♦ PRECISION INSTRUMENTS FOR TEST AND MEASUREMENT ♦

350 G

Liquid Dielectric Cell

Instruction Manual

IET LABS, INC.
Long Island, NY - Email: info@ietlabs.com
www.ietlabs.com
TEL: (516) 334-5959 • (800) 899-8438 • FAX: (516) 334-5988

COVER

MANUAL 350G

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THE 350G CELL MAY BE USED TO MEASURE THE DIELECTRIC CONSTANT AND OR VOLUME RESISTIVITY OF ALMOST ANY LIQUIDS. (OILS,SOLVENTS,SALTS, WATER BASE,NON VISCOUS CHEMICALS.)

ALL THAT IS REQUIRED IS A SUITABLE BRIDGE, MEGOMETER,OR ELECTROMETER,ETC..

THE CELL IS A TWO OR THREE TERMINAL DEVICE,WITH A GUARDED AND SHIELDED ELECTRODES.

THE ELECTRODES ARE POSITIONED IN A VERTICLE MANNER,WITH CONCENTRIC ELECTRODES, MANUFACTURED OF 303 STAINLESS STEEL.

THE CELL COMES COMPLETE EXCEPT FOR THE CABLES WITH WHICH MUST BE ORDERED SEPERATLY AND MANUFACTURED WITH THE RIGHT CONNECTORS, TO MATCH YOUR EQUIPMENT.

THE ONLY OTHER ITEMS THAT YOU NEED, IS A PYREX BEAKER OR SUITABLE CONTAINER,AND LAB STAND. A HIGH QUALITY STAND MAY BE ORDERED THAT IS FULLY ADJUSTABLE IN ALL DIRECTIONS. THIS STAND IS HIGHLY RECOMMENDED. THE STAND WILL HOLD YOUR CELL AWAY FROM THE BOTTOM OF THE BEAKER AND PRODUCE MORE ACCURATE RESULTS. IT WILL ALSO PREVENT THE CELL AND BEAKER FROM TIPPING OVER, SINCE THE CELL IS TOP HEAVY.

THE CELL CAN BE EASILY CLEANED AND DISASSEMBLED. REFER TO THE SECTION ON THE CLEANING OF THE CELL.

GENERAL DATA

MODEL:	350G
TYPE:	LIQUID DIELECTRIC TEST CELL
MEASURING PARAMETERS:	DIELECTRIC CONSTANT DISSIPATION FACTOR VOLUME RESISTIVITY
FREQUENCY:	10 --- 10 MHZ
TERMINALS:	THREE TERMINAL (GUARDED)
SHIELDED:	YES
CONNECTORS:	G/R-0874 , BANANA (FEMALE)
SIZE:	1.740 O.D. X 5.50 LENGTH
WEIGHT:	0.87 LBS.
MATERIAL:	303 STAINLESS STEEL, TEFLON
ELECTRODES:	CONCENTRIC CYLINDERS (OPEN END)
MATERIAL USE:	LIQUIDS, OILS, SOLVENTS, WATER, HYDROCARBONS, SALTS, ELECTROLYTES, FOODS
BRIDGE USE:	ALL TYPES THREE AND FOUR TERMINAL, G/R,QUAD-TECH, ANDEEN-HAGERLING, H/P,BOONTON, KEITHLEY
MEGOMETER:	GEN/RAD, GENERAL RADIO, QUAD-TECH,
ELECTROMETER:	KEITHLEY
ACCESSORIES:	CLOSED BOTTOM ELECTRODE, 400 ML PYREX BEAKERS 2.81 IN. O.D. X 5.00 IN. LENGTH (3.152 O.D. RIM) TOOL KIT for DISASSEMBLY AND CLEANING LABORATORY STAND & HOLDER.

INSTRUCTIONS

AFTER SETTING UP THE 350G CELL AND ATTACHING THE PROPER CABLES TO THE MEASURING INSTRUMENT, YOU MAY HAVE TO CALIBRATE THE INSTRUMENT.

SOME BRIDGES WILL HAVE A PRECEDURE FOR AUTOMATICALLY COMPENSATING FOR CABLE ERRORS (CAPACITANCE, RESISTANCE, INDUCTANCE).

ONE TYPE OF BRIDGE HAS A SWITCH THAT COMPENSATES FOR A ONE METER ELECTRICAL LENGTH CABLE ERRORS.

ANOTHER TYPE, YOU WILL HAVE TO DO AN OPEN AND SHORT CALIBRATION.

THE GEN/RAD 1620A CAPACITANCE MEASURING SYSTEM, WILL NOT NEED ANY CORRECTIONS IF USED IN THE THREE TERMINAL MODE.

OTHER BRIDGES YOU WILL HAVE TO MEASURE AND SUBTRACT THE CABLE CAPACITANCE FROM YOUR MEASUREMENTS.

AFTER SETTING UP THE CELL AND CABLES AND DOING AN CALIBRATION YOU SHOULD NOT DISTURB THE CABLES, AS SEPARATING THE CABLE PAIRS WILL CHANGE THE LOOP INDUCTANCE.

THE CABLES SHOULD ALWAYS BE KEPT AS SHORT AS POSSIBLE, YOU MAY WANT TO MAKE A ADDICTIONAL SET FOR MEASUREMENTS IN THE ENVIRONMENTAL CHAMBER.

350 G ASSEMBLY

FIRST REMOVE THE OUTER ELECTRODE, TURN THE ELECTRODE COUNTER-CLOCKWISE. (IT SHOULD BE HAND TIGHT)

THE ELECTRODE AND CELL CAN BE CLEANED WITH A GOOD GRADE LAB-ATORY SOLVENT. (METHYL-ALCOHOL) BE SURE TO RINSE WELL.

FOR A MORE COMPLETE CLEANING AND DISASSEMBLE, PROCEED AS FOLLOWS:

REMOVE THE G/R-0874 CONNECTOR ON TOP OF THE CELL. USE THE TOOL PRO ITED WITH THE CELL.

NEXT REMOVE THE LITTLE PIN THAT WAS INSIDE THE CONNECTOR. USE THE .062 O.D. DOWEL PIN PROVIDED.

YOU MAY ALSO REMOVE THE NUT NEXT TO THE PIN. USE THE SAME .062 DOWEL PIN.

THE INNER ELECTRODE CAN NOW BE REMOVED, YOU MAY HAVE TO TURN THE ELECTRODE AT THE SAME TIME THAT YOU PULL.

THAT WILL BE AS FAR AS YOU SHOULD GO.

WHEN YOU ASSEMBLE THE CELL BE CAREFULL NOT TO DAMAGE OR CROSS THE THREADS.

DIMENSIONS FOR YOUR CELL

MODEL: 350G S/N: 127

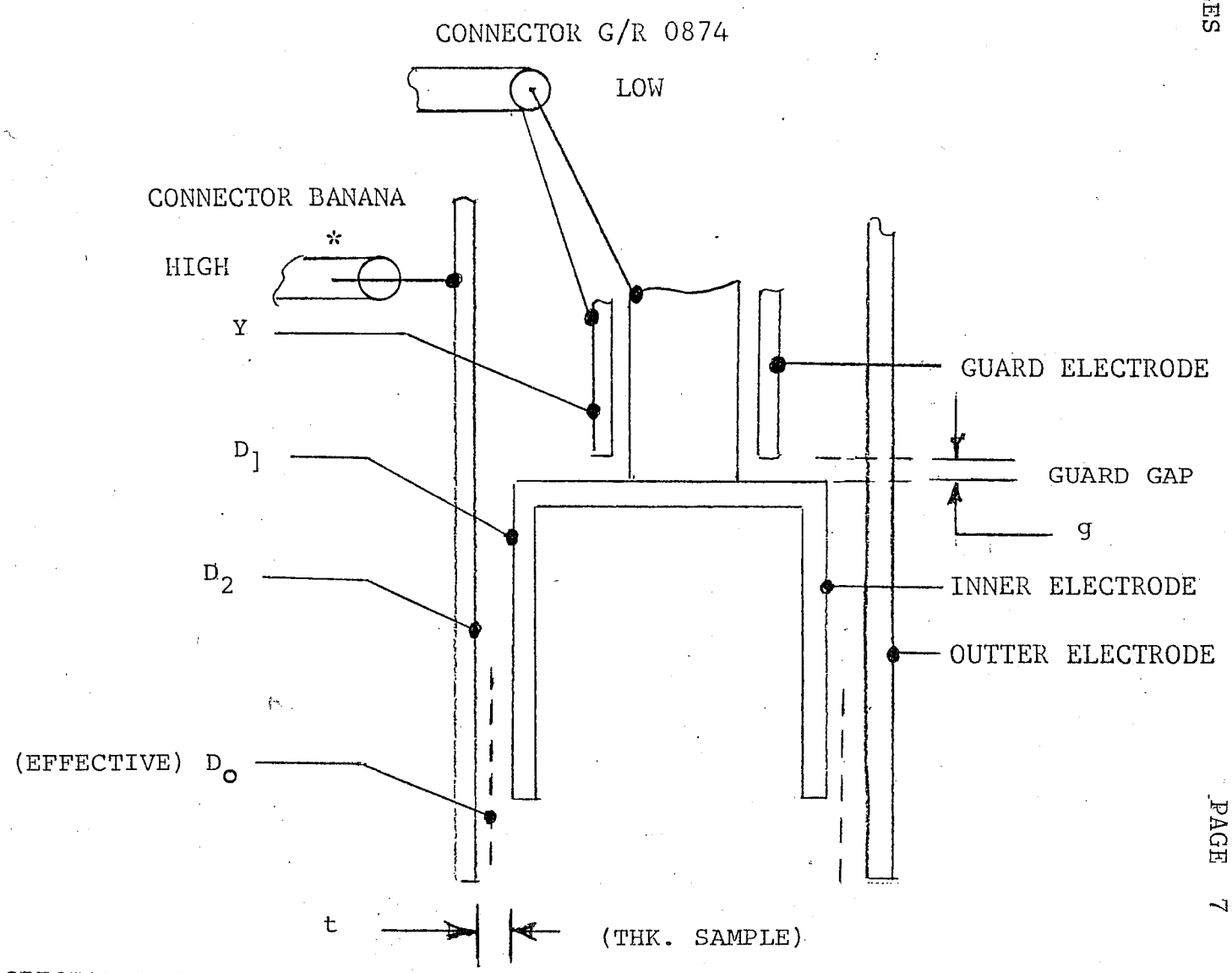
CUSTOMER: EXXON/MOBIL CORP.

CONTACT: JOE CAPASSO PHONE: 856-224-2142 x 2142
856-224-3689

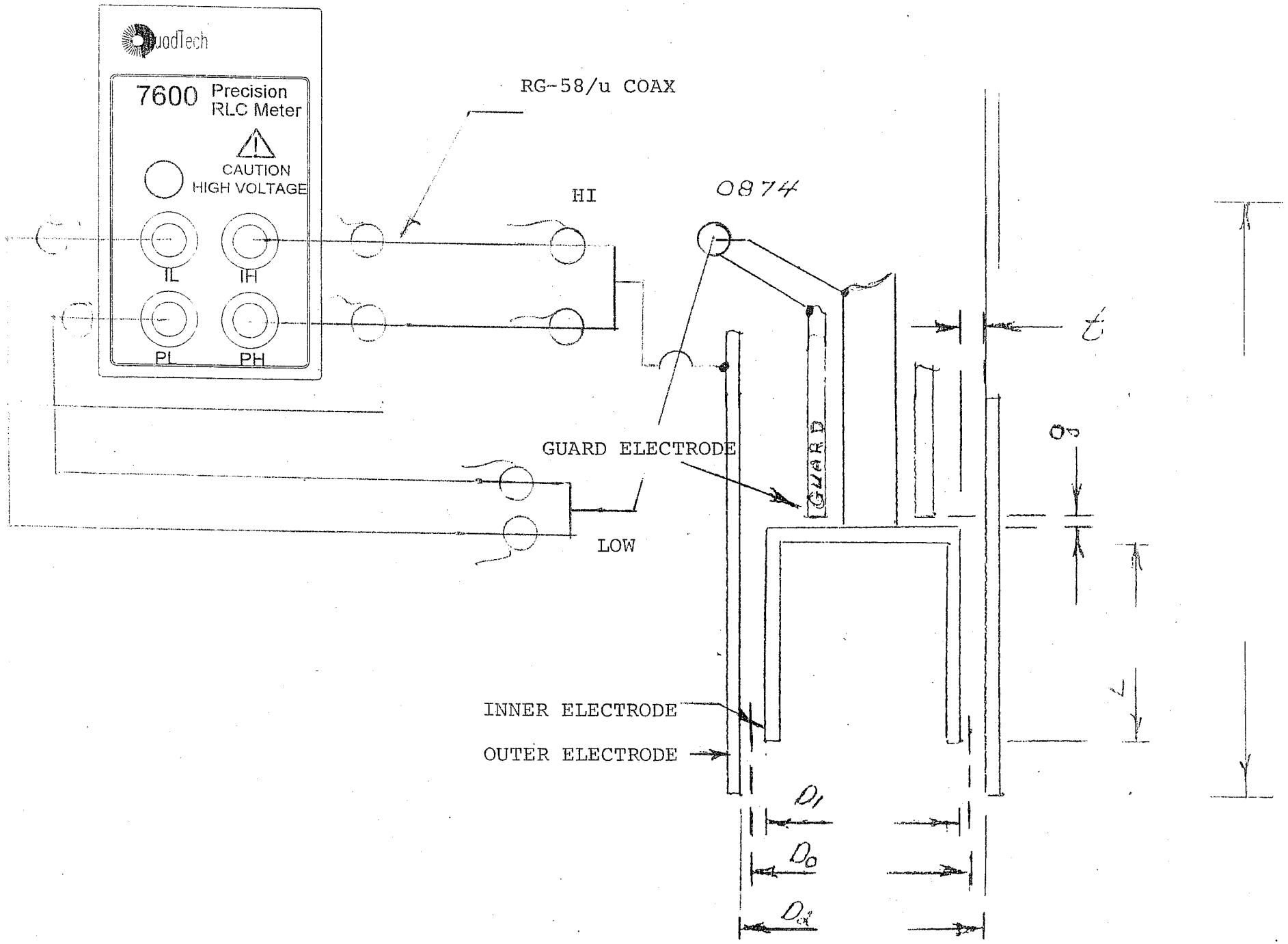
D_o ----	1.0139425 IN.	(O.D. ELECTRODE EFFECTIVE)
D_1 ----	0.966725 IN. (AV.)	(O.D. INNER ELECTRODE)
D_3 ----	0.87777 IN, (AV.)	(I.D. INNER ELECTRODE)
D_4 ----	1.1424 IN. (AV.)	(O.D. OUTTER ELECTRODE)
D_2 ----	1.06116 IN. (AV.)	(I.D. ELECTRODE OUTER)
L_1 ----	2.05716 IN. (AV.)	(LENGTH - INNER ELECTRODE)
g ----	0.0270 IN.	(GUARD, GAP)
Y ----	0.81273 IN. (AV.)	(GUARD, O.D.)
t ----	0.094435 IN. (AV.)	(INNER, OUTTER ELECT. GAP)
d ----	0.243 IN.	(DEPTH TO INNER ELECTRODE)
s ----	2.3455 IN.	(LENGTH TO SLOT,OUTTER ELECTRODE)
A ----	6.6388 IN^2 42.8313 CM^2	(AREA, EFFECTIVE)
*C_v ----	32.8494 uufd	(CAPACITANCE, EMPTY)(OUTSIDE HI)
C_c ----	174.0218	(CELL CONSTANT)
D.F. ----	0.000000	(DISSIPATION FACTOR)

* ---- AS MEASURED WITH A GEN/RAD -1620A CAPACITANCE BRIDGE, THE FREQUENCY IS 1.0 kHz (o,01 % ACC.)

TEST CELL



* ALL CABLES RG-58/U SPECIAL LOW NOISE


QuadTech
7600 Precision RLC Meter
CAUTION HIGH VOLTAGE
IL
IH
PL
PH
RG-58/u COAX
HI
0874
GUARD ELECTRODE
GUARD
LOW
INNER ELECTRODE
OUTER ELECTRODE
D1
Do
Dx
d
S
L
Y

FORMULAR FOR CALCULATING OUTSIDE DIAMETER (O.D.) OF MEASURING ELECTRODE (EFFECTIVE) (D_o)

$$D_o = \frac{D_1 + D_2}{2} + D_1$$

D_o EFFECTIVE O.D. OF MEASURING. (USE IN CALCULATIONS)

D_1 O.D. OF INNER,ELECTRODE

D_2 I.D. OF OUTSIDE ELECTRODE

FORMULAR FOR CALCULATION OF DIELECTRIC CONSTANT

MODEL 350G

$$\frac{C_x \text{ (MEASURED)}}{C_o \text{ (AIR)}} = \square$$

ε_r

k' ---- DIELECTRIC CONSTANT (SAME AS e_r)

C_o ---- CAPACITANCE AS MEASURED WITH AIR (ONLY) BETWEEN THE ELECTRODES (SEE FACTORY NUMBER)

C_x ---- CAPACITANCE OF UNKN SAMPLE BETWEEN THE ELECTRODES, AS MEASURED BY THE CAPACITANCE BRIDGE.

e_r ---- THE RELATIVITY OF DRY AIR AT NORMAL ATMOSPHERIC PRESSURE IS 1.00053. THIS IS USUALLY CLOSE ENOUGH TO THE VALUE IN A VACUUM, 1.0000 TO ALLOW THE CAPACITANCE C_a, OF THE CONFIGUATION OF ELECTRODES IN AIR TO BE USED INSTEAD OF C_o TO DETERMINE THE RELATIVE PERMITTIVITY e_r, WITH SUFFICIENT ACCUARACY.

ADMENDMENT: DISASSEMBLY INSTRUCTIONS.

1.) TO REMOVE THE TOP CONNECTION OF THE MC-100, USE THE 0874 CONNECTOR ELBOW (GROUND),AND UNSCREW THE CONNECTOR SHELL. (ELBOW PROVIDED IN THE TOOL KIT.)

2.) NOW USE THE 7/16 IN. SOCKET AND THE RACHET HANDEL,TO REMOVE THE 1/4 - 20 X 7/16 IN.HEX NUT. THIS MAY BE DONE WITHOUT REMOVING THE OUTTER 0874 CONNECTOR SHELL.

3.) UNDER THE NUT AND FLAT WASHER (1/4" I.D. X 1/2" O.D. X 1/2" THK.) THERE IS A BELLEVUE WASHER,(0.268 I.D. X O.D. 0.490 X 0.018 THK., FREE HT. 0.036, COMP. HT. 0.026 IN.,FORCE AT COMP. HT. 38 - 52 LBS.

SO WHEN RETIGHTENING ASSEMBLE,CENTER FLAT WASHER AND BELLEVUE WASHER, THEN TIGHTEN NUT BY HAND UNTIL YOU MEET A SLIGHT RESISTANCE. THE ROTATE NUT ABOUT 72° DEGREES.

THIS WILL ALLOW FOR TEMPERTURE EXPANSION OF ASSEMBLE.

4.) WHEN DOING THE ASSEMBLY OF THE GLASS SLEEVE,YOU SHOULD USE THE HI. TEMP. GREASE PROVIDED,A SLIGHT COATING OF THE O RING IS ALL THAT IS NEEDED.

NOW PRESS THE GLASS SLEEVE ON THE TOP HOUSING EVENLY (COPLANER) USING A SLIGHT PRESSURE,SLOWLY. THE HI. TEMP. O'RING IS FRAGILE. THE SILICONE GREASE PROVIDED IS DOW CORNING #5 COMPOUND. THIS GREASE CAN BE PURCHASED FROM: APPLIED INDUSTRIES TECH. PHONE NO. 978-988-0600.

THE ASSEMBLY SHOUL BE BROUGHT UP TO TEMP. SLOWLY, 70 - 485°F, OVER ABOUT 30 MIN. DO NOT PUT IN A HOT OVEN.

NOTES