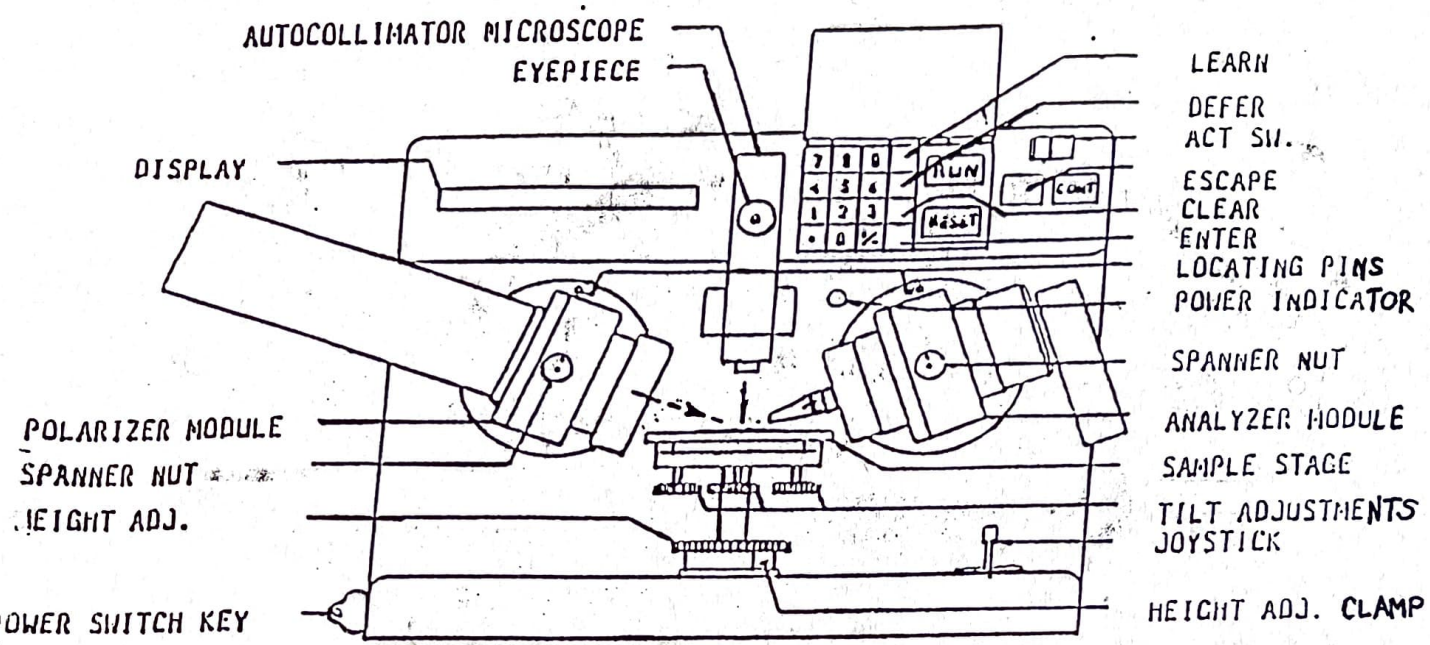


AutoEL IV NIR-3 WITH or WITHOUT OPTION SS1
 CONDENSED OPERATING INSTRUCTION
 FOR SOFTWARE VERSION

633nm →
 830nm →
 405nm → 1.0



- LEARN
- DEFER
- ACT SW.
- ESCAPE
- CLEAR
- ENTER
- LOCATING PINS
- POWER INDICATOR
- SPANNER NUT
- ANALYZER MODULE
- SAMPLE STAGE
- TILT ADJUSTMENTS
- JOYSTICK
- HEIGHT ADJ. CLAMP

INITIALIZATION

1. Turn on the AutoEL AC power with the keylock switch and wait fifteen minutes for warmup. If the power is already on, depress RESET. The green pilot light illuminates and the early stages of initialization commence automatically. Turn on the autocollimating telescope (ACT) lamp power.
2. The AutoEL prompts: "Insert Sample, Press CONT". Place an 1100A thick silicon dioxide film covered silicon sample (Rudolph Check Sample No. A9291-1100 or equal) on the sample stage and press CONT.
3. The AutoEL prompts: "Align Sample, Press CONT".
 - A. Using the joystick, position the sample on the stage so that the rectangular area is under the measurement light beam.
 - B. Adjust sample height to reflect light beam into analyzer entrance aperture. Alternate method: Focus ACT eyepiece sharply on the cross hair reticle; pull 40X magnifier assembly toward operator to limit; adjust sample height until bright spot in center of reticle is sharply focussed.
 - C. Securely tighten height adjustment clamp.

MEASUREMENT ROUTINE SUMMARY

Meas. Routine Number	Section Number	Zones	Speed	Accuracy	Keyboard Entries
1	4.8	1	Fastest	Lowest	None
2	4.8	2	Slowest	Highest	None
3	4.8	2/1	Medium	Medium	None
5	4.8	2/1	Fast	High	Standard Delta, Psi
6	4.8	1	Fastest	High	Delta, Psi Offsets
0	4.8	-----Measurement Bypass-----			Delta, Psi
7	4.8	1	Special	Special*	None
8	4.8	2	Special	Special*	None

* Fast Null Routine for Multi-Point measurements on same wafer. Refer to manual.

PRINTER FORMAT SUMMARY

Format No.	Quantities Printed
0	TU plus other computed quantities with standard deviations.
1	Format 0 plus measurement and calculation routine numbers, ORDERS
2	FORMAT 0 PLUS DELTA, PSI, CYCLE THICKNESS, measurement and calculation routine numbers
3	Format 1 plus DELTA and PSI
4	Format 2 plus, if applicable, R-Theta coordinates
5	Format 3 plus, if applicable, R-Theta coordinates
6	Format 4 plus P's, A's
7	Format 5 plus P's A's

COMMUNICATION ROUTINE SUMMARY

- 0 No communication
- 1 External printer or terminal is repeater for internal printer
- 2 Results transmitted to external computer using SECS II protocol

IDENTIFICATION FORMAT

Format No.

Quantities Printed

- 0 No ident number
- 1 Ident number entered first measurement only, printed every measurement, count also printed
- 2 Ident number entered every measurement is repeated using CONT key, last entered ident number is presented, counter incremented. If a new indent number is entered the counter is reset to 1.

FILM	NU, TU	UPPER FILM	NU, TU
SUBSTRATE	NS, KS	LOWER FILM	NL, TL
		SUBSTRATE	NS, KS

CALCULATION ROUTINE SUMMARY

To Calculate Select Enter Exact Parameters Enter Estimated Parameters

SINGLE LAYER TRANSPARENT FILMS ON SILICON SUBSTRATES

(LAMBDA = 6328A, PHI = 70, NS = 3.858, KS = 0.018
 TU, NU 10 None THICK
 TU 11 NU THICK

ANY TRANSPARENT SINGLE LAYER FILM ON ANY SUBSTRATE

TU, NU 12 LAMBDA, PHI, NS, KS NU, THICK
 TU 13 LAMBDA, PHI, NS, KS, NU THICK

SUBSTRATE OPTICAL CONSTANTS

NS, KS PHI, LAMBDA

CALCULATION ROUTINE SUMMARY (con't.)

TWO LAYER TRANSPARENT FILMS ON SILICON SUBSTRATES

(LAMBDA = 6328A, PHI = 70 , NS = 3.858, KS = 0.018

TU	21	NU, TL, NL	THICK
TU, NU	22	TL, NL	NU, THICK
TU, NL	23	NU, TL	NL, THICK
TU, TL	27	NU, NL	TL, THICK

TWO LAYER TRANSPARENT FILMS ON ANY SUBSTRATE

TU, NU	24	LAMBDA, PHI, NL, TL, NS, KS	NU, THICK
TU, NL	25	LAMBDA, PHI, NU, TL, NS, KS	NL, THICK
TU	26	LAMBDA, PHI, NU, NL, TL, NS, KS	THICK
TU, TL	28	LAMBDA, PHI, NU, NL, NS, KS	TL, THICK

SINGLE LAYER ABSORBING FILMS

TU, NU	31	LAMBDA, PHI, KU, NS, KS	NU, ORDER
TU, KU	32	LAMBDA, PHI, NU, NS, KS	KU, ORDER
TU	33	LAMBDA, PHI, NU, KU, NS, KS	ORDER

TWO LAYER ABSORBING FILMS

TU, NU	41	LAMBDA, PHI, KU, NL, KL, TL, NS, KS	NU, ORDER
TU, KU	42	LAMBDA, PHI, NU, NL, KL, TL, NS, KS	KU, ORDER
TU, NL	43	LAMBDA, PHI, NU, KU, KL, TL, NS, KS	NL, ORDER
TU, KL	44	LAMBDA, PHI, NU, KU, NL, TL, NS, KS	KL, ORDER
TU, TL	45	LAMBDA, PHI, NU, KU, NL, KL, NS, KS	TL, ORDER
TU	46	LAMBDA, PHI, NU, KU, NL, KL, TL, NS, KS	ORDER

POLYSILICON OVER SINGLE FILM ON SILICON (PHI = 70 degree)

TU, NU, KU	49	NL, KL, TL, LAMBDA, NS, KS	THICK
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SUBSTRATE OPTICAL CONSTANTS

NS, KS	70	PHI, LAMBDA	NONE
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FACTORY LOADED PATTERN LOG(WITH OPTION SS1)

APPLICATION	FILE
File available to operator	00-07
Joystick enabled (no stored pattern)	91
Keyboard coordinate entry (no stored pattern)	92
Joystick Enabled (with stored pattern)	93
List contents of pattern files on printer	98
Single point, sample center	20
Five ,points, sample center	21
Five point pattern, 100mm sample	22
Nine point pattern, 100mm sample	23
Twenty point pattern, 100mm sample	24
Five point pattern, 125mm sample	25
Nine point pattern, 125mm sample	26
Twenty point pattern, 125mm sample	27
Five point pattern. 150mm sample	28
Nine point pattern, 150mm sample	29
Twenty point pattern, 150mm sample	30

27

29

31

PATTERNS PROGRAM
 22 21
 +w NU

FACTORY LOADED PROGRAM LOG

FILE	APPLICATION
00-19	Program files available to operator
81	Execute 2 program/pattern files in succession
82	Execute 3 program/pattern files in succession
83	Order resolution specifications
98	List contents of program files on printer

FILE	ROUTINES		LAMBDA	CALUCULATE	DEFERRED PARAMETERS
	MEAS	CALC			
<u>12</u>	Single Layer Transparent Film on Si				
20	2	10	6328	TU, NU	-
21	2	11	6328	TU	NU
22	2	12	8300	TU, NU	-
23	2	13	8300	TU	NU
→ 24	2	12	4050	TU, NU	-
25	2	13	4050	TU	NU

ref w

Single Layer Transparent Film on Si (Entered Spec TU 1000)					
<u>26</u>	2	10	6328	TU, NU	-
28	2	12	8300	TU, NU	-
30	2	12	4050	TU, NU	-

SiO ₂ on Si Fixed Refractive Index* (Entered Spec TU 1000)					
27	2	11	6328	TU	-*
29	2	13	8300	TU	-*
31	2	13	4050	TU	-*

Polysilicon over Transparent Film on Si					
32	2	49	6328	TU, NU, KU	NL, TL
33	2	49	8300	TU, NU, KU	NL, TL

Measurement of Delta, Psi only					
34	2	00	-	DELTA, PSI	LAMBDA

Optical Constants of Bare Substrate					
35	2	70	-	Ns, Ks	LAMBDA

NOTE

Files 26 to 31 have no deferred parameters. The recommended use for these files are thin SiO₂ Films on Si and the Wafer Handling Robot.

* Refractive Index fixed at 1.460 @ 6328 1.455 @ 8300 1.470 @ 4050

Stage
 execute

00 99 Diag. # 5

- D. Adjust sample tilt as follows: Push 40X magnifier assembly to limit of travel away from operator; focus ACT eyepiece sharply on reticle; rotate tilt adjusting screws until white spot visible in ACT is centered on reticle. All tilt adjustment screws must be thumb snug.
- E. Press CONT.
- F. AutoEL displays the masterprompt "Press RUN, LEARN OR CONT" when initialization is complete.

MEASUREMENT ON CHECK SAMPLE (Confidence Test)

- 4. Place the Rudolph Research check sample A9291-1100 on the sample stage.
 - A. Without R-Theta Stage: Align sample as in step 3 above and run program 20 by depressing; RUN, 20.
 - B. With R-Theta Stage: Select pattern file 91 (stage moves under joystick control) and program file 20 by depressing; RUN 91, 20 ENTER. Move the rectangular area under the measurement light beam using the joystick. Align the sample as in Step 3 above. Press CONT. When printing of results is complete press ESCAPE.
- 5. Note results. The measured thickness and refractive index should agree with that on the check sample label within +/- 8A and +/- .005.
 - A. If an error message is displayed during a run, see the manual for explanation. Even if error message is displayed, values significantly different from those expected may result from operator errors that do cause error message displays. To eliminate this possibility, press RESET, return to Step 2, and repeat initialization and check sample measurement procedures.

SUBSEQUENT MEASUREMENTS

- 5. Place new sample on stage. Move the sample under the measurement light beam and align, if necessary as in Step 3. NOTE: The joystick is enabled whenever the master prompt is being displayed.
- 7. Consult the program and, if applicable, the pattern log and select the desired program and pattern files; press RUN; enter the pattern and program file numbers when prompted; enter deferred parameters, if any when prompted. Except for "joystick active" pattern file 91 the specification in the selected files are completed when the master prompt reappears. If the desired specifications are not already loaded in program and pattern files, they must be "learned" and stored in the file.

LEARNING PROGRAMS (Refer to Manual) 4.3.2.3

LEARNING PATTERNS -- JOYSTICK MODE (Refer to Manual)4.4.3

LEARNING PATTERNS -- KEYBOARD MODE (Refer to Manual)4.4.3