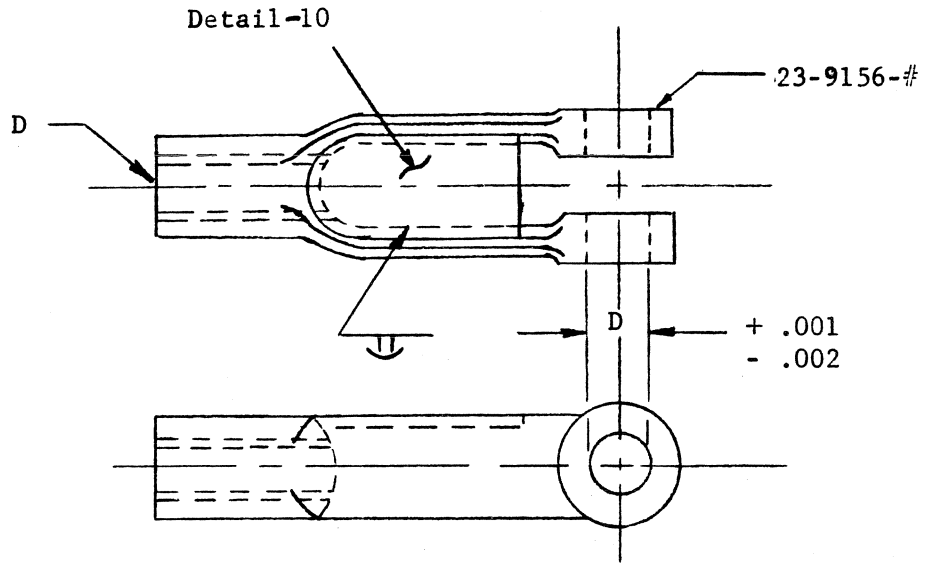
Portland FREIGHTLINER CORPORATION Oregon 97208

A23-9044

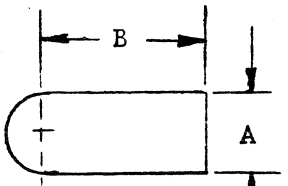
PRINT ISSUED	TITLE	PART NO.
1-14-69	Clevis, Assembly, Cylinder	A23-9044
LAST CHG. LTR. D		SHEET OF

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS
	KJA	8-22-69	Added -10 to fit all parts



Bolt Thread Size "D"	Detail 10			Std. Rod End No.	FL Part No.
	A	B	Material Gauge		
1/2	.75	2.125	.125	23-9156-004	23-9044-001
5/8	.875	3.00	.125	005	002
3/4	1.00	3.032	.125	006	003
7/8	1.125	3.469	.125	007	004
1	1.25	4.063	.125	008	005



Detail-10

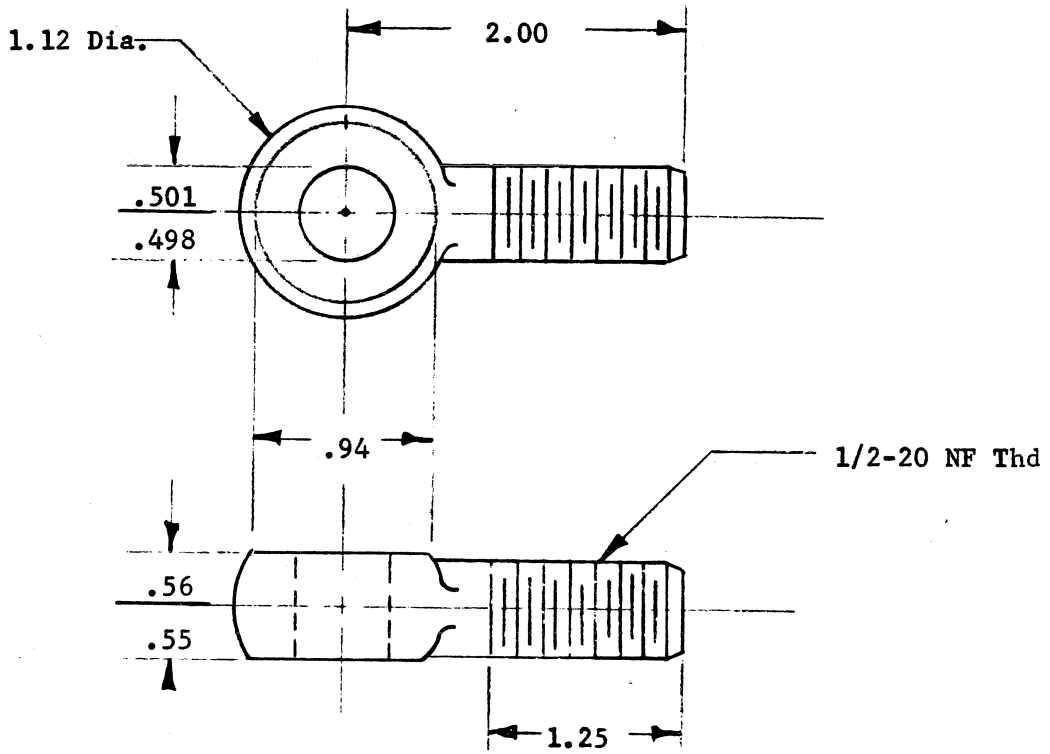
(1) Rod End - SAE 1010 or SAE 1111 Steel (23-9156)
Plate - SAE 1020 Steel (Detail-10)

COMPILED	KJA	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED		8-22-69		(1)	Vehicle

Portland FREIGHTLINER CORPORATION Oregon 97208

23-9045

PRINT ISSUED	TITLE	PART NO.
1-14-69	EYE, SHIFT TUBE EXTENSION - SPECIAL	23-9045
LAST CHG. LTR. B		SHEET OF



WAS	DATE	BY

CHG	BY	DATE	WAS
B	PRJ	12-23-68	B Size Drawing

(11) SAE 1010 or 1020 Steel

COMPILED	PRJ	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	PRJ	12-23-68		(1)	VEHICLE

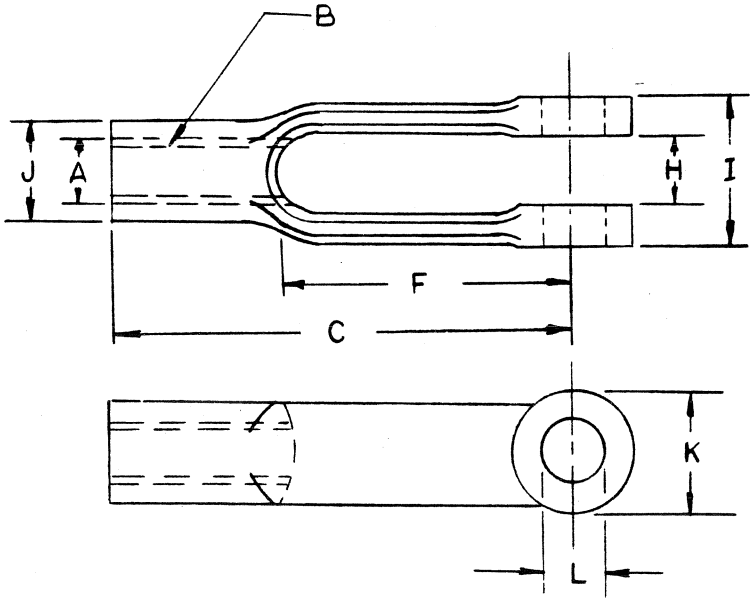
Portland FREIGHTLINER CORPORATION Oregon 97208

23-9156

PRINT ISSUED	TITLE	PART NO.
9-23-68	ROD END ADJUSTABLE YOKE HEAVY DUTY	23-9156
LAST CHG. LTR.		SHEET OF

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS



Meets SAE Standard J493

FL PART NO	A	THREADS PER IN B	C	F	H	I	J	K	L
-004	1/2	20	4-3/16	3- 1/16	9/16	1-1/8	13/16	15/16	1/2
-005	5/8	18	4-15/16	3-11/16	11/16	1-3/8	1-1/16	1-3/16	5/8
-006	3/4	16	6-1/16	4- 9/16	13/16	1-5/8	1-1/4	1-7/16	3/4
-007	7/8	14	7-1/8	5- 1/4	15/16	1-7/8	1-7/16	1-11/16	7/8
-008	1	14	8	6	1-1/16	2-1/8	1-5/8	1-15/16	1

(1) **MATERIAL:** SAE 1010 or SAE 1111

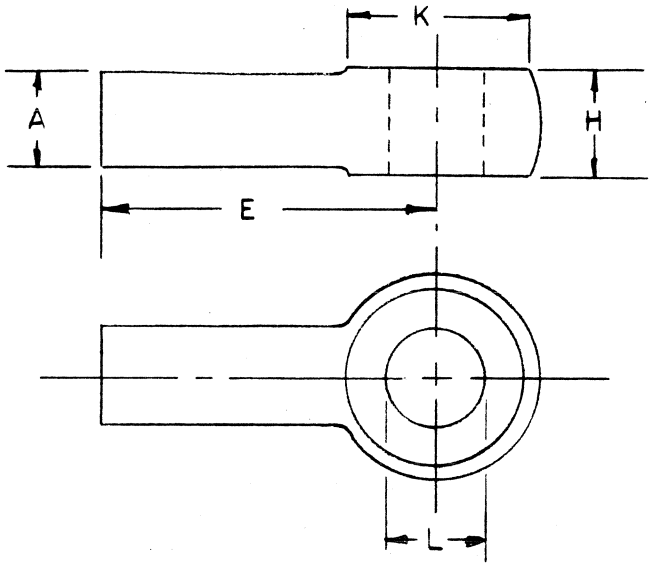
COMPILED	K.J.A	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A	9-19-68		(1)	VEHICLE

Portland FREIGHTLINER CORPORATION Oregon 97208

23-9157

PRINT ISSUED	TITLE	PART NO.
	ROD ENDS EYE TYPE LIGHT DUTY	23-9157
LAST CHG. LTR.		SHEET OF

CHG	BY	DATE	WAS



Meets SAE J493 Standard

FL PART NO	A	E	H	K	L
-000	No. 10	1-1/4	3/16	3/8	3/16
-004	1/4	1-1/4	9/32	1/2	1/4
-005	5/16	1-3/8	11/32	19/32	5/16
-006	3/8	1-1/2	7/16	11/16	3/8
-007	7/16	1-1/2	1/2	13/16	7/16
-008	1/2	1-3/4	9/16	15/16	1/2

CHG	BY	DATE	WAS

(1) MATERIAL: SAE 1010 or SAE 1111 Steel

COMPILED	K.J.A	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A	9-23-68		(1)	VEHICLE

10-3-68

Portland FREIGHTLINER CORPORATION Oregon 97208

E-183

23-9158

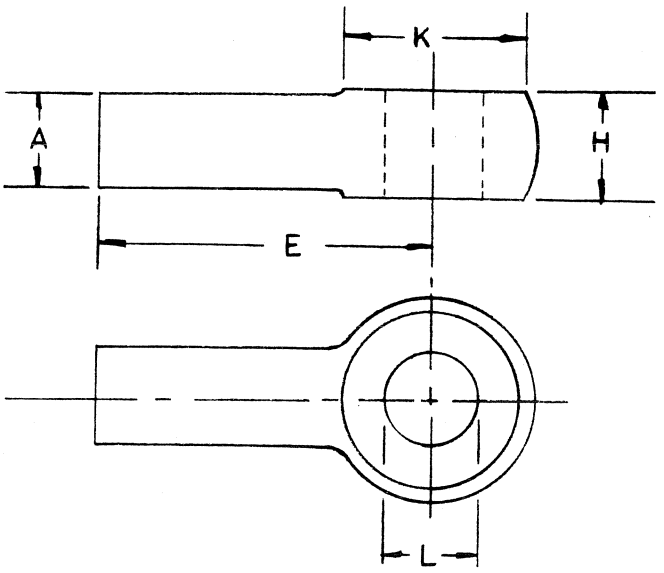
PRINT ISSUED	TITLE	PART NO.
	ROD ENDS EYE TYPE HEAVY DUTY	23-9153
LAST CHG. LTR.		SHEET OF

CHG	BY	DATE	WAS

1

CHG	BY	DATE	WAS

2



Meets SAE J493 Standard

FL PART NO	A	E	H	K	L
-005	5/8	2	11/16	1-3/16	5/8
-006	3/4	2-3/8	13/16	1-7/16	3/4
-007	7/8	2-3/4	15/16	1-11/16	7/8
-008	1	3	1-1/16	1-15/16	1

(1) MATERIAL: SAE 1010 or SAE 1111 Steel

COMPILED	K.J.A	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A	9-23-68		(1)	VEHICLE

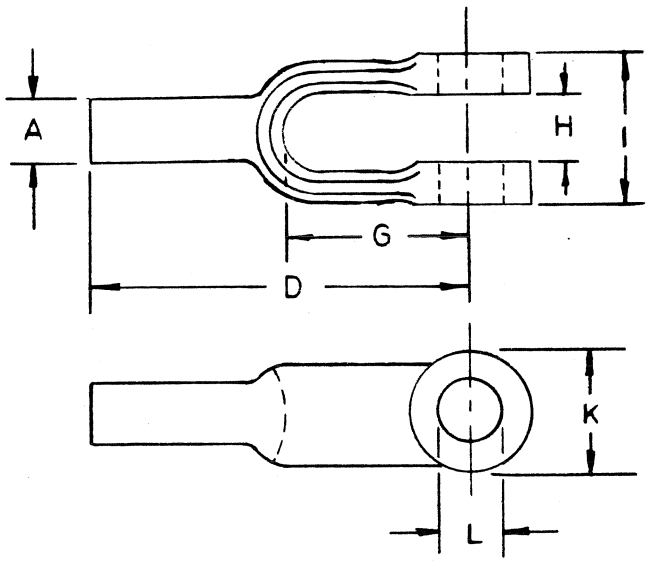
10-3-68

Portland FREIGHTLINER CORPORATION Oregon 97208

23-9159

PRINT ISSUED	TITLE	PART NO.
	ROD ENDS PLAIN YOKE LIGHT DUTY	23-9159
LAST CHG. LTR.		SHEET OF

CHG	BY	DATE	WAS



Meets SAE J493 Standard

FL PART NO	A	D	G	H	I	K	
-000	No. 10	1-1/4	7/16	3/16	7/16	3/8	
-004	1/4	1-3/4	5/8	9/32	5/8	1/2	
-005	5/16	2	3/4	11/32	3/4	19/32	
-006	3/8	2-1/8	27/32	7/16	7/8	11/16	
-007	7/16	2-1/4	1	1/2	1	13/16	
-008	1/2	2-1/2	1-1/8	9/16	1-1/8	15/16	

CHG	BY	DATE	WAS

(1) MATERIAL: SAE 1010 or SAE 1111 Steel

COMPILED	K.J.A	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A.	9-23-68		(1)	VEHICLE

10-3-68

Portland FREIGHTLINER CORPORATION Oregon 97208

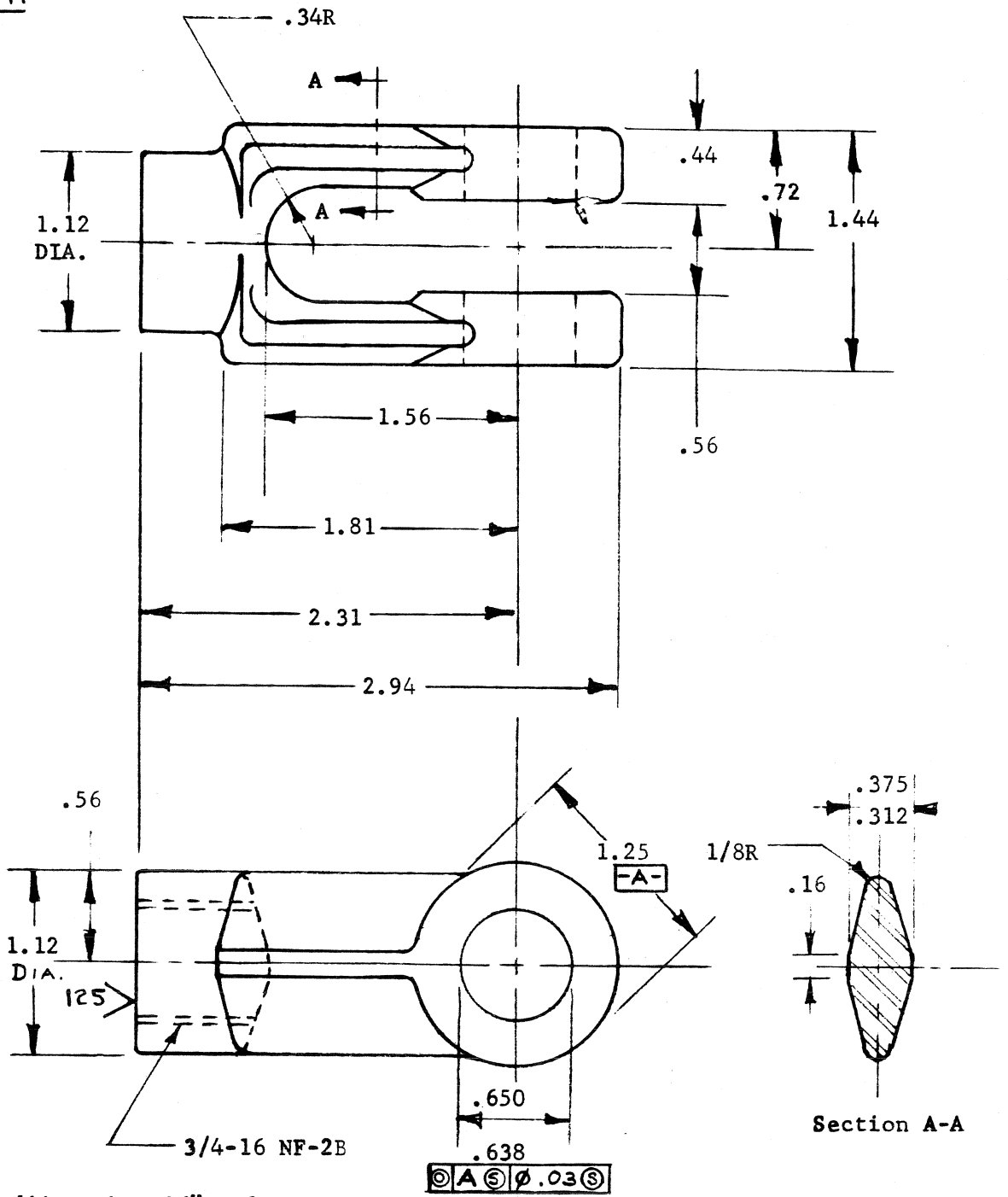
23-9143

PRINT ISSUED	TITLE	PART NO.
1-10-69	YOKE HEAVY ADJUSTABLE - (SPL)	23-9143
LAST CHG. LTR. D		SHEET 1 OF 1

CHG	BY	DATE	WAS	JOB NO

CHG	BY	DATE	WAS	JOB NO
B	PRJ	12-19-68	C Size Drawing	—
C	HJR	8-25-75	Add tolerances	C0700
D	RG	3-28-77	ADD NOTE ④	63756

SKETCH



2 All radii to be .06" unless otherwise specified.

3 Draft to be 15°

④ Alt. Material: CFH/2708-7C

① Steel - SAE 1020 { Min. Mech. Properties: Tensile, 64 ksi; Yield, 46 ksi; Elong. in 2 in., 30%; Brinell Hardness, 121

COMPILED	PRJ	DATE DRAWN		MATERIAL	
APPROVED	K.J.A	12-19-68		① ④	

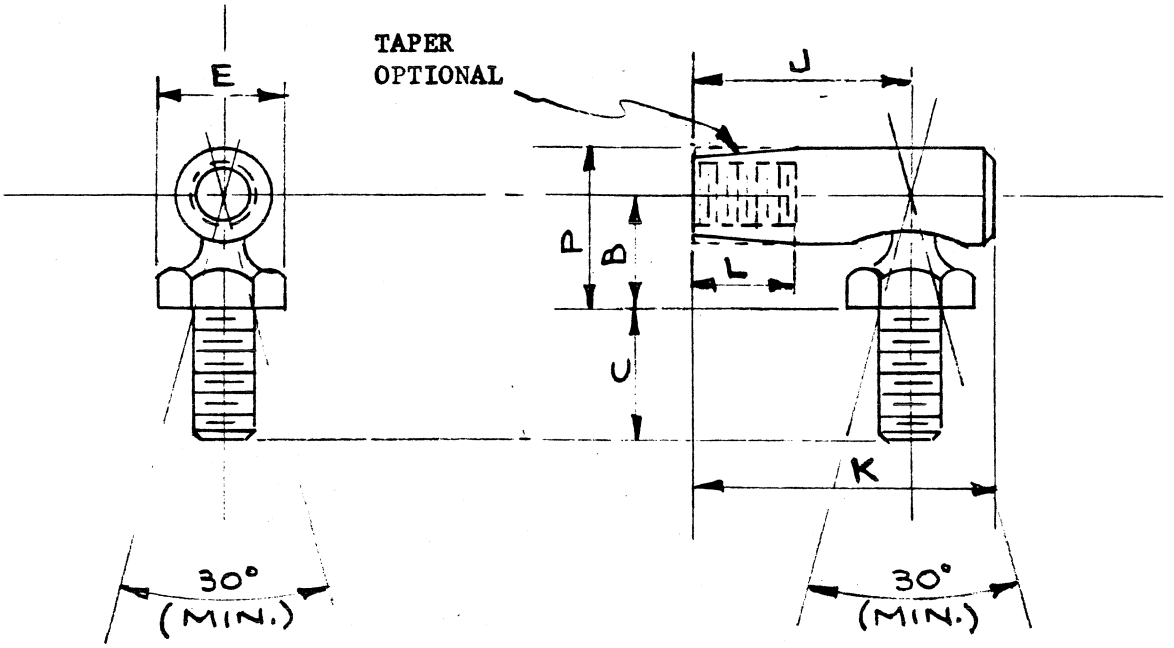
Portland FREIGHTLINER CORPORATION Oregon 97208

23-9103

PRINT ISSUED		TITLE	PART NO.
		BALL JOINTS SAE J490b	23-9103
LAST CHG. LTR.	A		SHEET OF

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS
A	PRJ	12-3-68	B Size Drawing



DASH NO.	NOMINAL SIZE AND THREAD DIA.	THREADS PER INCH	B	C	E	J	K	L	P
-001	No. 10(0.190)	32	0.44	0.44	0.312	0.88	1.25	0.44	0.65
-002	No. 12(0.216)	32	0.44	0.44	0.312	0.88	1.25	0.44	0.65
-003	1/4 (0.250)	28	0.47	0.56	0.375	0.97	1.38	0.50	0.72
-004	5/16 (0.3125)	24	0.53	0.69	0.438	1.12	1.56	0.56	0.81
-005	3/8 (0.375)	24	0.69	0.88	0.500	1.38	1.94	0.75	1.03
-006	7/16 (0.4375)	20	0.88	1.12	0.625	1.94	2.62	1.00	1.28
-007	1/2 (0.500)	20	0.88	1.12	0.625	1.94	2.62	1.00	1.28

(1) STEEL

COMPLIED	P.R.J.	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A.	12-3-68		(1)	VEHICLE

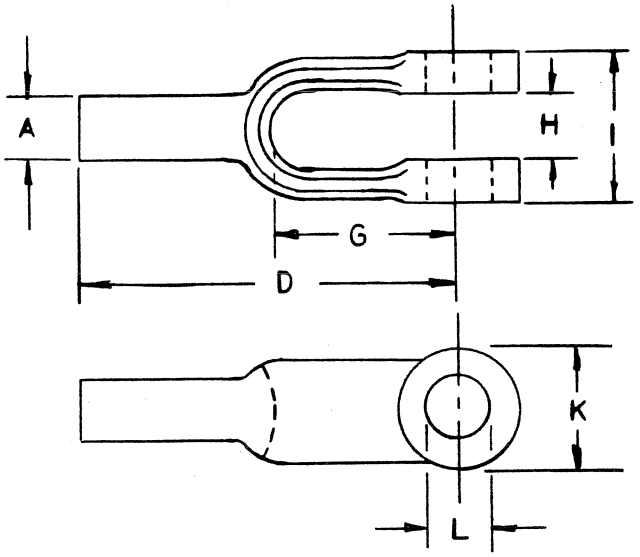
Portland FREIGHTLINER CORPORATION Oregon 97208

23-9175

PRINT ISSUED		TITLE	PART NO.
		ROD ENDS PLAIN YOKE HEAVY DUTY	23-9175
LAST CHG. LTR.	A		SHEET OF

CHG	BY	DATE	WAS

CHG	BY	DATE	WAS
A	KJA	10-25-68	23-9160



Meets SAE J493 Standard

FL PART NO	A	D	G	H	I	K	
-005	5/8	2-7/8	1-7/16	11/16	1-3/8	1-3/16	
-006	3/4	3-5/8	1-11/16	13/16	1-5/8	1-7/16	
-007	7/8	4	2	15/16	1-7/8	1-11/16	
-008	1	4-1/2	2-1/2	1-1/16	2-1/8	1-15/16	

(1) **MATERIAL:** SAE 1010 or SAE 1111 Steel

COMPILED	K.J.A.	DATE DRAWN		MATERIAL	NEXT ASSY. NO.
APPROVED	K.J.A.	9-23-68		(1)	VEHICLE

11-5-68

Portland FREIGHTLINER CORPORATION Oregon 97208

E-193

23-9197

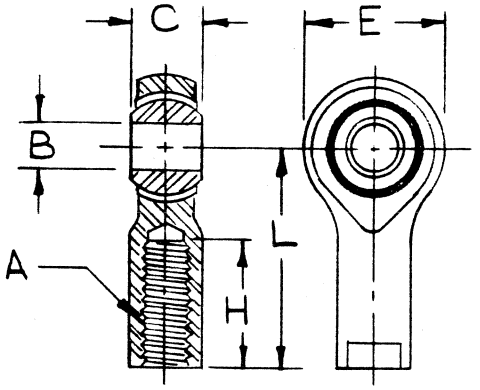
General Use Part

PRINT ISSUED	TITLE	PART NO.
3/29/71	ROD END SPHERICAL BEARING INTERNAL THREAD	23-9197
LAST CHG LTR E		SHEET 1 OF 1

CHG	BY	DATE	WAS	JOB #
			Job #60730	
D	HJR	7-15-74	Add Notes 2,3;	A0646
E1	MS	6-20-83	ADDED NKB MKR #	0733B
E2	MS	6-20-83	REVISED NOTE ①	0733B

CHG	BY	DATE	WAS
A	HJR	2-25-71	Revised & Redrawn;
			SBJ (MFR) Added
B	HJR	10-30-72	Added WFE; J #60280
C	DL	1-12-73	WF-#-B2 to VF-#-G2;

SKETCH



PART NUMBERS

A THREAD SIZE (UNF)	B BORE	C BALL WIDTH	E HEAD DIA.	H THD LGTH	L LENGTH TO ℄ BALL	MANUFACTURER'S NUMBER SBJ	HEI	VFE	NKB	F/L PART NO.
6-32	.125 /.127	.250	.469	.375	.812		HF-2C			23-9197-
8-32	.156 /.158	.281	.562	.375	.875		HF-2AC			-002
10-32	.189 /.191	.312	.625	.562	1.062	SPF-3	HF-3C	VF-3-G2	CAFR-3	-003
1/4 -28	.250 /.252	.375	.750	.750	1.312	SPF-4	HF-4C	VF-4-G2	CAFR-4	-004
5/16-24	.3125/3.145	.437	.875	.750	1.375	SPF-5	HF-5C	VF-5-G2	CAFR-5	-005
3/8 -24	.375 /.377	.500	1.000	.937	1.625	SPF-6	HF-6C	VF-6-G2	CAFR-6	-006
7/16-20	.437 /.440	.562	1.125	1.062	1.812		HF-7C	VF-7-G2	CAFR-7	-007
1/2 -20	.500 /.502	.625	1.312	1.187	2.125	SPF-8	HF-8C	VF-8-G2	CAFR-8	-008
5/8 -18	.625 /.627	.750	1.500	1.500	2.500	SPF-10	HF-10C	VF-10-G2	CAFR-10	-009
3/4 -16	.750 /.752	.875	1.75	1.750	2.875		HF-12C	VF-12-G2	CAFR-12	-010

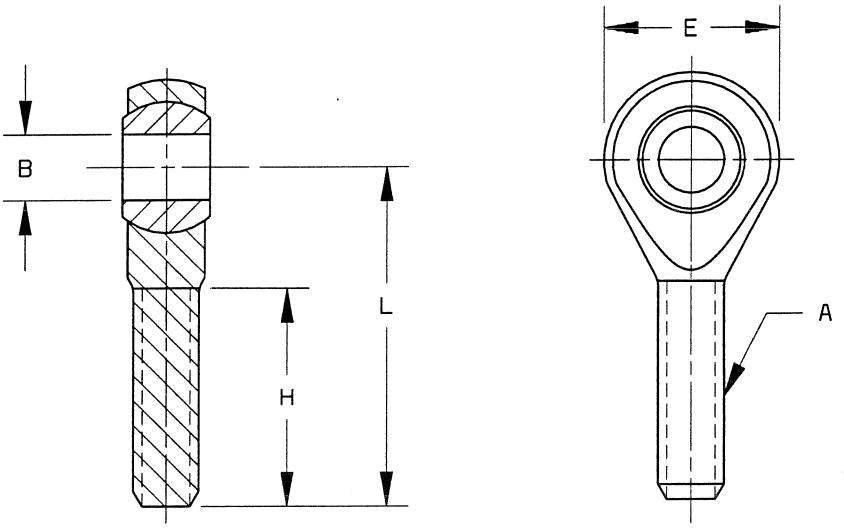
ENGINEERING NOTES

1. Material: Housing, Lo Carbon Stl, Cd Plate .0002 Min. plus clear dichromate. Spherical ball, Lo carbon alloy stl., carburized .008 min. deep, file hard, Cr. plated. Bearing Raceway, Fiberfil #6-6 (G-10/40/MS/5) high strength grade (With 5% MoS_2 for lubricity); alternate; bronze, Brass or 303 stainless steel.
2. The Spherical Bearing must have free movement over its design range of motion at temperatures down to -30°F (-34.4 C°).
3. Breakaway torque (torque required to free ball from raceway) to be 7 oz-in,max. for ball joints -001 thru -005, and not to exceed 10 oz-in. max.,for -006.

COMPILED	HJR	DATE DRAWN		MATERIAL	
APPROVED	Rollins	2-25-71		①	

Portland FREIGHTLINER CORPORATION Oregon 97208

DRAWN	LFB	TITLE ROD-END SPHERICAL BEARING, EXT. THREAD	DRAWING NUMBER 23-09498	
APPRV	DAJ			
DATE	12/06/99	FREIGHTLINER CORPORATION PORTLAND, OREGON	SHEET 1 OF 1	CHG. LTR. E
CATIA ORIGINAL				



"A" THREAD SIZE (UNF)	BORE	C BALL WIDTH	E HEAD DIA.	H THREAD LENGTH	L LTH TO ℄ BALL	MANUFACTURER'S NO.				FREIGHTLINER PART NUMBER
						SBJ	HEI	WFE	MKB	
5/16-24	.3125/.3145	.437	.875	1.25	1.88	SPM-5	HM-5C	VM-5-G2	CAMR-5	23-09498-005
3/8-24	.375/.377	.500	1.000	1.25	1.94	SPM-6	HM-6C	VM-6-G2	CAMR-6	23-09498-006
1/2-20	.500/.502	.625	1.312	1.50	2.44	SPM-8	HM-8C	VM-8-G2	CAMR-8	23-09498-008

ENGINEERING NOTES:

1. MATERIAL:
   HOUSING: LO CARBON STL, CD PLATE .0002 MIN. PLUS CLEAR DICHROMATE.

   SPHERICAL BALL: LO CARBON ALLOY STL., CARBURIZED .008 MIN. DEEP. FILE HARD CR. PLATED.

   BEARING RACEWAY: FIBERFIL #6-6 (G-10/40/MS/5) HI STRENGTH GRADE WITH 5% MOS_2 FOR LUBRICITY): ALTERNATE BRONZE, BRASS OR 303 STAINLESS STEEL.

2. THE SPHERICAL BEARING MUST HAVE FREE MOVEMENT OVER IT'S DESIGN RANGE OF MOTION AT TEMPERATURES DOWN TO -30°F (-34.4° C).

3. BREAKAWAY TORQUE (TORQUE REQUIRED TO FREE BALL FROM RACEWAY) TO BE 7 OZ-IN: MAX. FOR BALL JOINTS THROUGH -005. AND NOT TO EXCEEED 10 OZ-IN.MAX.FOR -006.

CHG	JOB NO	DATE	BY	REVISION
E	P10739-01	12/06/99	LFB	REVISED AND REDRAWN IN CATIA.

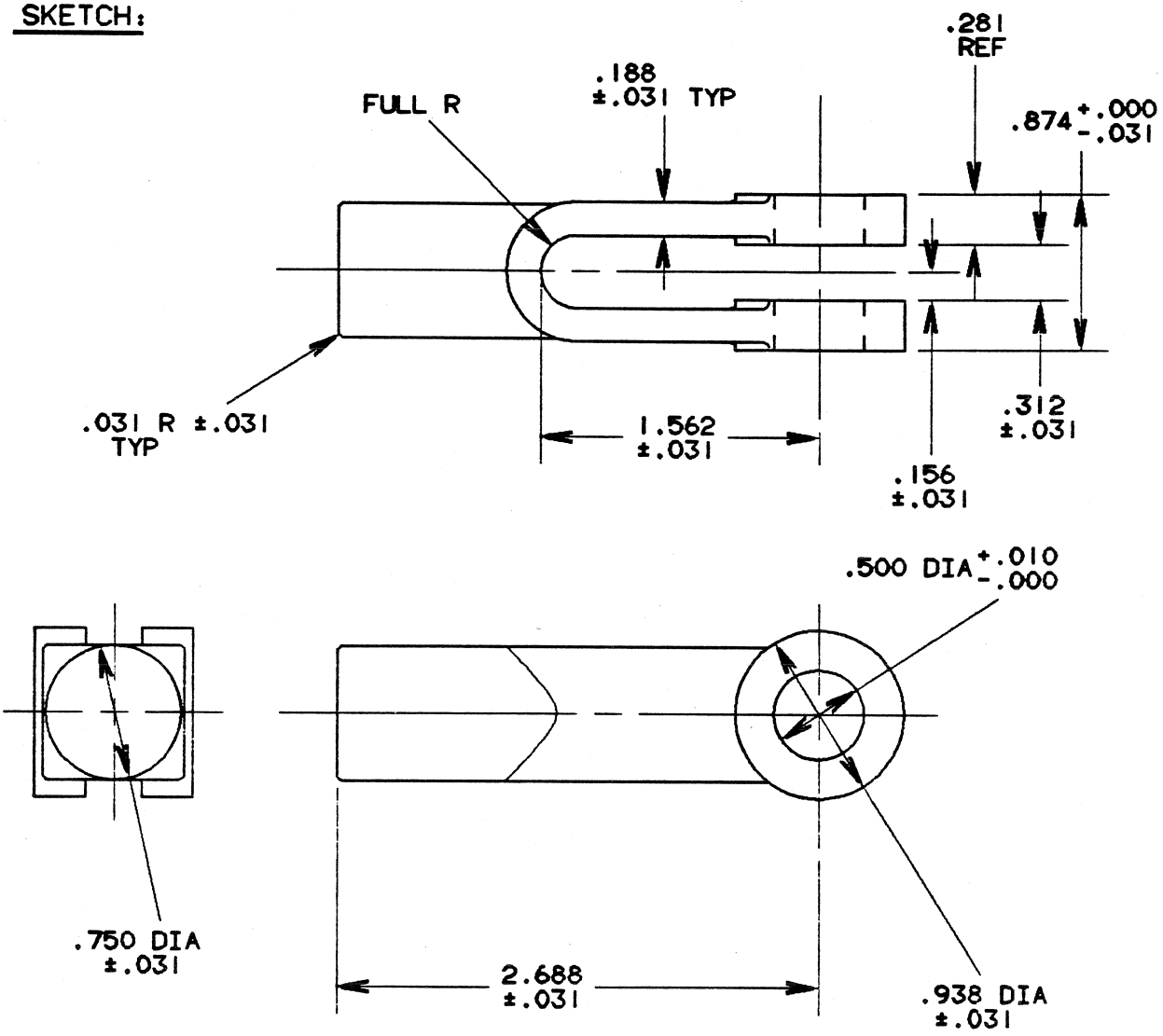
GENERAL USE PART

ORIGINAL JOB NO.	TITLE	PART NO.
1893C	ROD END CLEVIS YOKE	23-11813
LAST CHG LTR		SHEET 1 OF 1

LTR	JOB NO.	BY	DATE	CHANGE INFORMATION

LTR	JOB NO.	BY	DATE	CHANGE INFORMATION

SKETCH:



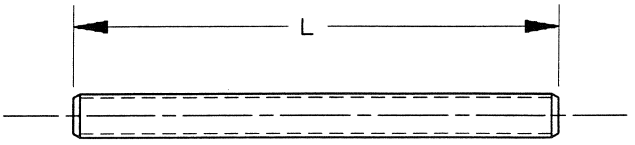
ENGINEERING NOTES:

MATERIAL: STEEL FORGING SAE 1010 OR SAE 1111

COMPILED	DEYO	DATE DRAWN	CADAM ORIGINAL		MASTER NUMBER	
APPROVED	AMB	05-13-86			04100	00001

23-10701 , A , ,ROD, THREADED

DRAWN	LFB	TITLE	DRAWING NUMBER	
APPRV	DAJ	ROD, THREADED	23-10701	
DATE	12/02/99			
CATIA ORIGINAL		FREIGHTLINER CORPORATION PORTLAND, OREGON	SHEET 1 OF 1	CHG. LTR. A



THREAD SIZE	FREIGHTLINER PART NUMBER*
1/4-28-2A	23-10701-L

* DASH NUMBER EQUALS LENGTH "L" IN INCHES.
EXAMPLE: 23-10701-275 IS 2.75 INCHES LONG.

ENGINEERING NOTES:

1. MATERIAL: STEEL, SAE B1112-1113 OR SAE 1010-1020.

CHG	JOB NO	DATE	BY	REVISION
A	G01467-05	12/02/99	LFB	REVISED AND REDRAWN IN CATIA.