

A. DCN: LIGO-T970046-00-D LIGO DETECTOR OPTICS
B. LIGO S/N: RM11 Incoming Inspection Check-off Sheet
Core Optics Blank Material

The purpose of this sheet is to verify material physical dimensions, perform visual inspection, and to facilitate material traceability of LIGO Detector optics. This sheet is to be included in the LIGO Quality Assurance traceability file. Complete a check-off sheet for each optic blank received and inspected.

C. LIGO Contract No.: PP207573 D. Glass Mfg./Order No: Corning/QD106248
E. Core optic Material: (BS / FM / ITM / ETM / RM) F. Glass Mfg. Part No.: (7980) F850316
G. LIGO Drawing No.: D970504-A-D H. Manufacturer's Boule No.: 31724 CCT
I. Date Received at Caltech: 11-20-97

J Verify glass manufacturer's Certification against LIGO Component Specification No. E960096-B-D
Attach the applicable Component Specification Verification sheet.

K Attach a copy of the glass manufacturer's Certification to check-off sheet.

L Attach the glass manufacturer's birefringence map, inclusion map, and data sheet per the above Component Specification.

M Visually inspect for shipping container for damage. If applicable, describe the damage on attached.

N Visually inspect the blanks for damage, for chips on surfaces and edges, or for other defects. If applicable, describe damage/defects on attached sheet.

O Verify core optic blank physical dimensions per applicable LIGO drawing.

Inspection of material diameter. Diameter 10.104 in 256.64 mm

Inspection of material thickness. Thickness 3.999 in 101.57 mm

P Verify that the Registration Mark is present (with arrow pointing to the first surface) as required by LIGO Component Specification.

Q Verify receipt of 25mm X 25mm cylinder Witness Sample(s) required by the LIGO Component Specification and visually inspect for damage. Describe damage on the attached sheet.

R Sign and date original packing slip (shipper) and distribute per paragraph 3.R.

Inspect By: [Signature] Date Inspected: 11-25-97

Reviewed and/or accepted by:

Cognizant Engineer: _____ Date: _____

LIGO QA Officer or Designee: _____ Date: _____

**LIGO DETECTOR OPTICS
Incoming Inspection Check-off Sheet**

Core Optics Blank Material

COMMENTS/DISCREPANCIES: (Disposition damage/discrepancies per LIGO Quality Assurance Plan (LIGO M960076-00-P) paragraphs 5.12 and 5.12.1.) _____

Data disc not in ASCII as required

SKETCHES:

DISPOSITIONS: _____

LIGO Component Specification Verification Sheet
Mirror Blanks, Recycling Mirror

		Serial Number: RM 11	Specification	Reported Value	✓
		Mirror Blanks, Recycling Mirror	Requirements	Physical Dimensions	LIGO-D970504
Diameter	256mm +1.0mm, -0mm			256.64 mm	✓
Thickness	101mm +1.0mm, -0mm			101.57mm	✓
Chamfer	2.0mm Max 2pl				
Clear Aperture	Central 235mm				✓
Material	Fused Silica #7980			Certification	✓
Registration Mark	"Top" of Optic, 80mm Arrow Points to Side 1			Certification	✓
Witness Sample	25mm dia. x 25mm cylindrical			present	✓
Witness Sample Map				Map Attached	✓
Defect Depth	< 0.5mm			Hand Sketch w/location & dim.	✓
Homogeneity Within the Central 80mm	$\leq 5.0 \times 10^{-7}$ p-v $\lambda = 632.8\text{nm}$			Interferogram Homogeneity Map	.110
Homogeneity Within the Central 200mm	$\leq 2.5 \times 10^{-6}$ p-v $\lambda = 632.8\text{nm}$			Interferogram Homogeneity Map	.358
Homogeneity Data	ASCII Format			PC Compatible 3½ in. Disk	No
Birefringence Within the Central 80mm	≤ 1 nm/cm			Certification, Birefringence Map	✓
Birefringence Within the Central 200mm	≤ 5 nm/cm			Certification, Birefringence Map	✓
Bubble & Inclusion within the clear aperture. Max. Inclusion Diameter	Total $\leq 0.03\text{mm}^2$ Per 100cm^3 of Glass. $\leq 0.1\text{mm}$			Hand Sketch w/location & dim.	✓
Absorption	< 20ppm/cm @ $\lambda = 1064\text{nm}$				NA
Striae within the Clear Aperture	Grade A per MIL-G-174			Inspection Report	NA

Blnk_RM.doc

CORNING

334 County Route 16
Canton, New York 13617-9703

Canton Plant . . .

...WHERE QUALITY MIRRORS PRIDE

CERTIFICATE OF COMPLIANCE

Customer: CALIF INSTITUTE OF TECHNOLOGY

Customer Order No.: PP207573


Corning Order No.: QD106248

Material: 7980, 0AA

Date Prepared: 11/14/97

CORNING ITEM NUMBER	CORNING CODE #	CUSTOMER PART #	QUANTITY SHIPPED	CORNING WORK ORDER #	DEV #
4	855310	UNKNOWN	1	31724CUV	
4	855310	UNKNOWN	1	31724EUV	
4	855310	UNKNOWN	1	31724DUV	

This is to certify that the above material shipped against your order is in conformance with all applicable requirements, specifications, and drawings.

Signed: 

Brian Bush

Title: Quality Assurance Section Leader

Date: 11/14/97

CORNING

334 County Route 16
Canton, New York 13617-9703

Canton Plant . . .

...WHERE QUALITY MIRRORS PRIDE

CERTIFICATE OF COMPLIANCE

Customer: CALIFORNIA INSTITUTE OF TECHNO

Customer Order No.: PP207573


Corning Order No.: QD106248

Material: 7980, 0AA

Date Prepared: 11/14/97

CORNING ITEM NUMBER	CORNING CODE #	CUSTOMER PART #	QUANTITY SHIPPED	CORNING WORK ORDER #	DEV #
5	850316	D970504	1	31724DCT	
5	850316	D970504	1	31724CCT	
5	850316	D970504	1	31724ECT	

This is to certify that the above material shipped against your order is in conformance with all applicable requirements, specifications, and drawings.

Signed: 

Brian Bush

Title: Quality Assurance Section Leader

Date: 11/14/97

DATA SHEET - CAL TECH LIGO MIRROR BLANKS

Cal Tech Purchase Order Number:

PP207573

Cal Tech Specification Number

LIGO-E960096-B-D

Attribute	Spec/Drawing #	Requirement	Actual	Stamp	
Diameter	LIGO-D970504-A-D	10.079", -0.0"/+0.040	10.104 / 10.104		QA
Thickness	LIGO-D970504-A-D	3.976", - 0.0" / + 0.040"	4.000 / 3.999 /3.999 /4.000		QA
Registration Mark	LIGO-D970504-A-D	Top center of optic	See Attached Cert.		M
Serial & Boule #	LIGO-D970504-A-D	Boule and Serial No.	31724CCT-RM11		M
Material	Fused Silica 7980		See Attached Cert.		M
Witness Sample Map			See Attached Map		M
Defects		< 0.5 mm	See Attached Map		QA
Inclusions		<0.1;<0.03mm /100cm ;<0.06mm disregard	See Attached Map		QA
Homogeneity - central		1.0 x 10E-6	0.11		M
Homogeneity - outside		2.5 x 10E-6	0.358		M
Interferograms		To be provided	Attached		M
Birefringence	MIL G-174 Section 4.4.5	< 1nm/cm (central 3.150") < 5 nm/cm (central 7.874")	See Attached Map		QA
Striae	MIL G-174 Section 4.4.6, Method 1 or 2	GRADE A	N / A		M
Absorption		< 20 ppm / cm @ $\lambda = 1.06 \mu\text{m}$	N / A		M

Comments:

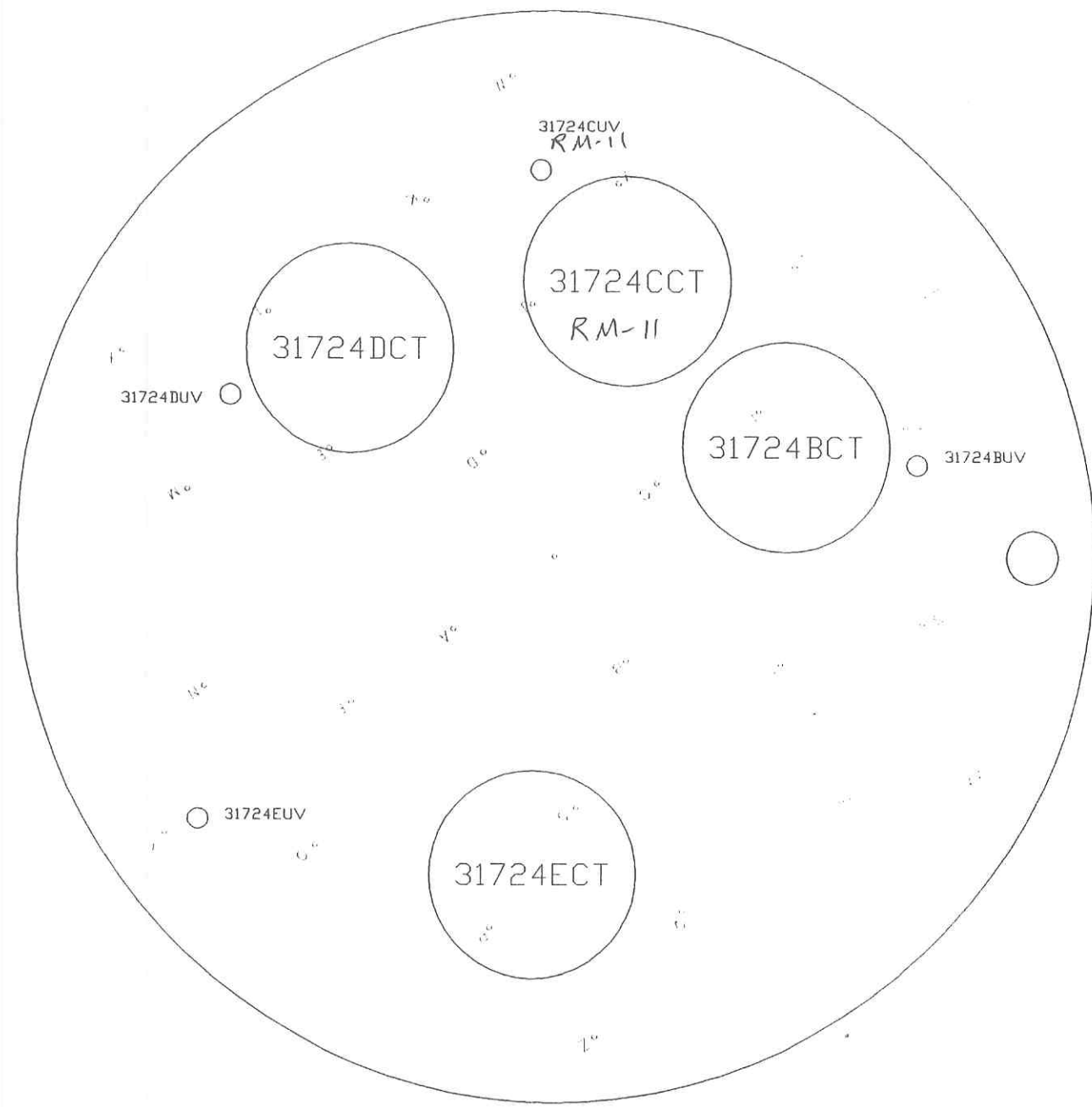
Inspected by:

Gail Andrews

Date: 11 / 12 / 97

CORNING INCORPORATED

180 DEG —

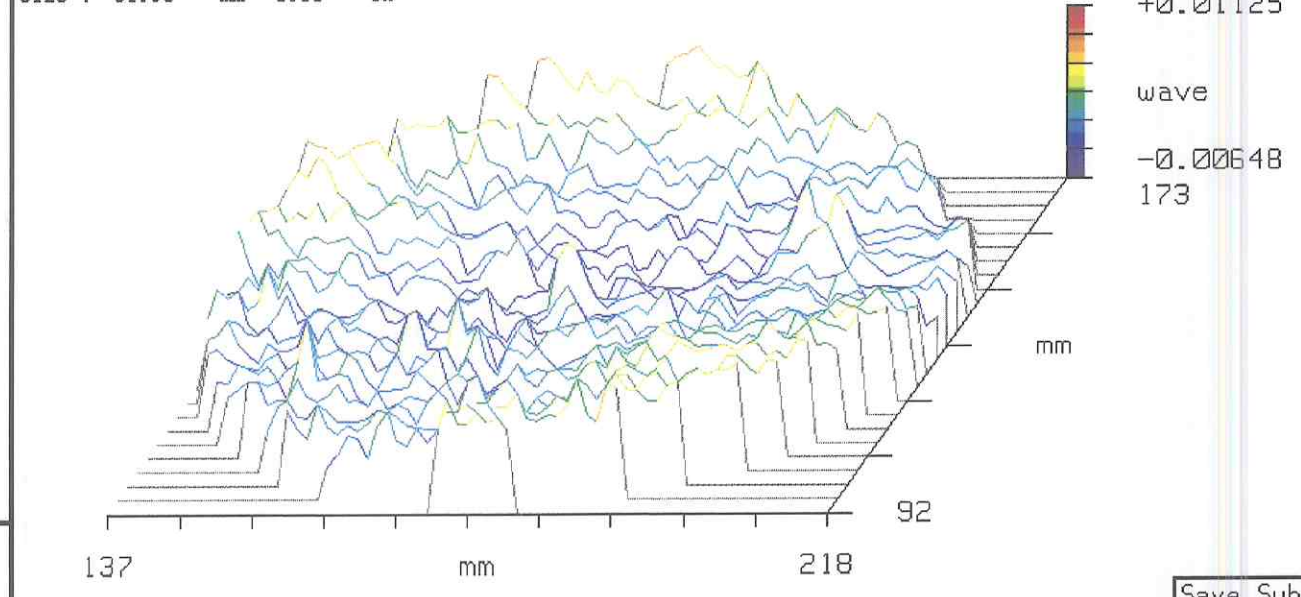


270 DEG

— 0 DEG

Corning Inc. Canton Plant Metrology Dept. 334 Co. Rt. 16, Canton, NY 13617 (315) 379-3283
 Size X 81.03 mm 3.19 in
 Size Y 81.03 mm 3.19 in

Lg Aperture
 PV 0.018 wave
 rms 0.002 wave
 Power 0.004 wave
 Homogeneity 1.10E-07
 Points 4161
 AstMag (Z) 0.005 wave



Removed:
 PST TLT
 PST TLT PWR AST CMA SA3

Zern Terms: 36

Zernike Coefficients from 4161 data points
 Order: 10th Terms: 36 rms: 0.001

-0.531	-0.002	0.107	0.002						
-0.001	-0.002	-0.001	0.001	0.000					
-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

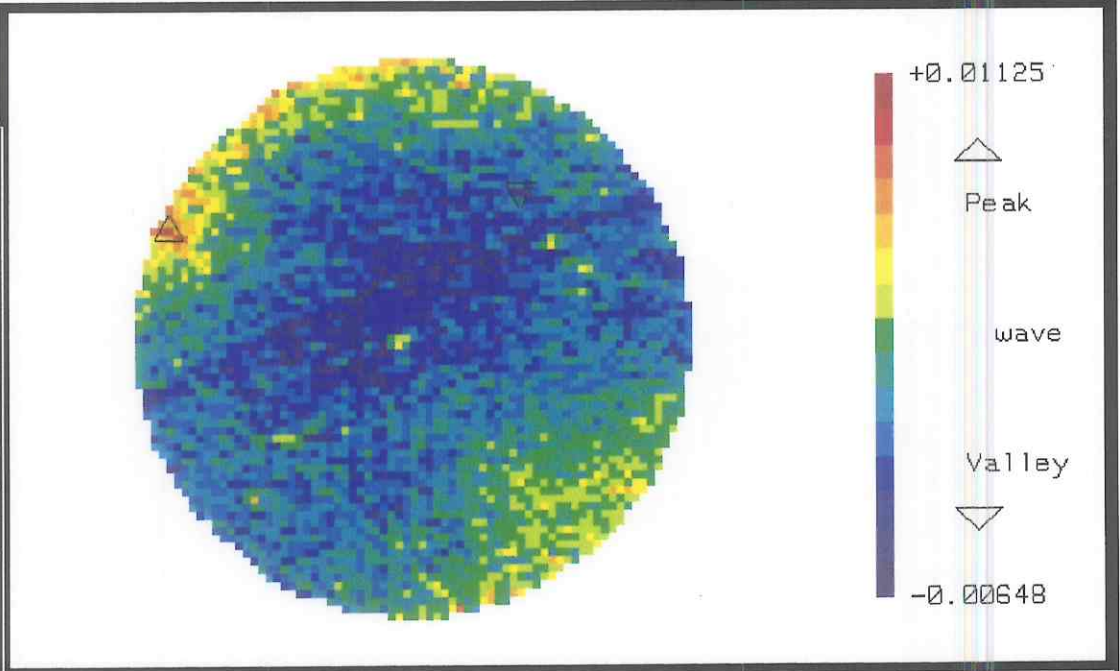
Measure Mask Data Save Data DBSAVE NCSAVE STP
 Analyze Calibrate Load Data

Subtract Sys Err: On
 Sys Err File: r101897.204
 Part Thickness: 4.008 in

Boule #: 31724
 Suffix: CCT

Comment:
 SN-RM11

Data File: 31724Ctc.cal
 Camera Res: 1.1100 mm
 Time: Mon Nov 03 19:22:39 1997



zygo

Homogeneity

Lg Aperture

PV 0.058 wave

rms 0.011 wave

Power 0.024 wave

Homogeneity 3.58E-07

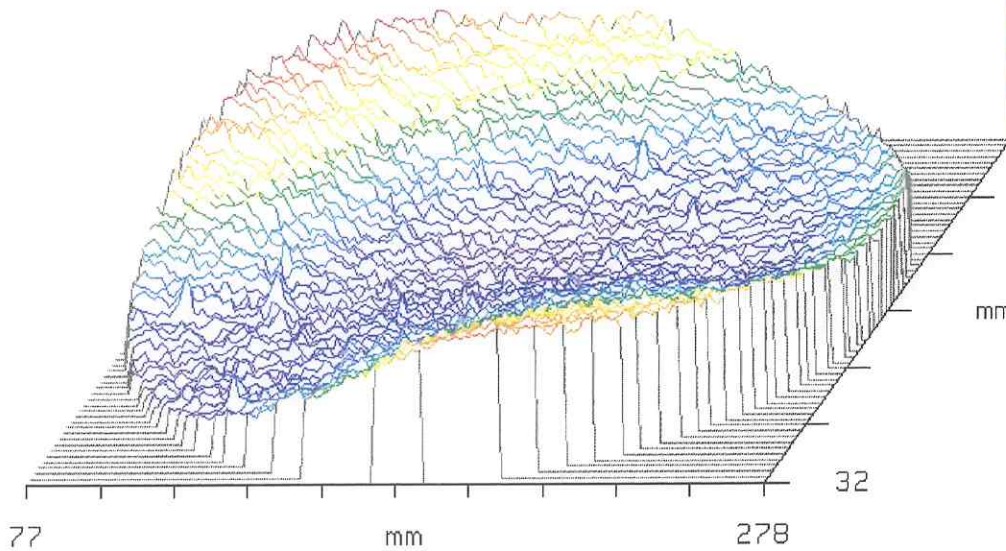
Points 25576

AstMag (Z) 0.038 wave

Corning Inc. Canton Plant Metrology Dept. 334 Co. Rt. 16, Canton, NY 13617 (315) 379-3283

Size X 200.91 mm 7.91 in
Size Y 200.91 mm 7.91 in

+0.03613
wave
-0.02142
233



Save Subapt

Removed:
PST TLT

PST TLT PWR AST CMA SA3

Zern Terms: 36

Zernike Coefficients from 25544 data points

Order: 10th Terms: 36 rms: 0.002

-0.520	-0.011	0.277	0.012						
-0.007	-0.018	0.000	0.006	-0.001					
-0.003	0.006	0.002	0.000	0.002	-0.002	0.000			
0.002	0.000	0.003	0.000	0.000	0.001	-0.001	0.001	0.000	
0.001	0.002	0.000	-0.001	0.000	-0.001	-0.001	0.000	0.000	

Measure Mask Data Save Data DBSAVE NCSAVE STP

Analyze Calibrate Load Data

Subtract Sys Err: On

Sys Err File: r101897.204

Part Thickness: 4.008 in

Boule #: 31724

Suffix: CCT

Comment:

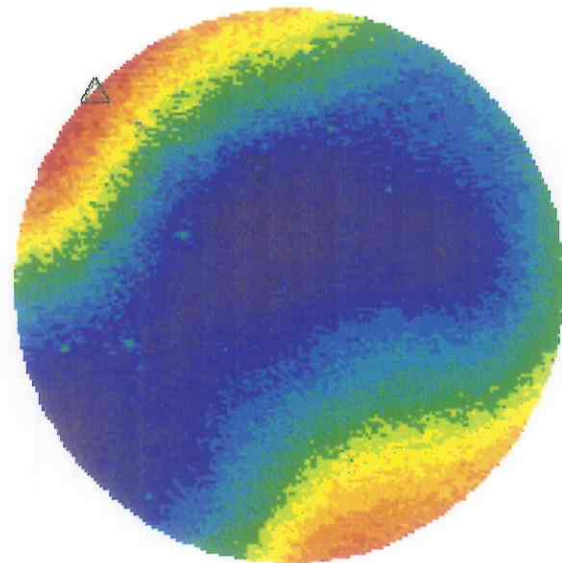
SN-RM11

Data File: 31724CTb.cal

Camera Res: 1.1100 mm

Reset

Time: Mon Nov 03 19:22:39 1997



+0.03613
Peak
wave
Valley
-0.02142

SlopeMag

TiltXY

Filter

AutoSeq

Manipulate

Metroscript

FileData

Profile

VideoMon

SlopeY

SPC

Meas Controls

FileCopy

Report

ZernGen

PACKING LIST

T. ORD. & DATE: 207573 08/20/96
 CNG. ORD. NO.: 0106248
 TO: CALIFORNIA INSTITUTE OF TECHNOLOGY 13717
 O IRENA PETRAC 04 056 04
 LIGO PROJECT, MAIL CODE 51-33
 1201 E CALIF BLVD
 SAME AS "SOLD TO" UNLESS OTHERWISE SPECIFIED
 CALIFORNIA INSTITUTE OF TECHNOLOGY 13717
 ATTN: MR. LOWELL JONES
 ATTN: GARILYNN BILLINGSLEY 04 056 09
 LIGO PROJECT, MAIL STOP 51-33
 PASADENA, CA 91125
 DISCOUNT FACTOR: []
 DESIRED SHIP DATE: 9/30/97
 WE EXPECT TO SHIP: 9/30/97
 DATE ENTERED: 8/28/96
 PPED O.B. ANTON, NY
 OFI FOB ORIG PFD FRT INVOICED

DATE SHIPPED		INVOICE NUMBER	
DATE SHIPPED		ROUTING	
BEST WAY		UPS Red	
CAR INITIAL AND NUMBER		54230	
THIS SHIPMENT		PREPAID	COLLECT
PARTIAL	COMPLETE	X	
DATE ISSUED		DATE TO SHIP	
		11/14/97	

WHSE. LOC. - PRODUCT CODE	DESCRIPTION	QUANTITY	
		UNITS	CASES
	SPECIAL INSTRUCTIONS CONTD : =====		
	NEW PART THK. REDUCED QTY'S OF ITEM 001 & PER P/O CHG LM 2/18/97: ADDRESS CHANGE ON SOLD TO ADDRESS. SW 2/26/97: CHANGED SPECIAL NOTES AS PER RANDY VANBROCKLIN. SLW 4/17/97: CHANGED CUSTOMERS SHIP TO ADDRESS PER MESSAGE FROM GARILYNN BILLINGSLEY//JMW 08/22/97 WE STILL NEED TO INVOICE FOR 2 PCS OF ITEM 1 & SHIP 4 PCS OF A NEW ITEM 005.LM		
4 855310 4 855310 7980 0000	DISC F S, DAA, WITNESS SAMPLE .984" X .984 CYLINDRICAL		3 pcs
	Rec'd 3 pcs. 11-20-97 <i>[Signature]</i>		