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ภาคผนวก

ภาคผนวก ก

ข้อมูลในการวางแผนและกำหนดงานผลิต

ตารางที่ 14 ข้อมูลในการวางแผนและกำหนดงานผลิต

รายละเอียดของชิ้นงาน

ชื่อชิ้นงาน	ลูกค้า	หน่วยต่อแผ่น	พื้นที่ต่อหน่วย	ไม่ผ่านชบวนการ	หมายเหตุ
d1086h	digital	4	0.47	G/P,C/M	
d1230a	data pro.	8	0.28	G/P	
d1301c	digital	2	0.87	-	
d1333a	w.digital	9	0.22	-	
d1345b	digital	2	0.75	-	
d1388b	s.c.i.	3	0.48	G/P	W/F S/M
d1398a	honeywell	2	0.75	-	W/F S/M
d1403a	h.p.	3	0.50	G/P	W/F S/M
d1449a	s.c.m.	9	0.22	-	W/F S/M
d802c	data pro.	2	0.67	G/P	
d804g	data pro.	2	0.56	-	
d827e	E&E	5	0.35	-	
d937a	data pro.	7	0.27	G/P,C/M	
d983g	digital	3	0.50	G/P C/M	
d938i	digital	4	0.53	S/M,G/P,C/M	
d1220a	digital	8	0.21	-	
d1254b	w.digital	6	0.32	-	W/F S/M
d1265b	w.digital	9	0.20	-	W/F S/M
d1242a	data pro.	2	0.75	G/P	

เวลาที่ใช้ผลิตชิ้นงานในหน่วยผลิต (ชั่วโมงต่อแผ่น)

รหัสชิ้นงาน	board cut	drilling	pth	panel plating	dry film	pattern plating
d1086h	0.006	0.006	0.006	0.007	0.004	0.007
d1230a	0.006	0.008	0.006	0.007	0.004	0.008
d1301c	0.006	0.004	0.006	0.005	0.004	0.008
d1333a	0.006	0.008	0.006	0.005	0.002	0.006
d1345b	0.006	0.007	0.006	0.007	0.004	0.008
d1358a	0.006	0.007	0.006	0.006	0.002	0.006
d1388b	0.006	0.014	0.006	0.006	0.004	0.007
d1398a	0.006	0.007	0.006	0.007	0.004	0.008
d1403a	0.006	0.013	0.006	0.007	0.004	0.007
d1449a	0.006	0.007	0.006	0.005	0.002	0.006
d802c	0.006	0.003	0.006	0.007	0.004	0.008
d804g	0.006	0.004	0.006	0.005	0.002	0.006
d827e	0.006	0.004	0.006	0.005	0.004	0.006
d937a	0.006	0.004	0.006	0.006	0.002	0.008
d983g	0.006	0.008	0.006	0.007	0.004	0.009
d938i	0.006	0.007	0.006	0.006	0.004	0.007
d1220a	0.006	0.009	0.006	0.005	0.002	0.006
d1254b	0.006	0.004	0.006	0.005	0.004	0.006
d1265b	0.006	0.009	0.006	0.005	0.004	0.006
d1242a	0.006	0.005	0.006	0.007	0.004	0.006

เวลาที่ใช้ผลิตชิ้นงานในหน่วยผลิต (ชั่วโมงต่อแผ่น)

ชื่อชิ้นงาน	etching	solder mask	gold plating	scl	comp. mark	profile
d1086h	0.003	0.007	0.0	0.004	0.0	0.007
d1230a	0.004	0.007	0.0	0.004	0.005	0.007
d1301c	0.004	0.007	0.007	0.004	0.005	0.011
d1333a	0.003	0.007	0.009	0.004	0.005	0.009
d1345b	0.004	0.007	0.007	0.004	0.005	0.006
d1358a	0.003	0.007	0.0	0.004	0.005	0.006
d1388b	0.003	0.006	0.0	0.004	0.005	0.006
d1398a	0.004	0.006	0.007	0.004	0.005	0.006
d1403a	0.002	0.006	0.0	0.004	0.005	0.008
d1449a	0.002	0.006	0.005	0.004	0.005	0.01
d802c	0.004	0.007	0.0	0.004	0.005	0.004
d804g	0.003	0.007	0.005	0.004	0.005	0.006
d827e	0.003	0.007	0.004	0.004	0.005	0.005
d937a	0.003	0.007	0.0	0.004	0.0	0.003
d983g	0.004	0.007	0.0	0.004	0.0	0.007
d938i	0.004	0.0	0.0	0.004	0.0	0.007
d1220a	0.003	0.007	0.006	0.004	0.005	0.007
d1254b	0.003	0.006	0.009	0.004	0.005	0.007
d1265b	0.004	0.006	0.009	0.004	0.005	0.008
d1242a	0.004	0.007	0.0	0.004	0.005	0.007

รายละเอียดการสั่งซื้อสินค้าใน WW.23

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d937a	data pro.	5607	1513.9	825	1559.3	2
d1242a	data pro.	4674	3505.5	2407	3610.5	3
d804g	data pro.	17140	9598.4	8827	9886.2	4
d1265b	w.digital	20779	4155.8	2378	4280.4	5
d983g	digital	2493	1246.5	856	1284.0	6
d1398a	honeywell	4674	3505.5	2407	3606.0	7
d1301c	digital	6544	5693.3	3370	5863.8	9
	รวม	61911	29218.9	21070	30090.2	

รายละเอียดการสั่งซื้อสินค้าใน WW.24

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d1301c	digital	2400	2088.0	1248	2171.5	9
d1086h	digital	3150	1480.5	819	1539.7	10
d1345b	digital	980	735.0	510	765.0	11
d1388b	s.c.i.	7915	3799.2	2745	3952.8	12
d1398a	honeywell	1885	1413.8	980	1470.0	12
d1230a	data pro.	1213	339.6	158	353.9	12
d983g	w.digital	1095	547.5	380	570.0	12
d1403a	h.p.	12250	6125.0	4247	6370.5	13
d937a	data pro.	3200	864.0	475	897.8	13
d804g	data pro.	2000	1120.0	1040	1164.8	13
d1242a	data pro.	740	555.0	385	577.5	14
d802c	data pro.	1452	972.8	755	1011.7	14
d938i	digital	4167	2208.5	1083	2295.9	15
d1333a	digital	36000	7920.0	4160	8236.8	15
	รวม	78447	30168.9	18985	31377.9	

รายละเอียดการส่งข้อมูลสินค้าใน พ.พ. 25

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d1345b	digital	5194	3895.5	2675	4012.5	17
d938i	digital	6233	3303.5	1605	3402.6	17
d1388b	s.c.i.	6751	3240.5	2318	3337.9	18
d1086h	digital	8513	4001.1	2192	4120.9	18
d802c	data pro.	5715	3829.1	2943	3943.6	16
d1333a	w.digital	15588	3429.4	1784	3532.3	17
d1449a	s.m.c.	23304	5126.9	2667	5280.7	17
	รวม	71298	26826.0	16184	27630.5	

รายละเอียดการสั่งซื้อสินค้าใน WW.29

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d1265b	w.digital	27000	5400.8	3090	5562.0	1
d983g	digital	2000	1000.0	687	1030.5	1
d1086h	digital	4320	2030.4	1112	2090.6	2
d1403a	h.p.	14550	7275.0	4996	7494.0	3
d802c	data pro.	7400	4958.0	3811	5106.7	5
d1333a	w.digital	43000	9460.0	4921	9743.6	5
	รวม	98270	30123.4	18617	31027.4	

รายละเอียดการสั่งซื้อสินค้าใน WW.30

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d1333a	digital	36000	7920.0	4120	8157.6	5
d983g	digital	3650	1825.0	1253	1879.5	6
d1388b	s.c.i.	9210	4420.8	3162	4553.3	6
d1230a	data pro.	2400	672.0	309	692.2	7
d1242a	data pro.	11300	8475.0	5650	8475.0	9
d1398a	honeywell	7920	5940.0	4079	6118.5	12
	รวม	70480	29252.8	18573	29876.1	

รายละเอียดการสั่งซื้อสินค้าใน WW.31

ชื่อชิ้นงาน	ลูกค้า	จำนวน (หน่วย)	พื้นที่ (ตร.ฟุต)	จำนวนผลิตจริง		วันส่ง
				(แผ่น)	(พื้นที่)	
d938i	digital	8334	4417.0	2166	4591.8	11
d1086h	digital	4850	2279.5	1249	2348.1	12
d1449a	s.m.c.	39000	8580.0	4463	8836.7	13
d1345b	digital	12500	9375.0	6438	9657.0	15
d1403a	h.p.	8690	4345.0	2984	4476.0	16
	รวม	73374	28996.5	17300	29909.6	

รายละเอียดของเหตุการณ์ที่เกิดขึ้นในระหว่างการผลิตใน WW.22

ประเภทการหยุด ของเครื่องจักร	ชบวนการ ผลิต	วันที่	เวลา	เวลา ปัจจุบัน	เวลาที่สูญเสีย ในการหยุด(ชม.)	
Conveyor loose	Etching	26/11	17.55	1.45	8.5	
Scrubbing down	Solder mask	26/11	15.30	1.35	1.75	
Chemical shortage	Etching	27/11	10.30	2.15	17.5	
Controller down	SCL	27/11	01.40	2.74	7.0	
Transporter down	Pattern plate	28/11	12.55	3.25	26.0	
ประเภทของ การบกพร่อง	ชบวนการ ผลิต	วันที่	เวลา	เวลา ปัจจุบัน	เกิดขึ้นกับ ชิ้นงาน	จำนวน (แผ่น)
S/M peel off	Solder mask	26/11	12.50	1.25	d983g	725
S/M underdevelop	Solder mask	27/11	07.00	2.0	d1301c	500
Small circuit	Dry film	27/11	14.00	2.29	d1403a	879
Extra hole	Drilling	30/11	14.40	5.32	d1086h	1506

รายละเอียดของเหตุการณ์ที่เกิดขึ้นในระหว่างการผลิตใน WW.28

ประเภทการหยุด ของเครื่องจักร	ขบวนการ ผลิต	วันที่	เวลา	เวลา ปัจจุบัน	เวลาที่สูญเสีย ในการหยุด(ชม.)	
vacuum clean down	drilling	8/1/91	09.35	2.11	4.5	
conveyorize oven	comp.mark	9/1/91	12.50	3.24	1.0	
scrubbing down	solder mask	9/1/91	19.10	3.51	3.2	
pth mixing driver	pth	11/1/91	03.45	4.86	6.5	
controler down	scl	12/1/91	15.15	6.34	9.5	
ประเภทของ การบกพร่อง	ขบวนการ ผลิต	วันที่	เวลา	เวลา ปัจจุบัน	เกิดขึ้นกับ ชิ้นงาน	จำนวน (แผ่น)
s/m peel off	solder mask	7/1/91	13.40	1.28	d1333a	220
solder uneven	scl	8/1/91	20.05	2.55	d1403a	150
s/m underdevelop	solder mask	10/1/91	23.00	4.17	d1333a	367
rough gold	gold plate	10/1/91	23.50	4.20	d1333a	124
copper expose	pattern plate	11/1/91	17.20	5.43	d983g	112
s/m peel off	solder mask	11/1/91	21.30	5.60	d1388b	248

ชนิดและจำนวนชิ้นงานในหน่วยผลิตในขณะเกิดเหตุการณ์หรือมีการพิจารณาใดๆ

เหตุการณ์ : conveyor loose ขบวนการ : etching

ขบวนการผลิต	ชนิดของงาน	จำนวน (แผ่น)	ขบวนการผลิต	ชนิดของงาน	จำนวน (แผ่น)
board cut	d1333a	547	solder mask	d1301c	3370
	d1345b	2675		d1398a	1571
drilling	d1333a	2653	gold plating	d1398a	836
	d938i	1083		d1265b	1167
pth	d1333a	960	scl	d983g	856
	d802c	755		d1265b	1211
	d1242a	385		d804g	2096
	d937a	229		component mark	d804g
panel plating	d937a	246	profile	d804g	2719
	d983g	380		d1242a	1211
	d1230a	158	finished jobs	d937a	825
	d804g	1040		d1242a	1196
dry film	d1403a	1780			
	d1398a	980			
	d1388b	650			
pattern plate	d1403a	1844			
	d1403a	623			
	d1388b	2095			
	d1345b	510			
etching	d1086h	144			
	d1086h	675			

เหตุการณ์ : s/m peel off(d983g) 725 panels เหตุการณ์ :solder mask

เหตุการณ์ผลิต	ชนิดของงาน	จำนวน (แผ่น)	เหตุการณ์ผลิต	ชนิดของงาน	จำนวน (แผ่น)
board cut	d1333a	2364	solder mask	d983g	856
				d1398a	2407
drilling	d802c	755		d1301c	642
	d1242a	385			
	d1333a	1796	gold plating	d1265b	2378
	d938i	1083			
pth			scl	d804g	4815
	d983g	380			
	d1230a	158	component mark	d804g	4012
	d804g	1040			
panel plating	d937a	475	profile	d937a	825
				d1242a	2407
	d1398a	980			
	d1388b	650			
dry film	d1403a	1780			
	d1388b	2095			
pattern plate	d1403a	2467			
	d1301c	1248			
etching	d1086h	819			
	d1345b	510			
	d1301c	2728			

ภาคผนวก ข

กฎเกณฑ์ต่าง ๆ ในระบบผู้สื่อข่าวชาวจีน

กฎเกณฑ์ต่างๆในระบบ

1. if no-change
 then use same sequence
 else proceed the following

แสดงอยู่ในโปรแกรมดังนี้

```
rule1:  if change = no and
        instruction1 = TEXT and
        display(TEXT)
        then no-change.
```

```
instruction1 = ['follow the same sequence until there are
               some changes,',nl,nl].
```

การผลิตยังใช้ตาม sequence เดิม ถ้าไม่มีการเปลี่ยนแปลงใดๆ

2. if events don't affect m/c break
 then use same sequence until
 there is some changes.

ใช้ screen events ที่ไม่มีผลต่อการหยุดชะงักของเครื่องจักร กำหนดด้วย rules ดังนี้

```
rule4:  if machine-break = yes and
        operation-breakdown = G and
        operation-breakdown = any-else and
        instruction3 = TEXT and
```


display(TEXT)

then machine-breakdown.

rule5: if machine-break = yes and

operation-breakdown = G and

kind-of-breakdown(G) = K and

kind-of-breakdown(G) = any-else and

instruction3 = TEXT and

display(TEXT)

then machine-breakdown.

instruction3 = ['this operation does not affect the sequence,
follow the updated sequence until there is
some changes or events.',nl,nll.

events เหล่านี้ เมื่อเกิดขึ้นแล้วการผลิตก็ยังคงใช้ sequence เดิม จนกว่ามี
การเปลี่ยนแปลงใหม่

- เกิดใน operation ที่ระบุว่าเป็น any-else (ได้แก่ board cut, dry film,
solder mask, component mark และ profile)

- ประเภทของ machine break ที่ระบุว่าเป็น any-else ใน operation
นอกจากข้างต้น (เช่น s/m scrubbing m/c down, scl-pre-heating
down เป็นต้น)

3. if events affect m/c break

then update the jobs' status

with expected time to be up

ใช้ screen events ที่มีผลต่อการหยุดชะงักของเครื่องจักร กำหนดด้วย rules
ดังนี้

```
rule6: if machine-break = yes and
        operation-breakdown = G and
        kind-of-breakdown(G) = K and
        not(kind-of-breakdown(G) = any-else) and
        display(TEXT) and
        duration-down-time
        then machine-breakdown.

rule8: if machine-break = yes and
        operation-breakdown = G and
        not(kind-of-breakdown(G) = any-else) and
        duration-break(G) = H and
        display(['duration ',G,' breakdown time = ',H, '
        hours',nl,nl])
        then duration-down-time.
```

events ต่อไปนี้ เมื่อเกิดขึ้นแล้วจะต้องคาดหมายเวลาที่ทำให้เครื่องจักรสามารถ
เดินได้ตามปกติ เพื่อใช้ในการคำนวณหา jobs status ใน operation นั้นต่อไป

- เกิดใน operation : drilling,pth,panel plating,pattern
plating,etching,gold plating ,scl และ
- ประเภทของ machine break ใน operation ข้างต้น:

drilling - vacuum cleaner down

- drill bit shortage

pth - pth mixing driver down

- pth transportor down

panel plating - panel mixing driver down

- panel transportor down

pattern plating - pattern mixing driver down

- pattern transportor down

etching - conveyer loose

- solution out of limit

- chemical shortage

gold plating - gold plating controller

scl - scl controller

4. if there are defect boards to be reworked

then sequence the reworked board

else use same sequence, not to be reworked

ใช้ screen events และ defect boards ที่มีผลต่อการพิจารณาลำดับการ
rework มี rules ดังนี้

```

rule9: if defect-jobs = yes and
      defect-in-operation = G and
      defect-in-operation = any-else and
      instruction3 = TEXT and
      display(TEXT)
      then rework-jobs.

```

```

rule10: if defect-jobs = yes and
        defect-in-operation = G and
        kind-of-defect(G) = any-else and
        instruction3 = TEXT and
        display(TEXT) and
        then rework-jobs.

```

defects ที่เกิดขึ้นโดยมีเงื่อนไขต่อไปนี้จะไม่นำมาพิจารณา sequence
เนื่องจากไม่มีผลกระทบ

- เกิดใน operation ที่ระบุว่าเป็น any-else (ได้แก่ board cut, etching, profile)
- ประเภทของ defect ที่ระบุว่าเป็น any-else ใน operation นอกเหนือจากข้างต้น (เช่น open circuit, short circuit, rough solder เป็นต้น)

```

rule11: if defect-jobs = yes and
        defect-in-operation = G and
        kind-of-defect(G) = K and
        not(kind-of-defect(G) = any-else) and
        jobtype-rework(G) = J and

```

quantity-rework(G) = Q

then rework-jobs.

events ของ defect boards ที่มีผลต่อ sequence ก็ต่อเมื่ออยู่ภายใต้เงื่อนไขต่อไปนี้

- เกิดใน operation : drilling, pth, panel plating, dry film pattern plating, solder mask, gold plating, scl, component mark และ

- ประเภทของ defect ใน operation ข้างต้น :

drilling - extra hole

- hole undersize

- hole oversize

pth - pth failed

panel plating - copper nodule

dry film - small circuit

solder mask - pattern shift

- uncomplete ink

- underdevelop

- s/m peel off

gold plating - rough gold

scl - solder uneven

component mark - blur mark

5. if duedate-changed
 then update the jobs'status

6. if job-cancelled
 then take the job(s)
 out of the list

rule จากข้อ 5 และ 6 ใช้สำหรับเกิดความไม่แน่นอนของ jobs order โดยมีผลต่อการคำนวณ job status ซึ่งแสดงด้วย rule ดังนี้

rule13: if contingency = yes and
 instruction4 = TEXT and
 display(TEXT)
 then contingencies.

instruction4 = ['do not forget to update the data before
 computing the sequence.',nl,nll.

7. if job-arrived(buffer)
 then goto state-iden-rules.

เมื่อมี jobs order หรือมี events ใดๆ การพิจารณาเพื่อจัด sequence จะใช้ state identification rules เพื่อแยก status ของชิ้นงานต่างๆใน buffer ของทุกๆ operations rules ต่อไปนี้ แสดงการ set ชิ้นงานก่อน

83 state-iden-rules

```
rule14: if present = P and
        do(set present-date = P) and
        display([nl,' under proceeding... please wait...'
        ,nl,nl]) and
        board-cut-buffer = B and
        length(B) = N and
        do(set bc-number-of-jobs = N) and
        drilling-buffer = B1 and
        length(B1) = N1 and
        do(set drill-number-of-jobs = N1) and
        pth-buffer = B2 and
        length(B2) = N2 and
        do(set pth-number-of-jobs = N2) and
        panel-plating-buffer = B3 and
        length(B3) = N3 and
        do(set panel-number-of-jobs = N3) and
        dry-film-buffer = B4 and
        length(B4) = N4 and
        do(set df-number-of-jobs = N4) and
        pattern-plating-buffer = B5 and
        length(B5) = N5 and
        do(set pattern-number-of-jobs = N5) and
        etching-buffer = B6 and
        length(B6) = N6 and
        do(set etch-number-of-jobs = N6) and
        solder-mask-buffer = B7 and
```

```
length(B7) = N7 and
do(set sm-number-of-jobs = N7) and
gold-plating-buffer = B8 and
length(B8) = N8 and
do(set gp-number-of-jobs = N8) and
scl-buffer = B9 and
length(B9) = N9 and
do(set scl-number-of-jobs = N9) and
component-mark-buffer = B10 and
length(B10) = N10 and
do(set cm-number-of-jobs = N10) and
profile-buffer = B11 and
length(B11) = N11 and
do(set profile-number-of-jobs = N11) and
addtodatabase(B) and
addtodatabase1(B1) and
addtodatabase2(B2) and
addtodatabase3(B3) and
addtodatabase4(B4) and
addtodatabase5(B5) and
addtodatabase6(B6) and
addtodatabase7(B7) and
addtodatabase8(B8) and
addtodatabase9(B9) and
addtodatabase10(B10) and
addtodatabase11(B11)
then set-jobtypes.
```


8. if no-of-jobs-in-operation-gt-limit
then machine-overload.

จำนวนงานที่จะต้องผลิตในแต่ละ operation ณ. การพิจารณาขณะนั้น จะเป็นการ
overload หากมีมากเกินไป limit ของ operation นั้นๆ rules เหล่านี้ คือ

rule366: if bc-number-of-jobs = N and
N > 7
then bc-machine-overload.

rule367: if drill-number-of-jobs = N and
N > 5
then drill-machine-overload.

rule368: if pth-number-of-jobs = N and
N > 6
then pth-machine-overload.

rule369: if panel-number-of-jobs = N and
N > 6
then panel-machine-overload.

rule370: if df-number-of-jobs = N and
N > 7
then df-machine-overload.

rule371: if pattern-number-of-jobs = N and
N > 6
then pattern-machine-overload.

rule372: if etch-number-of-jobs = N and
N > 6
then etch-machine-overload.

rule373: if sm-number-of-jobs = N and
N > 5
then sm-machine-overload.

rule374: if gp-number-of-jobs = N and
N > 5
then gp-machine-overload.

rule375: if scl-number-of-jobs = N and
N > 7
then scl-machine-overload.

rule376: if cm-number-of-jobs = N and
N > 7
then cm-machine-overload.

rule377: if profile-number-of-jobs = N and
N > 7
then profile-machine-overload.

จำนวนงานที่ limit ใน operation ผิดดังนี้

board cut - 7
 drilling - 5
 pth - 6
 panel plating - 6
 dry film - 7
 pattern plating - 6
 etching - 6
 solder mask - 5
 gold plating - 5
 scl - 7
 component mark - 7
 profile - 7

9. if STRM-lt-7200(min)
 then late(job).

10. if STRM-bt-7200(min)
 then ok(job).

เป็น state identification rule ที่ใช้ค่า SLACK TIME REMAINING (STRM) เป็นเกณฑ์ เพื่อแยก status ของงานว่าเป็น late job หรือ okjob แสดงด้วย rules ต่างๆ ดังนี้

rule402: if bc-jobtype = A and
 bc-strm(A) = S and
 S < 7200.0
 then bc-job-status(A) = late.

```
rule403: if bc-jobtype = A and
          bc-strm(A) = S and
          S >= 7200.0
          then bc-job-status(A) = ok.
```

```
rule404: if drill-jobtype = A and
          drill-strm(A) = S and
          S < 7200.0
          then drill-job-status(A) = late.
```

```
rule405: if pth-jobtype = A and
          pth-strm(A) = S and
          S <= 7200.0
          then pth-job-status(A) = ok.
```

ในทำนองเดียวกัน ใน operation อื่นๆ มีลักษณะ rule เหมือนกับข้างต้น คือ ถ้างานมีค่า strm น้อยกว่า 7200 นาที (120 ชั่วโมง) งานนั้นอยู่ในชั้น late แต่ถ้างานมีค่า strm มากกว่าหรือเท่ากับ 7200 นาที งานนั้นจะอยู่ในชั้น ok

```
11. if has-late-job and
     machine-overload
     then use COVERT for late.
```

เป็น mode selection rule ใช้สำหรับเลือก heuristic ที่เหมาะสม แสดงด้วย rules ดังต่อไปนี้

```

rule132: if pth-machine-overload and
          listof(A,pth-jobtype = A and pth-job-status(A) =
          late) = LIST and
          length(LIST) = N and
          N = 0 or N = 1 and
          display(' list of late jobtype in pth = ',
          LIST,nl))
          then late-job-sequence2 = LIST.

```

```

rule133: if pth-has-late-job and
          pth-machine-overload and
          list-of-jobtypes-ordered-by-covert2 = C and
          display(' list of late jobtypes ordered by
          COVERT in pth = ',C,nl)) and
          length(C) = N and
          not(N<2)
          then late-job-sequence2 = C.

```

```

rule134: if listof(A,pth-jobtype = A and pth-job-status(A) =
          late) = LIST and
          insort2(LIST) = OC
          then list-of-jobtypes-ordered-by-covert2 = OC.

```

job status คือ เครื่องจักร overload และเป็น late job
 สำหรับ conventional rule ที่ถูกนำมาใช้ คือ COVERT ดังนี้

```

rule167: if covert2(A) = C1 and
          covert2(X) = C2 and

```

$C1 \leq C2$ and
 $\text{insortx2}(X, L) = U$
 then $\text{insortx2}(X, [A:L]) = [A:U]$.

rule190: if $\text{pth-job-status}(A) = \text{late}$ and
 $\text{pth-strm}(A) = S$ and
 $S \leq 0$ and
 $\text{pth-wip-quantity}(A) = N$ and
 $\text{pth-processing-time}(A) = P$ and
 $N * P = T$ and
 $(1/T) * (-1) = C$
 then $\text{covert2}(A) = C$.

rule191: if $\text{pth-job-status}(A) = \text{late}$ and
 $\text{pth-strm}(A) = S$ and
 $S > 0$ and
 $\text{pth-wip-quantity}(A) = N$ and
 $\text{pth-processing-time}(A) = P$ and
 $N * P = T$ and
 $(S/100-1)/T = C$
 then $\text{covert2}(A) = C$.

และในทำนองเดียวกัน เหมือนกันกับ operations อื่นๆ เมื่อมี job status
 เช่นเดียวกันนี้

12. if has-late-job and
 $\text{not}(\text{machine-overload})$
 then use SPT for late.

เป็น mode selection rule อีก rule หนึ่งซึ่งเลือก heuristic ที่เหมาะสม
มี rules ต่างๆดังนี้

```
rule231: if not(sm-machine-overload) and
          listof(A,sm-jobtype = A and sm-job-status(A) =
          late) = LIST and
          length(LIST) = N and
          N = 0 or N = 1 and
          display('list of late jobtype in solder mask = ',
          ,LIST,nl))
          then late-job-sequence7 = LIST.
```

```
rule232: if sm-has-late-job and
          not(sm-machine-overload) and
          list-of-jobtypes-ordered-by-covert7 = PT and
          display('list of late jobtypes ordered by
          SPT in solder mask = ',PT,nl)) and
          length(PT) = N and
          not(N<2)
          then late-job-sequence7 = PT.
```

```
rule233: if listof(A,sm-jobtype = A and sm-job-status(A) =
          late) = LIST and
          insert7(LIST) = SPT
          then list-of-jobtypes-ordered-by-short-
          processing-time7 = SPT.
```

job status คือ เครื่องจักรไม่ overload และเป็น late job
 สำหรับ conventional rule ที่ถูกนำมาใช้ คือ shortest processing
 time(SPT) ดังนี้

```
rule297: if solder-mask-processing-time(A) = P1 and
          solder-mask-processing-time(X) = P2 and
          sm-wip-quantity(A) = N1 and
          sm-wip-quantity(X) = N2 and
          P1*N1 = M1 and
          P2*N2 = M2 and
          M1 <= M2 and
          insertx7(X,L) = U
          then insertx7(X,[A:L]) = [A:U].
```

สำหรับ operations อื่นๆ ที่มี job status แบบเดียวกันนี้ ก็ใช้ rule ลักษณะ
 เดียวกันนี้

```
13. if has-ok-job and
      machine-overload
      then use SPT for ok.
```

เป็น rule ใช้เลือก heuristic อีกลักษณะหนึ่ง โดยมี rules ต่างๆดังนี้

```
rule270:if gp-machine-overload and
          listof(A,pth-jobtype = A and gp-job-status(A) =
          ok) = LIST and
          length(LIST) = N and
          N = 0 or N = 1 and
```



```

display(' list of ok jobtype in gold plating = ',
LIST,nll)
then ok-job-sequence8 = LIST.

```

```

rule271: if gp-has-ok-job and
gp-machine-overload and
list-of-jobtypes-ordered-by-covert8 = PT and
display(' list of ok jobtypes ordered by SPT
in gold plating = ',PT,nll) and
length(PT) = N and
not(N<2)
then ok-job-sequence8 = PT.

```

```

rule272: if listof(A,gp-jobtype = A and gp-job-status(A) =
ok) = LIST and
insert8(LIST) = SPT
then list-of-jobtypes-ordered-by-processing time8 =
SPT.

```

job status คือ เครื่องจักร overload และเป็น ok job
conventional rules ที่ใช้คือ shortest processing time(SPT) ดังแสดง
ไว้ข้างต้น และใช้กับ operations อื่นๆ ที่มี job status เหมือนกัน

```

14. if has-ok-job and
not(machine-overload)
then use EDD for ok.

```

เป็น rule ในลักษณะสุดท้ายที่ใช้เลือก heuristic ที่เหมาะสม มี rules ดังต่อไปนี้

```
rule333: if not(scl-machine-overload) and
          listof(A,scl-jobtype = A and scl-job-status(A) =
          ok) = LIST and
          length(LIST) = N and
          N = 0 or N = 1 and
          display([' list of ok jobtype in scl = ',
          ,LIST,nl])
          then ok-job-sequence9 = LIST.
```

```
rule334: if scl-has-ok-job and
          not(scl-machine-overload) and
          list-of-jobtypes-ordered-by-earliest-due-
          date9 = ED and
          display([' list of late jobtypes ordered by
          EDD in scl = ',ED,nl]) and
          length(ED) = N and
          not(N<2)
          then ok-job-sequence9 = ED.
```

```
rule335: if listof(A,scl-jobtype = A and scl-job-status(A) =
          ok) = LIST and
          insert21(LIST) = EDD
          then list-of-jobtypes-ordered-by-earliest-
          due-date9 = EDD.
```

job status คือ เครื่องจักรไม่ overload และเป็น ok job
 conventional rule ที่ถูกนำมาใช้ คือ EARLIEST DUE DATE(EDD)
 โดยมี rule ดังนี้

```
rule361: if scl-duedate(A) = D1 and
           scl-duedate(X) = D2 and
           D1 < D2 and
           insertx21(X,L) = U
           then insertx21(X,[A:L]) = [A:U].
```

และเช่นกันในทุกๆ operations อื่น ที่มี job status ดังกล่าวก็
 ใช้ rule ลักษณะเดียวกัน

15. if jobs' status sequence are combined
 then get jobtypes-sequence.

เป็น rule ที่บ่งถึงเป้าหมาย(goal)ของโปรแกรมนี้ เป็นการเชื่อมต่อกับ
 jobs' status sequence ต่างๆที่เกิดจากการโปรแกรมใน expert
 system design ใน operation นั้น ผลลัพธ์คือ jobtypes sequence
 ที่เหมาะสม ตัวอย่าง rules ที่แสดงถึงการได้รับผลลัพธ์นี้ คือ

```
rule102: if late-job-sequence1 = A and
           ok-job-sequence1 = B and
           append(A,B) = C
           then drill-combined-sequence.
```

ภาคผนวก ค

ตัวอย่างแผนการผลิตที่ได้จากระบบผู้เชี่ยวชาญ

Are there any changes from last sequence consideration?

yes cf 100

Please complete in these database input :

1. operations buffer jobtypes(include new MOR,as a list format)
2. work-in-process quantity(panels of jobtypes in buffer).
3. duedate considered of jobtypes(against present time).
4. operations processing for jobtypes(hrs).

Do you input all databases ready?

yes cf 100

Are there any machine breakdown or absentism of operator(s) that affects the machine(s) break?

yes cf 100

Which operation breaks down?

pattern-plating cf 100

How long would you expect the pattern-plating will take to be up again?in x.x hrs

26.0 cf 100

the duration breakdown time in pattern-plating = 26.0 hrs

Are there any defect boards that have to rework during processing?

no cf 100

Are there any other contingencies ie. changes in due date, cancellation of jobs?

no cf 100

What is the date to be used as present time in the consideration?

3.25 cf 100

under proceeding... please wait...

* JOBTYPES SEQUENCE COMPUTATION RESULT *

BOARD CUT JOBTYPES SEQUENCE :

list of late jobtype in board cut = []

list of ok jobtypes ordered by EDD in board cut = [d802c,d1086h]

priority	jobtype	quantity	processing-time
1	d802c	2943	17.658
2	d1086h	2192	13.152

total board cut machine working hours = 30.81

DRILLING JOBTYPES SEQUENCE :

list of late jobtype in drilling = []

list of ok jobtypes ordered by EDD in drilling = [d938i,d1345b,
d1388b,d1086h]

priority	jobtype	quantity	processing-time
1	d938i	229	1.603
2	d1345b	2675	18.725
3	d1388b	2318	32.452
4	d1086h	33	0.198

total drilling machine working hours = 52.978

PLATE THROUGH HOLE JOBTYPES SEQUENCE :

list of late jobtype in pth = []

list of ok jobtypes ordered in pth = [d938i]

priority	jobtype	quantity	processing-time
1	d938i	2426	14.556

total pth machine working hours = 14.556

PANEL PLATING JOBTYPES SEQUENCE :

list of late jobtype in panel plating = []

list of ok jobtypes ordered by EDD in panel plating =
[d938i,d1333a]

priority	jobtype	quantity	processing-time
1	d938i	33	0.198
2	d1333a	2509	12.545

total panel plating machine working hours = 12.743

DRY FILM JOBTYPES SEQUENCE :

list of late jobtype in dry film = []

list of ok jobtypes ordered in dry film = [d1333a]

priority	jobtype	quantity	processing-time
1	d1333a	463	0.926

total dry film machine working hours = 0.926

PATTERN PLATING JOBTYPES SEQUENCE :

list of late jobtype in pattern plating = []

list of ok jobtypes ordered by EDD in paattern plating =

[d804g,d1403a,d1242a,,d802c,d1333a]

priority	jobtype	quantity	processing-time
1	d804g	621	3.726
2	d1403a	3546	24.822
3	d1242a	770	4.62
4	d802c	755	6.04
5	d1333a	1188	7.128

total pattern plating machine working hours = 46.336

ETCHING JOBTYPES SEQUENCE :

list of late jobtype in etching = []

list of ok jobtypes ordered by EDD in etching = [d1388b,d937a,d804g

priority	jobtype	quantity	processing-time
1	d1388b	547	1.641
2	d937a	475	1.425

3 d804g 419 1.257

total etching machine working hours = 4.323

SOLDER MASK JOBTYPES SEQUENCE :

list of late jobtype in solder mask = []

list of ok jobtypes ordered by EDD in solder mask = [d1345b,d983g,
d1230a,d1388b,d1398a]

priority	jobtype	quantity	processing-time
1	d1345b	510	3.57
2	d983g	380	2.66
3	d1230a	158	1.106
4	d1388b	2817	16.902
5	d1398a	980	5.88

total solder mask machine working hours = 30.118

GOLD PLATING JOBTYPES SEQUENCE :

list of late jobtype in gold plating = []

list of ok jobtypes ordered in gold plating = [d1301c]

priority	jobtype	quantity	processing-time
1	d1301c	944	6.608

total gpld plating machine working hours = 6.608

SOLDER COATED LEVELLING JOBTYPES SEQUENCE :

list of late jobtype in scl = []

list of ok jobtypes ordered by EDD in scl = [d1301c,d1086h]

priority	jobtype	quantity	processing-time
1	d1301c	1528	6.112
2	d1086h	819	3.276

total scl machine working hours = 9.388

COMPONENT MARK JOBTYPES SEQUENCE :

list of late jobtype in component mark = [d1398a]

list of ok jobtypes ordered in component mark = [d1301c]

priority	jobtype	quantity	processing-time
1	d1398a	2117	10.585
2	d1301c	898	4.49

total componentt mark machine working hours = 15.075

PROFILE JOBTYPES SEQUENCE :

list of late jobtype ordered by SPT in profile = [d1398a,d804g]

list of ok jobtypes ordered in profile = []

priority	jobtype	quantity	processing-time
1	d1398a	140	0.84
2	d804g	6929	41.574

total profile machine working hours = 42.414

jobtypes-sequence = yes (100%) because kb-109.

ภาคผนวก ง

ชุดคำสั่งภาษาต้นฉบับ

```

/*
    PCB : Production Master Plan Program...
    The goal is the optimal jobtypes sequence of Manufacturing
    Order Released (MOR).
*/

/* ----- WEEKLY-MOR-AND-EVENTS-SCREEN ----- */

initialdata =[no-change,has-change,machine-breakdown,rework-jobs,
contingencies,set-jobtypes].

question(change) =
['Are there any changes from last sequence consideration?'].

legalvals(change) = [yes,no].

if  change = no and
    instruction1 = TEXT and
    display(TEXT)
then no-change.

instruction1 =
['follow the same sequence until there are some changes.',nl,nl].

if  change = yes and
    instruction2 = TEXT and
    display(TEXT) and
    input-data = yes
then has-change.

question(input-data) = ['Do you input all databases ready?'].

legalvals(input-data) = [yes,no].

if  change = yes and
    input-data = no and
    display(['Please recheck and input above data refered',nl,
nl])
then has-change.

instruction2 = [nl,nl,'
Please complete in these database input :
    1. operations buffer jobtypes(include new MOR,as a list
format).
    2. work-in-process quantity(panels of jobtypes in buffer).
    3. duedate considered of jobtypes(against present time).
    4. operations processing time for jobtypes(hrs).',nl,nl].

/* ----- MACHINE-BREAKDOWN ----- */

if  machine-break = yes and
    operation-breakdown = G and
    operation-breakdown = any-else and

```

```

        instruction3 = TEXT and
        display(TEXT)
    then machine-breakdown.

    if machine-break = yes and
        operation-breakdown = G and
        kind-of-breakdown(G) = K and
        kind-of-breakdown(G) = any-else and
        instruction3 = TEXT and
        display(TEXT)
    then machine-breakdown.

    if machine-break = yes and
        operation-breakdown = G and
        kind-of-breakdown(G) = K and
        not(kind-of-breakdown(G) = any-else) and
        duration-down-time
    then machine-breakdown.

    if machine-break = no
    then machine-breakdown.

    question(machine-break) = ['Are there any machine breakdown
    or absentism of operator(s) that affects the machine(s) break?'].

    legalvals(machine-break) = [yes,no].

    noautomaticquestion(kind-of-breakdown(any-else)).

    question(operation-breakdown) = ['Which operation breaks down?'].

    legalvals(operation-breakdown) =
    [drilling,pth,panel-plating,pattern-plating,etching,gold-plating,
    scl,any-else].

    instruction3 =
    ['this operation does not affect the sequence, follow the updated
    sequence until there is some changes or events.',nl,nl].

    if machine-break = yes and
        operation-breakdown = G and
        not(kind-of-breakdown(G) = any-else) and
        duration-break(G) = H and
        display(['the duration breakdown time in ',G,' = ',H,'days'
        ,nl,nl])
    then duration-down-time.

    question(kind-of-breakdown(G)) =
    ['What is the kind of machine breakdown in ',G,'?'].

    legalvals(kind-of-breakdown(drilling)) =
    [vacuum-cleaner,drill-bit-shortage,any-else].

```

```

legalvals(kind-of-breakdown(pth)) =
[pth-mixing-driver,pth-transportor,any-else].

legalvals(kind-of-breakdown(panel-plating)) =
[panel-mixing-driver,panel-transportor,any-else].

legalvals(kind-of-breakdown(pattern-plating)) =
[pattern-mixing-driver,pattern-transportor,any-else].

legalvals(kind-of-breakdown(etching)) =
[conveyor-loose,solution-out-of-limit,chemical-shortage,any-else].

legalvals(kind-of-breakdown(gold-plating)) =
[gold-plating-controler,any-else].

legalvals(kind-of-breakdown(scl)) =
[scl-controler,any-else].

question(duration-break(G)) =
['How long would you expect the ',G,' will take to be up again?
in x.x hrs'].

legalvals(duration-break(G)) = real.

/* ----- REWORK-JOBS ----- */

if  defect-jobs = yes and
    defect-in-operation = G and
    defect-in-operation = any-else and
    instruction3 = TEXT and
    display(TEXT)
then rework-jobs.

if  defect-jobs = yes and
    defect-in-operation = G and
    kind-of-defect(G) = any-else and
    instruction3 = TEXT and
    display(TEXT)
then rework-jobs.

if  defect-jobs = yes and
    defect-in-operation = G and
    kind-of-defect(G) = K and
    not(kind-of-defect(G) = any-else) and
    jobtype-rework(G) = J and
    quantity-rework(G) = Q
then rework-jobs.

if  defect-jobs = no
then rework-jobs.

question(defect-jobs) =

```



```
['Are there any defect boards that have to rework during  
processing?'].
```

```
legalvals(defect-jobs) = [yes,no].
```

```
noautomaticquestion(kind-of-defect(any-else)).
```

```
question(defect-in-operation) =  
['Which operation occurs the defect board?'].
```

```
legalvals(defect-in-operation) =  
[drilling,pth,panel-plating,dry-film,pattern-plating,solder-mask,  
gold-plating,scl,component-mark,any-else].
```

```
question(kind-of-defect(G)) =  
['What is the kind of defect board in ',G,'?'].
```

```
legalvals(kind-of-defect(drilling)) =  
[extra-hole,hole-undersize,hole-oversize,any-else].
```

```
legalvals(kind-of-defect(pth)) =  
[pth-failed,any-else].
```

```
legalvals(kind-of-defect(panel-plating)) =  
[copper-nodule,any-else].
```

```
legalvals(kind-of-defect(dry-film)) =  
[small-circuit,any-else].
```

```
legalvals(kind-of-defect(pattern-plating)) =  
[copper-expose,any-else].
```

```
legalvals(kind-of-defect(solder-mask)) =  
[pattern-shift,uncomplete-ink,under-develop,solder-mask-peel-off  
,any-else].
```

```
legalvals(kind-of-defect(gold-plating)) =  
[rough-gold,any-else].
```

```
legalvals(kind-of-defect(scl)) =  
[solder-uneven,any-else].
```

```
legalvals(kind-of-defect(component-mark)) =  
[blur-mark,any-else].
```

```
question(jobtype-rework(G)) =  
['What kind of jobtype have to be reworked in ',G,'?'].
```

```
question(quantity-rework(G)) =  
['How many panels of the rework boards?'].
```

```
legalvals(quantity-rework(G)) = integer.
```

```

/* ----- CONTINGENCIES ----- */

if  contingency = yes and
    instruction4 = TEXT and
    display(TEXT)
then contingencies.

question(contingency) =
['Are there any other contingencies ie. changes in duedate,
cancellation of jobs?'].

legalvals(contingency) = [yes,no].

instruction4 =
['do not forget to update the data before computing the sequence.
',nl,nl].

/* ----- OPTIMAL-JOBTYPES-SEQUENCE ----- */

goal = jobtypes-sequence.

if  present-time = P and
    do(set present-date = P) and
    display([nl,'under proceeding...please wait...',nl,nl]) and
    board-cut-buffer = B and
    length(B) = N and
    do(set bc-number-of-jobs = N) and
    drilling-buffer = B1 and
    length(B1) = N1 and
    do(set drill-number-of-jobs = N1) and
    pth-buffer = B2 and
    length(B2) = N2 and
    do(set pth-number-of-jobs = N2) and
    panel-plating-buffer = B3 and
    length(B3) = N3 and
    do(set panel-number-of-jobs = N3) and
    dry-film-buffer = B4 and
    length(B4) = N4 and
    do(set df-number-of-jobs = N4) and
    pattern-plating-buffer = B5 and
    length(B5) = N5 and
    do(set pattern-number-of-jobs = N5) and
    etching-buffer = B6 and
    length(B6) = N6 and
    do(set etch-number-of-jobs = N6) and
    solder-mask-buffer = B7 and
    length(B7) = N7 and
    do(set sm-number-of-jobs = N7) and
    gold-plating-buffer = B8 and
    length(B8) = N8 and
    do(set gp-number-of-jobs = N8) and
    scl-buffer = B9 and
    length(B9) = N9 and

```

```
do(set scl-number-of-jobs = N9) and
component-mark-buffer = B10 and
length(B10) = N10 and
do(set cm-number-of-jobs = N10) and
profile-buffer = B11 and
length(B11) = N11 and
do(set profile-number-of-jobs = N11) and
addtodatabase(B) and
addtodatabase1(B1) and
addtodatabase2(B2) and
addtodatabase3(B3) and
addtodatabase4(B4) and
addtodatabase5(B5) and
addtodatabase6(B6) and
addtodatabase7(B7) and
addtodatabase8(B8) and
addtodatabase9(B9) and
addtodatabase10(B10) and
addtodatabase11(B11)
then set-jobtypes.

if present = K
then present-time = (K/24)+1.

question(present) = ['What is the date to be used as
present time in the consideration?'].

legalvals(present) = real.

addtodatabase([]).

if do(set bc-jobtype = A) and
bc-wip-quantity(A) = Q and
addtodatabase(L)
then addtodatabase([A|L]).

addtodatabase1([]).

if do(set drill-jobtype = A) and
drill-wip-quantity(A) = Q and
addtodatabase1(L)
then addtodatabase1([A|L]).

addtodatabase2([]).

if do(set pth-jobtype = A) and
pth-wip-quantity(A) = Q and
addtodatabase2(L)
then addtodatabase2([A|L]).

addtodatabase3([]).
```

```
if do(set panel-jobtype = A) and
    panel-wip-quantity(A) = Q and
    addtodatabase3(L)
then addtodatabase3([A|L]).
```

```
addtodatabase4([]).
```

```
if do(set df-jobtype = A) and
    df-wip-quantity(A) = Q and
    addtodatabase4(L)
then addtodatabase4([A|L]).
```

```
addtodatabase5([]).
```

```
if do(set pattern-jobtype = A) and
    pattern-wip-quantity(A) = Q and
    addtodatabase5(L)
then addtodatabase5([A|L]).
```

```
addtodatabase6([]).
```

```
if do(set etch-jobtype = A) and
    etch-wip-quantity(A) = Q and
    addtodatabase6(L)
then addtodatabase6([A|L]).
```

```
addtodatabase7([]).
```

```
if do(set sm-jobtype = A) and
    sm-wip-quantity(A) = Q and
    addtodatabase7(L)
then addtodatabase7([A|L]).
```

```
addtodatabase8([]).
```

```
if do(set gp-jobtype = A) and
    gp-wip-quantity(A) = Q and
    addtodatabase8(L)
then addtodatabase8([A|L]).
```

```
addtodatabase9([]).
```

```
if do(set scl-jobtype = A) and
    scl-wip-quantity(A) = Q and
    addtodatabase9(L)
then addtodatabase9([A|L]).
```

```
addtodatabase10([]).
```

```
if do(set cm-jobtype = A) and
    cm-wip-quantity(A) = Q and
    addtodatabase10(L)
```

```

then addtodatabase+10([A;L]).

addtodatabase11([]).

if do(set profile-jobtype = A) and
   profile-wip-quantity(A) = Q and
   addtodatabase11(L)
then addtodatabase11([A;L]).

if display([nl,'
*****
* JOBTYPES SEQUENCE COMPUTATION RESULT *
*****',nl,nl]) and
   board-cut-sequence and
   drilling-sequence and
   pth-sequence and
   panel-plating-sequence and
   dry-film-sequence and
   pattern-plating-sequence and
   etching-sequence and
   solder-mask-sequence and
   gold-plating-sequence and
   scl-sequence and
   component-mark-sequence and
   profile-sequence
then jobtypes-sequence.

if board-cut-buffer = []
then board-cut-sequence.

s = 0.

if display([nl,'BOARD CUT JOBTYPES SEQUENCE:',nl,nl]) and
   bc-combined-sequence = C and
   s = E and
   display(['priority  jobtype  quantity  processing-time'
,nl]) and
   addto-result(C,E) and
   bc-processing-time
then board-cut-sequence.

if listof(B,bc-jobtype = A and bc-wip-quantity(A) = Q and
   board-cut-processing-time(A) = P and Q*P = B) = LIST and
   sum(LIST) = X and
   display([nl,'total board cut machine working hours =
',X,nl,nl])
then bc-processing-time.

if drilling-buffer = []
then drilling-sequence.

if display([nl,'DRILLING JOBTYPES SEQUENCE:',nl,nl]) and
   drill-combined-sequence = C and

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```

s = E and
display(['priority  jobtype  quantity  processing-time'
,nl]) and
addto-result1(C,E) and
note-rework1 and
drill-processing-time
then drilling-sequence.

if  defect-jobs = yes and
not(defect-in-operation = drilling)
then note-rework1.

if  defect-jobs = yes and
kind-of-defect(drilling) = extra-hole or
kind-of-defect(drilling) = hole-undersize and
jobtype-rework(drilling) = J and
quantity-rework(drilling) = Q and
display(['
remark:jobtype ',J,' quantity ',Q,' panels have to be
reworked after complete proceed ',J,'in sequence.'
,nl])
then note-rework1.

if  defect-jobs = yes and
kind-of-defect(drilling) = hole-oversize and
jobtype-rework(drilling) = J and
quantity-rework(drilling) = Q and
display(['
remark:jobtype ',J,' quantity ',Q,' panels have to be
arranged to rework in the last priority of this
sequence.',nl])
then note-rework1.

if  defect-jobs = no
then note-rework1.

if  defect-jobs = no or
not(defect-in-operation = drilling) or
kind-of-defect(drilling) = any-else and
listof(B,drill-jobtype = A and drill-wip-quantity(A) = Q and
drilling-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display(['nl,'total drilling machine working hours = '
,X,nl,nl])
then drill-processing-time.

if  listof(B,drill-jobtype = A and drill-wip-quantity(A) = Q and
drilling-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(drilling) = J and
drilling-processing-time(J) = M and
quantity-rework(drilling) = QR and
M*QR = Y and

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```

X+Y = S and
display([nl,'total drilling machine working hours = '
,S,nl,nl])
then drill-processing-time.

if pth-buffer = []
then pth-sequence.

if display([nl,'PLATE THROUGH HOLE JOBTYPES SEQUENCE:'
,nl,nl]) and
pth-combined-sequence = C and
s = E and
display(['priority  jobtype  quantity  processing-time'
,nl]) and
addto-result2(C,E) and
note-rework2 and
plth-processing-time
then pth-sequence.

if defect-jobs = yes and
not(defect-in-operation = pth)
then note-rework2.

if defect-jobs = yes and
kind-of-defect(pth) = pth-failed and
jobtype-rework(pth) = J and
quantity-rework(pth) = Q and
display(['
remark:jobtype ',J,' quantity ',Q,' panels have to be
reworked after complete proceed ',J,' in sequence.'
,nl])
then note-rework2.

if defect-jobs = no
then note-rework2.

if defect-jobs = no or
not(defect-in-operation = pth) or
kind-of-defect(pth) = any-else and
listof(B,pth-jobtype = A and pth-wip-quantity(A) = Q and
pth-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl,'total pth machine working hours = ',X,nl,nl])
then plth-processing-time.

if listof(B,pth-jobtype = A and pth-wip-quantity(A) = Q and
pth-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(pth) = J and
pth-processing-time(J) = M and
quantity-rework(pth) = QR and
M*QR = Y and
X+Y = S and

```

```

display([nl,'total pth machine working hours = ',S,nl,nl])
then plth-processing-time.

if panel-plating-buffer = []
then panel-plating-sequence.

if display([nl,'PANEL PLATING JOBTYPES SEQUENCE: ',nl,nl]) and
panel-combined-sequence = C and
s = E and
display(['priority  jobtype  quantity  processing-time'
,nl]) and
addto-result3(C,E) and
note-rework3 and
panel-processing-time
then panel-plating-sequence.

if defect-jobs = yes and
not(defect-in-operation = panel-plating)
then note-rework3.

if defect-jobs = yes and
kind-of-defect(panel-plating) = copper-nodule and
jobtype-rework(panel-plating) = J and
quantity-rework(panel-plating) = Q and
display(['
remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
after complete proceed ',J,' in sequence.',nl])
then note-rework3.

if defect-jobs = no
then note-rework3.

if defect-jobs = no or
not(defect-in-operation = panel-plating) or
kind-of-defect(panel-plating) = any-else and
listof(B,panel-jobtype = A and panel-wip-quantity(A) = Q and
panel-plating-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl,'total panel plating machine working hours = '
,X,nl,nl])
then panel-processing-time.

if listof(B,panel-jobtype = A and panel-wip-quantity(A) = Q and
panel-plating-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(panel-plating) = J and
panel-plating-processing-time(J) = M and
quantity-rework(panel-plating) = QR and
M*QR = Y and
X+Y = S and
display([nl,'total panel plating machine working hours = '
,S,nl,nl])
then panel-processing-time.

```



```

if  dry-film-buffer = []
then dry-film-sequence.

if  display([[nl,'DRY FILM JOBTYPES SEQUENCE:',nl,nl]]) and
    df-combined-sequence = C and
    s = E and
    display(['priority  jobtype  quantity  processing-time'
            ,nl]]) and
    addto-result4(C,E) and
    note-rework4 and
    df-processing-time
then dry-film-sequence.

if  defect-jobs = yes and
    not(defect-in-operation = dry-film)
then note-rework4.

if  defect-jobs = yes and
    kind-of-defect(dry-film) = small-circuit and
    jobtype-rework(dry-film) = J and
    quantity-rework(dry-film) = Q and
    display(['
            remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
            after complete proceed ',J,' in sequence.',nl]])
then note-rework4.

if  defect-jobs = no
then note-rework4.

if  defect-jobs = no or
    not(defect-in-operation = dry-film) or
    kind-of-defect(dry-film) = any-else and
    listof(B,df-jobtype = A and df-wip-quantity(A) = Q and
    dry-film-processing-time(A) = P and  $Q * P = B$ ) = LIST and
    sum(LIST) = X and
    display([[nl,'total dry film machine working hours = '
            ,X,nl,nl]])
then df-processing-time.

if  listof(B,df-jobtype = A and df-wip-quantity(A) = Q and
    dry-film-processing-time(A) = P and  $Q * P = B$ ) = LIST and
    sum(LIST) = X and
    jobtype-rework(dry-film) = J and
    dry-film-processing-time(J) = M and
    quantity-rework(dry-film) = QR and
     $M * QR = Y$  and
     $X + Y = S$  and
    display([[nl,'total dry film machine working hours = '
            ,S,nl,nl]])
then df-processing-time.

if  pattern-plating-buffer = []
then pattern-plating-sequence.

```

```

if display([nl,'PATTERN PLATING JOBTYPES SEQUENCE:',nl,nl]) and
   pattern-combined-sequence = C and
   s = E and
   display(['priority  jobtype  quantity  processing-time'
            ,nl]) and
   addto-result5(C,E) and
   note-rework5 and
   pattern-processing-time
then pattern-plating-sequence.

if defect-jobs = yes and
   not(defect-in-operation = pattern-plating)
then note-rework5.

if defect-jobs = yes and
   kind-of-defect(pattern-plating) = copper-expose and
   jobtype-rework(pattern-plating) = J and
   quantity-rework(pattern-plating) = Q and
   display(['
            remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
            after complete proceed ',J,' in sequence.',nl])
then note-rework5.

if defect-jobs = no
then note-rework5.

if defect-jobs = no or
   not(defect-in-operation = pattern-plating) or
   kind-of-defect(pattern-plating) = any-else and
   listof(B,pattern-jobtype = A and pattern-wip-quantity(A) =
   Q and
   pattern-plating-processing-time(A) = P and  $Q * P = B$ ) =
   LIST and
   sum(LIST) = X and
   display([nl,'total pattern plating machine working hours = '
            ,X,nl,nl])
then pattern-processing-time.

if listof(B,pattern-jobtype = A and pattern-wip-quantity(A) =
   Q and
   pattern-plating-processing-time(A) = P and  $Q * P = B$ ) =
   LIST and
   sum(LIST) = X and
   jobtype-rework(pattern-plating) = J and
   pattern-plating-processing-time(J) = M and
   quantity-rework(pattern-plating) = QR and
    $M * QR = Y$  and
    $X + Y = S$  and
   display([nl,'total pattern plating machine working hours = '
            ,S,nl,nl])
then pattern-processing-time.

```

```

if etching-buffer = []
then etching-sequence.

if display([nl,'ETCHING JOBTYPES SEQUENCE:',nl,nl]) and
etch-combined-sequence = C and
s = E and
display(['priority  jobtype  quantity  processing-time'
,nl]) and
addto-result6(C,E) and
etch-processing-time
then etching-sequence.

if listof(B,etch-jobtype = A and etch-wip-quantity(A) = Q and
etching-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl,'total etching machine working hours = '
,X,nl,nl])
then etch-processing-time.

if solder-mask-buffer = []
then solder-mask-sequence.

if display([nl,'SOLDER MASK JOBTYPES SEQUENCE:',nl,nl]) and
sm-combined-sequence = C and
s = E and
display(['priority  jobtype  quantity  processing-time'
,nl]) and
addto-result7(C,E) and
note-rework7 and
sm-processing-time
then solder-mask-sequence.

if defect-jobs = yes and
not(defect-in-operation = solder-mask)
then note-rework7.

if defect-jobs = yes and
kind-of-defect(solder-mask) = uncomplete-ink or
kind-of-defect(solder-mask) = under-develop or
kind-of-defect(solder-mask) = solder-mask-peel-off and
jobtype-rework(solder-mask) = J and
quantity-rework(solder-mask) = Q and
display(['
remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
after complete proceed ',J,' in sequence.',nl])
then note-rework7.

if defect-jobs = yes and
kind-of-defect(solder-mask) = pattern-shift and
jobtype-rework(solder-mask) = J and
quantity-rework(solder-mask) = Q and
display(['
remark:jobtype ',J,' quantity ',Q,' panels have to be

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arranged to rework in the last priority of this
sequence.',nl])
then note-rework7.

if defect-jobs = no
then note-rework7.

if defect-jobs = no or
not(defect-in-operation = solder-mask) or
kind-of-defect(solder-mask) = any-else and
listof(B,sm-jobtype = A and sm-wip-quantity(A) = Q and
solder-mask-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl,'total solder mask machine working hours = '
,X,nl,nl])
then sm-processing-time.

if listof(B,sm-jobtype = A and sm-wip-quantity(A) = Q and
solder-mask-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(solder-mask) = J and
solder-mask-processing-time(J) = M and
quantity-rework(solder-mask) = QR and
M*QR = Y and
X+Y = S and
display([nl,'total solder mask machine working hours = '
,S,nl,nl])
then sm-processing-time.

if gold-plating-buffer = []
then gold-plating-sequence.

if display([nl,'GOLD PLATING JOBTYPES SEQUENCE:',nl,nl]) and
gp-combined-sequence = C and
s = E and
display(['priority jobtype quantity processing-time'
,nl]) and
addto-result8(C,E) and
note-rework8 and
gp-processing-time
then gold-plating-sequence.

if defect-jobs = yes and
not(defect-in-operation = gold-plating)
then note-rework8.

if defect-jobs = yes and
kind-of-defect(gold-plating) = rough-gold and
jobtype-rework(gold-plating) = J and
quantity-rework(gold-plating) = Q and
display(['
remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
after complete proceed ',J,' in sequence.',nl])

```

```

then note-rework8.

if defect-jobs = no
then note-rework8.

if defect-jobs = no or
not(defect-in-operation = gold-plating) or
kind-of-defect(gold-plating) = any-else and
listof(B, gp-jobtype = A and gp-wip-quantity(A) = Q and
gold-plating-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl, 'total gold plating machine working hours = '
,X,nl,nl])
then gp-processing-time.

if listof(B, gp-jobtype = A and gp-wip-quantity(A) = Q and
gold-plating-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(gold-plating) = J and
gold-plating-processing-time(J) = M and
quantity-rework(gold-plating) = QR and
M*QR = Y and
X+Y = S and
display([nl, 'total gold plating machine working hours = '
,S,nl,nl])
then gp-processing-time.

if scl-buffer = []
then scl-sequence.

if display([nl, 'SOLDER COATED LEVELLING JOBTYPES SEQUENCE:'
,nl,nl]) and
scl-combined-sequence = C and
s = E and
display(['priority jobtype quantity processing-time'
,nl]) and
addto-result9(C,E) and
note-rework9 and
socl-processing-time
then scl-sequence.

if defect-jobs = yes and
not(defect-in-operation = scl)
then note-rework9.

if defect-jobs = yes and
kind-of-defect(scl) = solder-uneven and
jobtype-rework(scl) = J and
quantity-rework(scl) = Q and
display(['
remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
after complete proceed ',J,' in sequence.',nl])
then note-rework9.

```

```

if defect-jobs = no
then note-rework9.

if defect-jobs = no or
not(defect-in-operation = scl) or
kind-of-defect(scl) = any-else and
listof(B,scl-jobtype = A and scl-wip-quantity(A) = Q and
scl-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
display([nl,'total scl machine working hours = ',X,nl,nl])
then scl-processing-time.

if listof(B,scl-jobtype = A and scl-wip-quantity(A) = Q and
scl-processing-time(A) = P and Q*P = B) = LIST and
sum(LIST) = X and
jobtype-rework(scl) = J and
scl-processing-time(J) = M and
quantity-rework(scl) = QR and
M*QR = Y and
X+Y = S and
display([nl,'total scl machine working hours = ',S,nl,nl])
then scl-processing-time.

if component-mark-buffer = []
then component-mark-sequence.

if display([nl,'COMPONENT MARK JOBTYPES SEQUENCE:',nl,nl]) and
cm-combined-sequence = C and
s = E and
display(['priority jobtype quantity processing-time',
,nl]) and
addto-result10(C,E) and
note-rework10 and
cm-processing-time
then component-mark-sequence.

if defect-jobs = yes and
not(defect-in-operation = component-mark)
then note-rework10.

if defect-jobs = yes and
kind-of-defect(component-mark) = blur-mark and
jobtype-rework(component-mark) = J and
quantity-rework(component-mark) = Q and
display(['
remark:jobtype ',J,'quantity ',Q,'panels have to be reworked
after complete proceed ',J,' in sequence.',nl])
then note-rework10.

if defect-jobs = no
then note-rework10.

```

```

if  defect-jobs = no or
    not(defect-in-operation = component-mark) or
    kind-of-defect(component-mark) = any-else and
    listof(B,cm-jobtype = A and cm-wip-quantity(A) = Q and
    component-mark-processing-time(A) = P and Q*P = B) =
    LIST and
    sum(LIST) = X and
    display([nl,'total component mark machine working hours = ',
    ,X,nl,nl])
then cm-processing-time.

```

```

if  listof(B,cm-jobtype = A and cm-wip-quantity(A) = Q and
    component-mark-processing-time(A) = P and Q*P = B) =
    LIST and
    sum(LIST) = X and
    jobtype-rework(component-mark) = J and
    component-mark-processing-time(J) = M and
    quantity-rework(component-mark) = QR and
    M*QR = Y and
    X+Y = S and
    display([nl,'total component mark machine working hours = ',
    ,S,nl,nl])
then cm-processing-time.

```

```

if  profile-buffer = []
then profile-sequence.

```

```

if  display([nl,'PROFILE JOBTYPES SEQUENCE:',nl,nl]) and
    profile-combined-sequence = C and
    s = E and
    display(['priority  jobtype  quantity  processing-time',
    ,nl]) and
    addto-result11(C,E) and
    pf-processing-time
then profile-sequence.

```

```

if  listof(B,profile-jobtype = A and profile-wip-quantity(A) =
    Q and
    profile-processing-time(A) = P and Q*P = B) = LIST and
    sum(LIST) = X and
    display([nl,'total profile machine working hours = ',
    ,X,nl,nl])
then pf-processing-time.

```

```

sum([]) = 0.

```

```

if  sum(G) = C and
    C+F = H
then sum([F|G]) = H.

```

```

if  late-job-sequence = A and
    ok-job-sequence = B and
    append(A,B) = C

```

```
then bc-combined-sequence = C.

if  late-job-sequence1 = A and
    ok-job-sequence1 = B and
    append(A,B) = C
then drill-combined-sequence = C.

if  late-job-sequence2 = A and
    ok-job-sequence2 = B and
    append(A,B) = C
then pth-combined-sequence = C.

if  late-job-sequence3 = A and
    ok-job-sequence3 = B and
    append(A,B) = C
then panel-combined-sequence = C.

if  late-job-sequence4 = A and
    ok-job-sequence4 = B and
    append(A,B) = C
then df-combined-sequence = C.

if  late-job-sequence5 = A and
    ok-job-sequence5 = B and
    append(A,B) = C
then pattern-combined-sequence = C.

if  late-job-sequence6 = A and
    ok-job-sequence6 = B and
    append(A,B) = C
then etch-combined-sequence = C.

if  late-job-sequence7 = A and
    ok-job-sequence7 = B and
    append(A,B) = C
then sm-combined-sequence = C.

if  late-job-sequence8 = A and
    ok-job-sequence8 = B and
    append(A,B) = C
then gp-combined-sequence = C.

if  late-job-sequence9 = A and
    ok-job-sequence9 = B and
    append(A,B) = C
then scl-combined-sequence = C.

if  late-job-sequence10 = A and
    ok-job-sequence10 = B and
    append(A,B) = C
then cm-combined-sequence = C.
```



```

if late-job-sequencell = A and
   ok-job-sequencell = B and
   append(A,B) = C
then profile-combined-sequence = C.

```

```
addto-result([],E).
```

```

if E+1 = F and
   do(set job-number = F) and
   do(set jobid(F) = A) and
   bc-wip-quantity(A) = Q and
   board-cut-processing-time(A) = P and
   Q*P = B and
   display([' ',F,' ',A,' ',Q,' ',B,nl]) and
   addto-result(L,F)
then addto-result([A|L],E).

```

```
addto-result1([],E).
```

```

if E+1 = F and
   do(set job-number = F) and
   do(set jobid(F) = A) and
   drill-wip-quantity(A) = Q and
   drilling-processing-time(A) = P and
   Q*P = B and
   display([' ',F,' ',A,' ',Q,' ',B,nl]) and
   addto-result1(L,F)
then addto-result1([A|L],E).

```

```
addto-result2([],E).
```

```

if E+1 = F and
   do(set job-number = F) and
   do(set jobid(F) = A) and
   pth-wip-quantity(A) = Q and
   pth-processing-time(A) = P and
   Q*P = B and
   display([' ',F,' ',A,' ',Q,' ',B,nl]) and
   addto-result2(L,F)
then addto-result2([A|L],E).

```

```
addto-result3([],E).
```

```

if E+1 = F and
   do(set job-number = F) and
   do(set jobid(F) = A) and
   panel-wip-quantity(A) = Q and
   panel-plating-processing-time(A) = P and
   Q*P = B and
   display([' ',F,' ',A,' ',Q,' ',B,nl]) and
   addto-result3(L,F)
then addto-result3([A|L],E).

```

```
addto-result4([],E).
```

```
if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
df-wip-quantity(A) = Q and
dry-film-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result4(L,F)
then addto-result4([A|L],E).
```

```
addto-result5([],E).
```

```
if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
pattern-wip-quantity(A) = Q and
pattern-plating-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result5(L,F)
then addto-result5([A|L],E).
```

```
addto-result6([],E).
```

```
if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
etch-wip-quantity(A) = Q and
etching-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result6(L,F)
then addto-result6([A|L],E).
```

```
addto-result7([],E).
```

```
if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
sm-wip-quantity(A) = Q and
solder-mask-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result7(L,F)
then addto-result7([A|L],E).
```

```
addto-result8([],E).
```

```
if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
```

```

gp-wip-quantity(A) = Q and
gold-plating-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result8(L,F)
then addto-result8([A|L],E).

```

```
addto-result9([],E).
```

```

if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
scl-wip-quantity(A) = Q and
scl-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result9(L,F)
then addto-result9([A|L],E).

```

```
addto-result10([],E).
```

```

if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
cm-wip-quantity(A) = Q and
component-mark-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result10(L,F)
then addto-result10([A|L],E).

```

```
addto-result11([],E).
```

```

if E+1 = F and
do(set job-number = F) and
do(set jobid(F) = A) and
profile-wip-quantity(A) = Q and
profile-processing-time(A) = P and
Q*P = B and
display([' ',F,' ',A,' ',Q,' ',B,nl]) and
addto-result11(L,F)
then addto-result11([A|L],E).

```

```
/* ----- LATE-JOBTYPES-SEQUENCE ----- */
```

```

multivalued(bc-jobtype).
multivalued(drill-jobtype).
multivalued(pth-jobtype).
multivalued(panel-jobtype).
multivalued(df-jobtype).
multivalued(pattern-jobtype).
multivalued(etch-jobtype).
multivalued(sm-jobtype).

```

```

multivalued(gp-jobtype).
multivalued(scl-jobtype).
multivalued(cm-jobtype).
multivalued(profile-jobtype).

```

```

if bc-machine-overload and
  listof(A,bc-jobtype = A and bc-job-status(A) = late) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of late jobtype in board cut = '
    ,LIST,nl])
then late-job-sequence = LIST.

```

```

if bc-has-late-job and
  bc-machine-overload and
  list-of-jobtypes-ordered-by-covert = C and
  display([' list of late jobtypes ordered by COVERT in
  board cut = ',C,nl]) and
  length(C) = N and
  not(N<2)
then late-job-sequence = C.

```

```

if listof(A,bc-jobtype = A and bc-job-status(A) = late) =
  LIST and
  insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert = OC.

```

```

if drill-machine-overload and
  listof(A,drill-jobtype = A and drill-job-status(A) =
  late) = LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of late jobtype in drilling = ',LIST,nl])
then late-job-sequencel = LIST.

```

```

if drill-has-late-job and
  drill-machine-overload and
  list-of-jobtypes-ordered-by-covert1 = C and
  display([' list of late jobtypes ordered by COVERT in
  drilling = ',C,nl]) and
  length(C) = N and
  not(N<2)
then late-job-sequencel = C.

```

```

if listof(A,drill-jobtype = A and drill-job-status(A) = late) =
  LIST and
  insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert1 = OC.

```

```

if pth-machine-overload and
  listof(A,pth-jobtype = A and pth-job-status(A) = late) =

```

```

LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in pth = ',LIST,nl])
then late-job-sequence2 = LIST.

if pth-has-late-job and
pth-machine-overload and
list-of-jobtypes-ordered-by-covert2 = C and
display([' list of late jobtypes ordered by COVERT in pth = '
,C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence2 = C.

if listof(A,pth-jobtype = A and pth-job-status(A) = late) =
LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert2 = OC.

if panel-machine-overload and
listof(A,panel-jobtype = A and panel-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in panel plating = '
,LIST,nl])
then late-job-sequence3 = LIST.

if panel-has-late-job and
panel-machine-overload and
list-of-jobtypes-ordered-by-covert3 = C and
display([' list of late jobtypes ordered by COVERT in panel
plating = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence3 = C.

if listof(A,panel-jobtype = A and panel-job-status(A) = late) =
LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert3 = OC.

if df-machine-overload and
listof(A,df-jobtype = A and df-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in dry film = ',LIST,nl])
then late-job-sequence4 = LIST.

if df-has-late-job and
df-machine-overload and

```

```

list-of-jobtypes-ordered-by-covert4 = C and
display([' list of late jobtypes ordered by COVERT in dry
film = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence4 = C.

if listof(A,df-jobtype = A and df-job-status(A) = late) =
LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert4 = OC.

if pattern-machine-overload and
listof(A,pattern-jobtype = A and pattern-job-status(A) =
late) = LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in pattern plating = ',
LIST,nl])
then late-job-sequence5 = LIST.

if pattern-has-late-job and
pattern-machine-overload and
list-of-jobtypes-ordered-by-covert5 = C and
display(['list of late jobtypes ordered by COVERT in pattern
plating = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence5 = C.

if listof(A,pattern-jobtype = A and pattern-job-status(A) =
late)
= LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert5 = OC.

if etch-machine-overload and
listof(A,etch-jobtype = A and etch-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in etching = ',LIST,nl])
then late-job-sequence6 = LIST.

if etch-has-late-job and
etch-machine-overload and
list-of-jobtypes-ordered-by-covert6 = C and
display([' list of late jobtypes ordered by COVERT in
etching = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence6 = C.

```

```

if  listof(A,etch-jobtype = A and etch-job-status(A) = late) =
    LIST and
    insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert6 = OC.

if  sm-machine-overload and
    listof(A,sm-jobtype = A and sm-job-status(A) = late) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of late jobtype in solder mask = '
            ,LIST,nl])
then late-job-sequence7 = LIST.

if  sm-has-late-job and
    sm-machine-overload and
    list-of-jobtypes-ordered-by-covert7 = C and
    display([' list of late jobtypes ordered by COVERT in solder
            mask = ' ,C,nl]) and
    length(C) = N and
    not(N<2)
then late-job-sequence7 = C.

if  listof(A,sm-jobtype = A and sm-job-status(A) = late) =
    LIST and
    insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert7 = OC.

if  gp-machine-overload and
    listof(A,gp-jobtype = A and gp-job-status(A) = late) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of late jobtype in gold plating = '
            ,LIST,nl])
then late-job-sequence8 = LIST.

if  gp-has-late-job and
    gp-machine-overload and
    list-of-jobtypes-ordered-by-covert8 = C and
    display([' list of late jobtypes ordered by COVERT in gold
            plating = ' ,C,nl]) and
    length(C) = N and
    not(N<2)

then late-job-sequence8 = C.
if  listof(A,gp-jobtype = A and gp-job-status(A) = late) =
    LIST and
    insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert8 = OC.

if  scl-machine-overload and
    listof(A,scl-jobtype = A and scl-job-status(A) = late) =

```

```

LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in scl = ',LIST,nl])
then late-job-sequence9 = LIST.

if scl-has-late-job and
scl-machine-overload and
list-of-jobtypes-ordered-by-covert9 = C and
display([' list of late jobtypes ordered by COVERT in scl = ',
,C,nl,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence9 = C.

if listof(A,scl-jobtype = A and scl-job-status(A) = late) =
LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert9 = OC.

if cm-machine-overload and
listof(A,cm-jobtype = A and cm-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in component mark = ',
,LIST,nl])
then late-job-sequence10 = LIST.

if cm-has-late-job and
cm-machine-overload and
list-of-jobtypes-ordered-by-covert10 = C and
display([' list of late jobtypes ordered by COVERT in
component mark = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequence10 = C.

if listof(A,cm-jobtype = A and cm-job-status(A) = late) =
LIST and
insert1(LIST) = OC
then list-of-jobtypes-ordered-by-covert10 = OC.

if profile-machine-overload and
listof(A,profile-jobtype = A and profile-job-status(A) =
late) = LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in profile = ',LIST,nl])
then late-job-sequence11 = LIST.

if profile-has-late-job and
profile-machine-overload and

```



```

list-of-jobtypes-ordered-by-covert11 = C and
display([' list of late jobtypes ordered by COVERT in
profile = ',C,nl]) and
length(C) = N and
not(N<2)
then late-job-sequencell = C.

if  listof(A,profile-jobtype = A and profile-job-status(A) =
late) = LIST and
insert1(LIST) = OC
then  list-of-jobtypes-ordered-by-covert11 = OC.

insert1([]) = [].

if  insert1(L) = S and
insertx1(X,S) = U
then insert1([X|L]) = U.

if  covert(A) = C1 and
covert(X) = C2 and
C1<=C2 and
insertx1(X,L) = U
then insertx1(X,[A|L]) = [A|U].

insertx1(X,L) = [X|L].

multivalued(bc-job-status(A)).
multivalued(drill-job-status(A)).
multivalued(pth-job-status(A)).
multivalued(panel-job-status(A)).
multivalued(df-job-status(A)).
multivalued(pattern-job-status(A)).
multivalued(etch-job-status(A)).
multivalued(sm-job-status(A)).
multivalued(gp-job-status(A)).
multivalued(scl-job-status(A)).
multivalued(cm-job-status(A)).
multivalued(profile-job-status(A)).

if  bc-job-status(A) = late and
bc-strm(A) = S and
S =<0 and
bc-wip-quantity(A) = N and

board-cut-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if  bc-job-status(A) = late and
bc-strm(A) = S and
S>0 and
bc-wip-quantity(A) = N and

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board-cut-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if  drill-job-status(A) = late and
    drill-strm(A) = S and
    S <= 0 and
    drill-wip-quantity(A) = N and
    drilling-processing-time(A) = P and
    N*P = T and
    (1/T)*(-1) = C
then covert(A) = C.

if  drill-job-status(A) = late and
    drill-strm(A) = S and
    S > 0 and
    drill-wip-quantity(A) = N and
    drilling-processing-time(A) = P and
    N*P = T and
    (S/100-1)/T = C
then covert(A) = C.

if  pth-job-status(A) = late and
    pth-strm(A) = S and
    S <= 0 and
    pth-wip-quantity(A) = N and
    pth-processing-time(A) = P and
    N*P = T and
    (1/T)*(-1) = C
then covert(A) = C.

if  pth-job-status(A) = late and
    pth-strm(A) = S and
    S > 0 and
    pth-wip-quantity(A) = N and
    pth-processing-time(A) = P and
    N*P = T and
    (S/100-1)/T = C
then covert(A) = C.

if  panel-job-status(A) = late and
    panel-strm(A) = S and
    S <= 0 and
    panel-wip-quantity(A) = N and
    panel-plating-processing-time(A) = P and
    N*P = T and
    (1/T)*(-1) = C
then covert(A) = C.

if  panel-job-status(A) = late and
    panel-strm(A) = S and
    S > 0 and

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```

panel-wip-quantity(A) = N and
panel-plating-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if df-job-status(A) = late and
df-strm(A) = S and
S <= 0 and
df-wip-quantity(A) = N and
dry-film-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if df-job-status(A) = late and
df-strm(A) = S and
S > 0 and
df-wip-quantity(A) = N and
dry-film-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if pattern-job-status(A) = late and
pattern-strm(A) = S and
S <= 0 and
pattern-wip-quantity(A) = N and
pattern-plating-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if pattern-job-status(A) = late and
pattern-strm(A) = S and
S > 0 and
pattern-wip-quantity(A) = N and
pattern-plating-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if etch-job-status(A) = late and
etch-strm(A) = S and
S <= 0 and
etch-wip-quantity(A) = N and
etching-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if etch-job-status(A) = late and
etch-strm(A) = S and

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S>0 and
etch-wip-quantity(A) = N and
etching-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if sm-job-status(A) = late and
sm-strm(A) = S and
S =<0 and
sm-wip-quantity(A) = N and
solder-mask-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if sm-job-status(A) = late and
sm-strm(A) = S and
S>0 and
sm-wip-quantity(A) = N and
solder-mask-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if gp-job-status(A) = late and
gp-strm(A) = S and
S =<0 and
gp-wip-quantity(A) = N and
gold-plating-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

if gp-job-status(A) = late and
gp-strm(A) = S and
S>0 and
gp-wip-quantity(A) = N and
gold-plating-processing-time(A) = P and
N*P = T and
(S/100-1)/T = C
then covert(A) = C.

if scl-job-status(A) = late and
scl-strm(A) = S and
S =<0 and
scl-wip-quantity(A) = N and
scl-processing-time(A) = P and
N*P = T and
(1/T)*(-1) = C
then covert(A) = C.

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```

if scl-job-status(A) = late and
   scl-strm(A) = S and
   S>0 and
   scl-wip-quantity(A) = N and
   scl-processing-time(A) = P and
   N*P = T and
   (S/100-1)/T = C
then covert(A) = C.

if cm-job-status(A) = late and
   cm-strm(A) = S and
   S = <0 and
   cm-wip-quantity(A) = N and
   component-mark-processing-time(A) = P and
   N*P = T and
   (1/T)*(-1) = C
then covert(A) = C.

if cm-job-status(A) = late and
   cm-strm(A) = S and
   S>0 and
   cm-wip-quantity(A) = N and
   component-mark-processing-time(A) = P and
   N*P = T and
   (S/100-1)/T = C
then covert(A) = C.

if profile-job-status(A) = late and
   profile-strm(A) = S and
   S = <0 and
   profile-wip-quantity(A) = N and
   profile-processing-time(A) = P and
   N*P = T and
   (1/T)*(-1) = C
then covert(A) = C.

if profile-job-status(A) = late and
   profile-strm(A) = S and
   S>0 and
   profile-wip-quantity(A) = N and
   profile-processing-time(A) = P and
   N*P = T and
   (S/100-1)/T = C
then covert(A) = C.

if not(bc-machine-overload) and
   listof(A, bc-jobtype = A and bc-job-status(A) = late) =
   LIST and
   length(LIST) = N and
   N = 0 or N = 1 and
   display([' list of late jobtype in board cut = ', LIST, nl])
then late-job-sequence = LIST.

```

```

if bc-has-late-job and
not(bc-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time = PT and
display([' list of late jobtypes ordered by SPT in board
cut = ',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence = PT.

if listof(A,bc-jobtype = A and bc-job-status(A) = late) =
LIST and
insort(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time = SPT.

if not(drill-machine-overload) and
listof(A,drill-jobtype = A and drill-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in drilling = ',LIST,nl])
then late-job-sequence1 = LIST.

if drill-has-late-job and
not(drill-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time1 = PT and
display([' list of late jobtypes ordered by SPT in drilling =
',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence1 = PT.

if listof(A,drill-jobtype = A and drill-job-status(A) = late) =
LIST and
insort1(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time1 = SPT.

if not(pth-machine-overload) and
listof(A,pth-jobtype = A and pth-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in pth = ',LIST,nl])
then late-job-sequence2 = LIST.

if pth-has-late-job and
not(pth-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time2 = PT and
display([' list of late jobtypes ordered by SPT in pth = '
,PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence2 = PT.

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if  listof(A,pth-jobtype = A and pth-job-status(A) = late) =
    LIST and
    insert2(LIST) = SPT
then  list-of-jobtypes-ordered-by-short-processing-time2 = SPT.

if  not(panel-machine-overload) and
    listof(A,panel-jobtype = A and panel-job-status(A) = late) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of late jobtype in panel plating = ',
            ,LIST,nl])
then  late-job-sequence3 = LIST.

if  panel-has-late-job and
    not(panel-machine-overload) and
    list-of-jobtypes-ordered-by-short-processing-time3 = PT and
    display([' list of late jobtypes ordered by SPT in panel
            plating = ',PT,nl]) and
    length(PT) = N and
    not(N<2)
then  late-job-sequence3 = PT.

if  listof(A,panel-jobtype = A and panel-job-status(A) = late) =
    LIST and
    insert3(LIST) = SPT
then  list-of-jobtypes-ordered-by-short-processing-time3 = SPT.

if  not(df-machine-overload) and
    listof(A,df-jobtype = A and df-job-status(A) = late) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of late jobtype in dry film = ',LIST,nl])
then  late-job-sequence4 = LIST.

if  df-has-late-job and
    not(df-machine-overload) and
    list-of-jobtypes-ordered-by-short-processing-time4 = PT and
    display([' list of late jobtypes ordered by SPT in dry
            film = ',PT,nl]) and
    length(PT) = N and
    not(N<2)
then  late-job-sequence4 = PT.

if  listof(A,df-jobtype = A and df-job-status(A) = late) =
    LIST and
    insert4(LIST) = SPT
then  list-of-jobtypes-ordered-by-short-processing-time4 = SPT.

if  not(pattern-machine-overload) and
    listof(A,pattern-jobtype = A and pattern-job-status(A) =
    late) = LIST and

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length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in pattern plating = ',
LIST,nl])
then late-job-sequence5 = LIST.

if pattern-has-late-job and
not(pattern-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time5 = PT and
display([' list of late jobtypes ordered by SPT in pattern
plating = ',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence5 = PT.

if listof(A,pattern-jobtype = A and pattern-job-status(A)
= late) = LIST and
insert5(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time5 = SPT.

if not(etch-machine-overload) and
listof(A,etch-jobtype = A and etch-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in etching = ',LIST,nl])
then late-job-sequence6 = LIST.

if etch-has-late-job and
not(etch-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time6 = PT and
display([' list of late jobtypes ordered by SPT in etching =
',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence6 = PT.

if listof(A,etch-jobtype = A and etch-job-status(A) = late) =
LIST and
insert6(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time6 = SPT.

if not(sm-machine-overload) and
listof(A,sm-jobtype = A and sm-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in solder mask = ',LIST,nl])
then late-job-sequence7 = LIST.

if sm-has-late-job and
not(sm-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time7 = PT and

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display([' list of late jobtypes ordered by SPT in solder
mask = ',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence7 = PT.

if listof(A,sm-jobtype = A and sm-job-status(A) = late) =
LIST and
insort7(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time7 = SPT.

if not(gp-machine-overload) and
listof(A,gp-jobtype = A and gp-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in gold plating = '
,LIST,nl])
then late-job-sequence8 = LIST.

if gp-has-late-job and
not(gp-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time8 = PT and
display([' list of late jobtypes ordered by SPT in gold
plating = ',PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence8 = PT.

if listof(A,gp-jobtype = A and gp-job-status(A) = late) =
LIST and
insort8(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time8 = SPT.

if not(scl-machine-overload) and
listof(A,scl-jobtype = A and scl-job-status(A) = late) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of late jobtype in scl = ',LIST,nl])
then late-job-sequence9 = LIST.

if scl-has-late-job and
not(scl-machine-overload) and
list-of-jobtypes-ordered-by-short-processing-time9 = PT and
display([' list of late jobtypes ordered by SPT in scl = '
,PT,nl]) and
length(PT) = N and
not(N<2)
then late-job-sequence9 = PT.

if listof(A,scl-jobtype = A and scl-job-status(A) = late) =
LIST and

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insert9(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time9 = SPT.

if not(cm-machine-overload) and
   listof(A,cm-jobtype = A and cm-job-status(A) = late) =
   LIST and
   length(LIST) = N and
   N = 0 or N = 1 and
   display([' list of late jobtype in component mark = '
           ,LIST,nl])
then late-job-sequence10 = LIST.

if cm-has-late-job and
   not(cm-machine-overload) and
   list-of-jobtypes-ordered-by-short-processing-time10 =
   PT and
   display([' list of late jobtypes ordered by SPT in
           component mark = ' ,PT,nl]) and
   length(PT) = N and
   not(N<2)
then late-job-sequence10 = PT.

if listof(A,cm-jobtype = A and cm-job-status(A) = late) =
   LIST and
   insert10(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time10 = SPT.

if not(profile-machine-overload) and
   listof(A,profile-jobtype = A and profile-job-status(A) =
   late) = LIST and
   length(LIST) = N and
   N = 0 or N = 1 and
   display([' list of late jobtype in profile = ' ,LIST,nl])
then late-job-sequence11 = LIST.

if profile-has-late-job and
   not(profile-machine-overload) and
   list-of-jobtypes-ordered-by-short-processing-time11 =
   PT and
   display([' list of late jobtypes ordered by SPT in profile =
           ' ,PT,nl]) and
   length(PT) = N and
   not(N<2)
then late-job-sequence11 = PT.

if listof(A,profile-jobtype = A and profile-job-status(A) =
   late)
   = LIST and
   insert11(LIST) = SPT
then list-of-jobtypes-ordered-by-short-processing-time11 = SPT.

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/* ----- OK-JOBTYPES-SEQUENCE ----- */

if bc-machine-overload and
  listof(A, bc-jobtype = A and bc-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display(['list of ok jobtype in board cut = ', LIST, nl, nl])
then ok-job-sequence = LIST.

if bc-has-ok-job and
  bc-machine-overload and
  list-of-jobtypes-ordered-by-processing-time = PT and
  display([' list of ok jobtypes ordered by SPT in board cut =
  ', PT, nl, nl]) and
  length(PT) = N and
  not(N<2)
then ok-job-sequence = PT.

if listof(A, bc-jobtype = A and bc-job-status(A) = ok) =
  LIST and
  insert(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time = SPT.

if drill-machine-overload and
  listof(A, drill-jobtype = A and drill-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of ok jobtype in drilling = ', LIST, nl, nl])
then ok-job-sequence1 = LIST.

if drill-has-ok-job and
  drill-machine-overload and
  list-of-jobtypes-ordered-by-processing-time1 = PT and
  display([' list of ok jobtypes ordered by SPT in drilling =
  ', PT, nl, nl]) and
  length(PT) = N and
  not(N<2)
then ok-job-sequence1 = PT.

if listof(A, drill-jobtype = A and drill-job-status(A) = ok) =
  LIST and
  insert1(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time1 = SPT.

if pth-machine-overload and
  listof(A, pth-jobtype = A and pth-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of ok jobtype in pth = ', LIST, nl, nl])
then ok-job-sequence2 = LIST.

```

```

if  pth-has-ok-job and
    pth-machine-overload and
    list-of-jobtypes-ordered-by-processing-time2 = PT and
    display([' list of ok jobtypes ordered by SPT in pth = '
            ,PT,nl,nl]) and
    length(PT) = N and
    not(N<2)
then ok-job-sequence2 = PT.

if  listof(A,pth-jobtype = A and pth-job-status(A) = ok) =
    LIST and
    insert2(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time2 = SPT.

if  panel-machine-overload and
    listof(A,panel-jobtype = A and panel-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in panel plating = '
            ,LIST,nl,nl])
then ok-job-sequence3 = LIST.

if  panel-has-ok-job and
    panel-machine-overload and
    list-of-jobtypes-ordered-by-processing-time3 = PT and
    display([' list of ok jobtypes ordered by SPT in panel
            plating = ',PT,nl,nl]) and
    length(PT) = N and
    not(N<2)
then ok-job-sequence3 = PT.

if  listof(A,panel-jobtype = A and panel-job-status(A) = ok) =
    LIST and
    insert3(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time3 = SPT.

if  df-machine-overload and
    listof(A,df-jobtype = A and df-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in dry film = ',LIST,nl,nl])
then ok-job-sequence4 = LIST.

if  df-has-ok-job and
    df-machine-overload and
    list-of-jobtypes-ordered-by-processing-time4 = PT and
    display([' list of ok jobtypes ordered by SPT in dry film = '
            ,PT,nl,nl]) and
    length(PT) = N and
    not(N<2)
then ok-job-sequence4 = PT.

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if  listof(A,df-jobtype = A and df-job-status(A) = ok) =
    LIST and
    insert4(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time4 = SPT.

if  pattern-machine-overload and
    listof(A,pattern-jobtype = A and pattern-job-status(A) = ok)
    = LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in pattern plating = '
            ,LIST,nl,nl])
then ok-job-sequence5 = LIST.

if  pattern-has-ok-job and
    pattern-machine-overload and
    list-of-jobtypes-ordered-by-processing-time5 = PT and
    display([' list of ok jobtypes ordered by SPT in pattern
            plating = ',PT,nl,nl]) and
    length(PT) = N and
    not(N<2)
then ok-job-sequence5 = PT.

if  listof(A,pattern-jobtype = A and pattern-job-status(A) = ok)
    = LIST and
    insert5(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time5 = SPT.

if  etch-machine-overload and
    listof(A,etch-jobtype = A and etch-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in etching = ',LIST,nl,nl])
then ok-job-sequence6 = LIST.

if  etch-has-ok-job and
    etch-machine-overload and
    list-of-jobtypes-ordered-by-processing-time6 = PT and
    display([' list of ok jobtypes ordered by SPT in etching =
            ',PT,nl,nl]) and
    length(PT) = N and
    not(N<2)
then ok-job-sequence6 = PT.

if  listof(A,etch-jobtype = A and etch-job-status(A) = ok) =
    LIST and
    insert6(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time6 = SPT.

if  sm-machine-overload and
    listof(A,sm-jobtype = A and sm-job-status(A) = ok) =
    LIST and

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length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in solder mask = ',
,LIST,nl,nl])
then ok-job-sequence7 = LIST.

if sm-has-ok-job and
sm-machine-overload and
list-of-jobtypes-ordered-by-processing-time7 = PT and
display([' list of ok jobtypes ordered by SPT in solder
mask = ',PT,nl,nl]) and
length(PT) = N and
not(N<2)
then ok-job-sequence7 = PT.

if listof(A,sm-jobtype = A and sm-job-status(A) = ok) =
LIST and
insort7(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time7 = SPT.

if gp-machine-overload and
listof(A,gp-jobtype = A and gp-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in gold plating = ',
,LIST,nl,nl])
then ok-job-sequence8 = LIST.

if gp-has-ok-job and
gp-machine-overload and
list-of-jobtypes-ordered-by-processing-time8 = PT and
display([' list of ok jobtypes ordered by SPT in gold
plating = ',PT,nl,nl]) and
length(PT) = N and
not(N<2)
then ok-job-sequence8 = PT.

if listof(A,gp-jobtype = A and gp-job-status(A) = ok) =
LIST and
insort8(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time8 = SPT.

if scl-machine-overload and
listof(A,scl-jobtype = A and scl-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in scl = ',LIST,nl,nl])
then ok-job-sequence9 = LIST.

if scl-has-ok-job and
scl-machine-overload and

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list-of-jobtypes-ordered-by-processing-time9 = PT and
display([' list of ok jobtypes ordered by SPT in scl = ',
,PT,nl,nl]) and
length(PT) = N and
not(N<2)
then ok-job-sequence9 = PT.

if listof(A,scl-jobtype = A and scl-job-status(A) = ok) =
LIST and
insert9(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time9 = SPT.

if cm-machine-overload and
listof(A,cm-jobtype = A and cm-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in component mark = ',
,LIST,nl,nl])
then ok-job-sequence10 = LIST.

if cm-has-ok-job and
cm-machine-overload and
list-of-jobtypes-ordered-by-processing-time10 = PT and
display([' list of ok jobtypes ordered by SPT in component
mark = ',PT,nl,nl]) and
length(PT) = N and
not(N<2)
then ok-job-sequence10 = PT.

if listof(A,cm-jobtype = A and cm-job-status(A) = ok) =
LIST and
insert10(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time10 = SPT.

if profile-machine-overload and
listof(A,profile-jobtype = A and profile-job-status(A) = ok)
= LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in profile = ',LIST,nl,nl])
then ok-job-sequence11 = LIST.

if profile-has-ok-job and
profile-machine-overload and
list-of-jobtypes-ordered-by-processing-time11 = PT and
display([' list of ok jobtypes ordered by SPT in profile =
',PT,nl,nl]) and
length(PT) = N and
not(N<2)
then ok-job-sequence11 = PT.

```

```

if  listof(A,profile-jobtype = A and profile-job-status(A) = ok)
    = LIST and
    insert11(LIST) = SPT
then list-of-jobtypes-ordered-by-processing-time11 = SPT.

```

```

if  board-cut-processing-time(A) = P1 and
    board-cut-processing-time(X) = P2 and
    bc-wip-quantity(A) = N1 and
    bc-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx(X,L) = U
then insertx(X,[A|L]) = [A|U].

```

```
insert([]) = [].
```

```

if  insert(L) = S and
    insertx(X,S) = U
then insert([X|L]) = U.

```

```
insertx(X,L) = [X|L].
```

```
insert1([]) = [].
```

```

if  insert1(L) = S and
    insertx1(X,S) = U
then insert1([X|L]) = U.

```

```

if  drilling-processing-time(A) = P1 and
    drilling-processing-time(X) = P2 and
    drill-wip-quantity(A) = N1 and
    drill-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx1(X,L) = U
then insertx1(X,[A|L]) = [A|U].

```

```
insertx1(X,L) = [X|L].
```

```
insert2([]) = [].
```

```

if  insert2(L) = S and
    insertx2(X,S) = U
then insert2([X|L]) = U.

```

```

if  pth-processing-time(A) = P1 and
    pth-processing-time(X) = P2 and
    pth-wip-quantity(A) = N1 and
    pth-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and

```



```

    M1<=M2 and
    insertx2(X,L) = U
then insertx2(X,[A|L]) = [A|U].

insertx2(X,L) = [X|L].

insert3([]) = [].

if  insert3(L) = S and
    insertx3(X,S) = U
then insert3([X|L]) = U.

if  panel-plating-processing-time(A) = P1 and
    panel-plating-processing-time(X) = P2 and
    panel-wip-quantity(A) = N1 and
    panel-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx3(X,L) = U
then insertx3(X,[A|L]) = [A|U].

insertx3(X,L) = [X|L].

insert4([]) = [].

if  insert4(L) = S and
    insertx4(X,S) = U
then insert4([X|L]) = U.

if  dry-film-processing-time(A) = P1 and
    dry-film-processing-time(X) = P2 and
    df-wip-quantity(A) = N1 and
    df-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx4(X,L) = U
then insertx4(X,[A|L]) = [A|U].

insertx4(X,L) = [X|L].

insert5([]) = [].

if  insert5(L) = S and
    insertx5(X,S) = U
then insert5([X|L]) = U.

if  pattern-plating-processing-time(A) = P1 and
    pattern-plating-processing-time(X) = P2 and
    pattern-wip-quantity(A) = N1 and
    pattern-wip-quantity(X) = N2 and
    P1*N1 = M1 and

```

```

P2*N2 = M2 and
M1<=M2 and
insertx5(X,L) = U
then insertx5(X,[A|L]) = [A|U].

```

```

insertx5(X,L) = [X|L].

```

```

insert6([]) = [].

```

```

if insert6(L) = S and
insertx6(X,S) = U
then insert6([X|L]) = U.

```

```

if etching-processing-time(A) = P1 and
etching-processing-time(X) = P2 and
etch-wip-quantity(A) = N1 and
etch-wip-quantity(X) = N2 and
P1*N1 = M1 and
P2*N2 = M2 and
M1<=M2 and
insertx6(X,L) = U
then insertx6(X,[A|L]) = [A|U].

```

```

insertx6(X,L) = [X|L].

```

```

insert7([]) = [].

```

```

if insert7(L) = S and
insertx7(X,S) = U
then insert7([X|L]) = U.

```

```

if solder-mask-processing-time(A) = P1 and
solder-mask-processing-time(X) = P2 and
sm-wip-quantity(A) = N1 and
sm-wip-quantity(X) = N2 and
P1*N1 = M1 and
P2*N2 = M2 and
M1<=M2 and
insertx7(X,L) = U
then insertx7(X,[A|L]) = [A|U].

```

```

insertx7(X,L) = [X|L].

```

```

insert8([]) = [].

```

```

if insert8(L) = S and
insertx8(X,S) = U
then insert8([X|L]) = U.

```

```

if gold-plating-processing-time(A) = P1 and
gold-plating-processing-time(X) = P2 and
gp-wip-quantity(A) = N1 and
gp-wip-quantity(X) = N2 and

```

```

    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx8(X,L) = U
then insertx8(X,[A|L]) = [A|U].

```

```
insertx8(X,L) = [X|L].
```

```
insert9([]) = [].
```

```

if  insert9(L) = S and
    insertx9(X,S) = U
then insert9([X|L]) = U.

```

```

if  scl-processing-time(A) = P1 and
    scl-processing-time(X) = P2 and
    scl-wip-quantity(A) = N1 and
    scl-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx9(X,L) = U
then insertx9(X,[A|L]) = [A|U].

```

```
insertx9(X,L) = [X|L].
```

```
insert10([]) = [].
```

```

if  insert10(L) = S and
    insertx10(X,S) = U
then insert10([X|L]) = U.

```

```

if  component-mark-processing-time(A) = P1 and
    component-mark-processing-time(X) = P2 and
    cm-wip-quantity(A) = N1 and
    cm-wip-quantity(X) = N2 and
    P1*N1 = M1 and
    P2*N2 = M2 and
    M1<=M2 and
    insertx10(X,L) = U
then insertx10(X,[A|L]) = [A|U].

```

```
insertx10(X,L) = [X|L].
```

```
insert11([]) = [].
```

```

if  insert11(L) = S and
    insertx11(X,S) = U
then insert11([X|L]) = U.

```

```

if  profile-processing-time(A) = P1 and
    profile-processing-time(X) = P2 and
    profile-wip-quantity(A) = N1 and

```

```

profile-wip-quantity(X) = N2 and
P1*N1 = M1 and
P2*N2 = M2 and
M1<=M2 and
insertx11(X,L) = U
then insertx11(X,[A|L]) = [A|U].

insertx11(X,L) = [X|L].

if not(bc-machine-overload) and
listof(A,bc-jobtype = A and bc-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display(['list of ok jobtype in board cut = ',LIST,nl,nl])
then ok-job-sequence = LIST.

if bc-has-ok-job and
not(bc-machine-overload) and
list-of-jobtypes-ordered-by-earliest-due-date = ED and
display([' list of ok jobtypes ordered by EDD in board cut =
',ED,nl,nl]) and
length(ED) = N and
not(N<2)
then ok-job-sequence = ED.

if listof(A,bc-jobtype = A and bc-job-status(A) = ok) =
LIST and
insert12(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date = EDD.

if not(drill-machine-overload) and
listof(A,drill-jobtype = A and drill-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in drilling = ',LIST,nl,nl])
then ok-job-sequencel = LIST.

if drill-has-ok-job and
not(drill-machine-overload) and
list-of-jobtypes-ordered-by-earliest-due-date1 = ED and
display([' list of ok jobtypes ordered by EDD in drilling =
',ED,nl,nl]) and
length(ED) = N and
not(N<2)
then ok-job-sequencel = ED.

if listof(A,drill-jobtype = A and drill-job-status(A) = ok) =
LIST and
insert13(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date1 = EDD.

```

```

if not(pth-machine-overload) and
  listof(A,pth-jobtype = A and pth-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of ok jobtype in pth = ',LIST,nl,nl])
then ok-job-sequence2 = LIST.

if pth-has-ok-job and
  not(pth-machine-overload) and
  list-of-jobtypes-ordered-by-earliest-due-date2 = ED and
  display([' list of ok jobtypes ordered by EDD in pth = ',
  ,ED,nl,nl]) and
  length(ED) = N and
  not(N<2)
then ok-job-sequence2 = ED.

if listof(A,pth-jobtype = A and pth-job-status(A) = ok) =
  LIST and
  insert14(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date2 = EDD.

if not(panel-machine-overload) and
  listof(A,panel-jobtype = A and panel-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of ok jobtype in panel plating = ',
  ,LIST,nl,nl])
then ok-job-sequence3 = LIST.

if panel-has-ok-job and
  not(panel-machine-overload) and
  list-of-jobtypes-ordered-by-earliest-due-date3 = ED and
  display([' list of ok jobtypes ordered by EDD in panel
  plating = ',ED,nl,nl]) and
  length(ED) = N and
  not(N<2)
then ok-job-sequence3 = ED.

if listof(A,panel-jobtype = A and panel-job-status(A) = ok) =
  LIST and
  insert15(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date3 = EDD.

if not(df-machine-overload) and
  listof(A,df-jobtype = A and df-job-status(A) = ok) =
  LIST and
  length(LIST) = N and
  N = 0 or N = 1 and
  display([' list of ok jobtype in dry film = ',LIST,nl,nl])
then ok-job-sequence4 = LIST.

```

```

if  df-has-ok-job and
    not(df-machine-overload) and
    list-of-jobtypes-ordered-by-earliest-due-date4 = ED and
    display([' list of ok jobtypes ordered by EDD in dry film =
            ',ED,nl,nl]) and
    length(ED) = N and
    not(N<2)
then ok-job-sequence4 = ED.

if  listof(A,df-jobtype = A and df-job-status(A) = ok) =
    LIST and
    insert16(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date4 = EDD.

if  not(pattern-machine-overload) and
    listof(A,pattern-jobtype = A and pattern-job-status(A) = ok)
    = LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in pattern plating = '
            ',LIST,nl,nl])
then ok-job-sequence5 = LIST.

if  pattern-has-ok-job and
    not(pattern-machine-overload) and
    list-of-jobtypes-ordered-by-earliest-due-date5 = ED and
    display([' list of ok jobtypes ordered by EDD in pattern
            plating = ',ED,nl,nl]) and
    length(ED) = N and
    not(N<2)
then ok-job-sequence5 = ED.

if  listof(A,pattern-jobtype = A and pattern-job-status(A) = ok)
    = LIST and
    insert17(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date5 = EDD.

if  not(etch-machine-overload) and
    listof(A,etch-jobtype = A and etch-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in etching = ',LIST,nl,nl])
then ok-job-sequence6 = LIST.

if  etch-has-ok-job and
    not(etch-machine-overload) and
    list-of-jobtypes-ordered-by-earliest-due-date6 = ED and
    display([' list of ok jobtypes ordered by EDD in etching =
            ',ED,nl,nl]) and
    length(ED) = N and
    not(N<2)
then ok-job-sequence6 = ED.

```

```

if  listof(A,etch-jobtype = A and etch-job-status(A) = ok) =
    LIST and
    insert18(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date6 = EDD.

if  not(sm-machine-overload) and
    listof(A,sm-jobtype = A and sm-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in solder mask = ',
            ,LIST,nl,nl])
then ok-job-sequence7 = LIST.

if  sm-has-ok-job and
    not(sm-machine-overload) and
    list-of-jobtypes-ordered-by-earliest-due-date7 = ED and
    display([' list of ok jobtypes ordered by EDD in solder
    mask = ',ED,nl,nl]) and
    length(ED) = N and
    not(N<2)
then ok-job-sequence7 = ED.

if  listof(A,sm-jobtype = A and sm-job-status(A) = ok) =
    LIST and
    insert19(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date7 = EDD.

if  not(gp-machine-overload) and
    listof(A,gp-jobtype = A and gp-job-status(A) = ok) =
    LIST and
    length(LIST) = N and
    N = 0 or N = 1 and
    display([' list of ok jobtype in gold plating = ',
            ,LIST,nl,nl])
then ok-job-sequence8 = LIST.

if  gp-has-ok-job and
    not(gp-machine-overload) and
    list-of-jobtypes-ordered-by-earliest-due-date8 = ED and
    display([' list of ok jobtypes ordered by EDD in gold
    plating = ',ED,nl,nl]) and
    length(ED) = N and
    not(N<2)
then ok-job-sequence8 = ED.

if  listof(A,gp-jobtype = A and gp-job-status(A) = ok) =
    LIST and
    insert20(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date8 = EDD.

if  not(scl-machine-overload) and
    listof(A,scl-jobtype = A and scl-job-status(A) = ok) =

```

```

LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in scl = ',LIST,nl,nl])
then ok-job-sequence9 = LIST.

if scl-has-ok-job and
not(scl-machine-overload) and
list-of-jobtypes-ordered-by-earliest-due-date9 = ED and
display([' list of ok jobtypes ordered by EDD in scl = ',
,ED,nl,nl]) and
length(ED) = N and
not(N<2)
then ok-job-sequence9 = ED.

if listof(A,scl-jobtype = A and scl-job-status(A) = ok) =
LIST and
insert21(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date9 = EDD.

if not(cm-machine-overload) and
listof(A,cm-jobtype = A and cm-job-status(A) = ok) =
LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in component mark = ',
,LIST,nl,nl])
then ok-job-sequence10 = LIST.

if cm-has-ok-job and
not(cm-machine-overload) and
list-of-jobtypes-ordered-by-earliest-due-date10 = ED and
display([' list of ok jobtypes ordered by EDD in component
mark = ',ED,nl,nl]) and
length(ED) = N and
not(N<2)
then ok-job-sequence10 = ED.

if listof(A,cm-jobtype = A and cm-job-status(A) = ok) =
LIST and
insert22(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date10 = EDD.

if not(profile-machine-overload) and
listof(A,profile-jobtype = A and profile-job-status(A) = ok)
= LIST and
length(LIST) = N and
N = 0 or N = 1 and
display([' list of ok jobtype in profile = ',LIST,nl,nl])
then ok-job-sequence11 = LIST.

if profile-has-ok-job and
not(profile-machine-overload) and

```



```

list-of-jobtypes-ordered-by-earliest-due-date11 = ED and
display([' list of ok jobtypes ordered by EDD in profile =
',ED,nl,nl]) and
length(ED) = N and
not(N<2)
then ok-job-sequencell = ED.

if listof(A,profile-jobtype = A and profile-job-status(A) = ok)
= LIST and
insert23(LIST) = EDD
then list-of-jobtypes-ordered-by-earliest-due-date11 = EDD.

insert12([]) = [].

if insert12(L) = S and
insertx12(X,S) = U
then insert12([X|L]) = U.

if bc-duedate(A) = D1 and
bc-duedate(X) = D2 and
D1 < D2 and
insertx12(X,L) = U
then insertx12(X,[A|L]) = [A|U].

insertx12(X,L) = [X|L].

insert13([]) = [].

if insert13(L) = S and
insertx13(X,S) = U
then insert13([X|L]) = U.

if drill-duedate(A) = D1 and
drill-duedate(X) = D2 and
D1 < D2 and
insertx13(X,L) = U
then insertx13(X,[A|L]) = [A|U].

insertx13(X,L) = [X|L].

insert14([]) = [].

if insert14(L) = S and
insertx14(X,S) = U
then insert14([X|L]) = U.

if pth-duedate(A) = D1 and
pth-duedate(X) = D2 and
D1 < D2 and
insertx14(X,L) = U
then insertx14(X,[A|L]) = [A|U].

```

```
insortx14(X,L) = [X|L].

insort15([]) = [].

if   insort15(L) = S and
     insortx15(X,S) = U
then insort15([X|L]) = U.

if   panel-duedate(A) = D1 and
     panel-duedate(X) = D2 and
     D1 < D2 and
     insortx15(X,L) = U
then insortx15(X,[A|L]) = [A|U].

insortx15(X,L) = [X|L].

insort16([]) = [].

if   insort16(L) = S and
     insortx16(X,S) = U
then insort16([X|L]) = U.

if   df-duedate(A) = D1 and
     df-duedate(X) = D2 and
     D1 < D2 and
     insortx16(X,L) = U
then insortx16(X,[A|L]) = [A|U].

insortx16(X,L) = [X|L].

insort17([]) = [].

if   insort17(L) = S and
     insortx17(X,S) = U
then insort17([X|L]) = U.

if   pattern-duedate(A) = D1 and
     pattern-duedate(X) = D2 and
     D1 < D2 and
     insortx17(X,L) = U
then insortx17(X,[A|L]) = [A|U].

insortx17(X,L) = [X|L].

insort18([]) = [].

if   insort18(L) = S and
     insortx18(X,S) = U
then insort18([X|L]) = U.

if   etch-duedate(A) = D1 and
     etch-duedate(X) = D2 and
     D1 < D2 and
```

```

    insertx18(X,L) = U
  then insertx18(X,[A|L]) = [A|U].

```

```

insertx18(X,L) = [X|L].

```

```

insert19([]) = [].

```

```

if  insert19(L) = S and
    insertx19(X,S) = U
then insert19([X|L]) = U.

```

```

if  sm-duedate(A) = D1 and
    sm-duedate(X) = D2 and
    D1 < D2 and
    insertx19(X,L) = U
then insertx19(X,[A|L]) = [A|U].

```

```

insertx19(X,L) = [X|L].

```

```

insert20([]) = [].

```

```

if  insert20(L) = S and
    insertx20(X,S) = U
then insert20([X|L]) = U.

```

```

if  gp-duedate(A) = D1 and
    gp-duedate(X) = D2 and
    D1 < D2 and
    insertx20(X,L) = U
then insertx20(X,[A|L]) = [A|U].

```

```

insertx20(X,L) = [X|L].

```

```

insert21([]) = [].

```

```

if  insert21(L) = S and
    insertx21(X,S) = U
then insert21([X|L]) = U.

```

```

if  scl-duedate(A) = D1 and
    scl-duedate(X) = D2 and
    D1 < D2 and
    insertx21(X,L) = U
then insertx21(X,[A|L]) = [A|U].

```

```

insertx21(X,L) = [X|L].

```

```

insert22([]) = [].

```

```

if  insert22(L) = S and
    insertx22(X,S) = U
then insert22([X|L]) = U.

```

```
if  cm-duedate(A) = D1 and  
    cm-duedate(X) = D2 and  
    D1 < D2 and  
    insertx22(X,L) = U  
then insertx22(X,[A|L]) = [A|U].
```

```
insertx22(X,L) = [X|L].
```

```
insert23([]) = [].
```

```
if  insert23(L) = S and  
    insertx23(X,S) = U  
then insert23([X|L]) = U.
```

```
if  profile-duedate(A) = D1 and  
    profile-duedate(X) = D2 and  
    D1 < D2 and  
    insertx23(X,L) = U  
then insertx23(X,[A|L]) = [A|U].
```

```
insertx23(X,L) = [X|L].
```

```
if  bc-number-of-jobs = N and  
    N > 7  
then bc-machine-overload.
```

```
if  drill-number-of-jobs = N and  
    N > 5  
then drill-machine-overload.
```

```
if  pth-number-of-jobs = N and  
    N > 6  
then pth-machine-overload.
```

```
if  panel-number-of-jobs = N and  
    N > 6  
then panel-machine-overload.
```

```
if  df-number-of-jobs = N and  
    N > 7  
then df-machine-overload.
```

```
if  pattern-number-of-jobs = N and  
    N > 6  
then pattern-machine-overload.
```

```
if  etch-number-of-jobs = N and  
    N > 6  
then etch-machine-overload.
```

```
if  sm-number-of-jobs = N and  
    N > 5  
then sm-machine-overload.
```

```
if  gp-number-of-jobs = N and
    N > 5
then gp-machine-overload.

if  scl-number-of-jobs = N and
    N > 7
then scl-machine-overload.

if  cm-number-of-jobs = N and
    N > 7
then cm-machine-overload.

if  profile-number-of-jobs = N and
    N > 7
then profile-machine-overload.

if  bc-jobtype = A and
    bc-job-status(A) = late
then bc-has-late-job.

if  bc-jobtype = A and
    bc-job-status(A) = ok
then bc-has-ok-job.

if  drill-jobtype = A and
    drill-job-status(A) = late
then drill-has-late-job.

if  drill-jobtype = A and
    drill-job-status(A) = ok
then drill-has-ok-job.

if  pth-jobtype = A and
    pth-job-status(A) = late
then pth-has-late-job.

if  pth-jobtype = A and
    pth-job-status(A) = ok
then pth-has-ok-job.

if  panel-jobtype = A and
    panel-job-status(A) = late
then panel-has-late-job.

if  panel-jobtype = A and
    panel-job-status(A) = ok
then panel-has-ok-job.

if  df-jobtype = A and
    df-job-status(A) = late
then df-has-late-job.
```

```
if df-jobtype = A and
   df-job-status(A) = ok
then df-has-ok-job.

if pattern-jobtype = A and
   pattern-job-status(A) = late
then pattern-has-late-job.

if pattern-jobtype = A and
   pattern-job-status(A) = ok
then pattern-has-ok-job.

if etch-jobtype = A and
   etch-job-status(A) = late
then etch-has-late-job.

if etch-jobtype = A and
   etch-job-status(A) = ok
then etch-has-ok-job.

if sm-jobtype = A and
   sm-job-status(A) = late
then sm-has-late-job.

if sm-jobtype = A and
   sm-job-status(A) = ok
then sm-has-ok-job.

if gp-jobtype = A and
   gp-job-status(A) = late
then gp-has-late-job.

if gp-jobtype = A and
   gp-job-status(A) = ok
then gp-has-ok-job.

if scl-jobtype = A and
   scl-job-status(A) = late
then scl-has-late-job.

if scl-jobtype = A and
   scl-job-status(A) = ok
then scl-has-ok-job.

if cm-jobtype = A and
   cm-job-status(A) = late
then cm-has-late-job.

if cm-jobtype = A and
   cm-job-status(A) = ok
then cm-has-ok-job.
```

```
if  profile-jobtype = A and
    profile-job-status(A) = late
then profile-has-late-job.
```

```
if  profile-jobtype = A and
    profile-job-status(A) = ok
then profile-has-ok-job.
```

```
/* ----- JOB-STATUS ----- */
```

```
if  bc-jobtype = A and
    bc-strm(A) = S and
    S < 7200.0
then bc-job-status(A) = late.
```

```
if  bc-jobtype = A and
    bc-strm(A) = S and
    S >= 7200.0
then bc-job-status(A) = ok.
```

```
if  drill-jobtype = A and
    drill-strm(A) = S and
    S < 7200.0
then drill-job-status(A) = late.
```

```
if  drill-jobtype = A and
    drill-strm(A) = S and
    S >= 7200.0
then drill-job-status(A) = ok.
```

```
if  pth-jobtype = A and
    pth-strm(A) = S and
    S < 7200.0
then pth-job-status(A) = late.
```

```
if  pth-jobtype = A and
    pth-strm(A) = S and
    S >= 7200.0
then pth-job-status(A) = ok.
```

```
if  panel-jobtype = A and
    panel-strm(A) = S and
    S < 7200.0
then panel-job-status(A) = late.
```

```
if  panel-jobtype = A and
    panel-strm(A) = S and
    S >= 7200.0
then panel-job-status(A) = ok.
```

```
if  df-jobtype = A and
    df-strm(A) = S and
    S < 7200.0
```

```
then df-job-status(A) = late.

if  df-jobtype = A and
   df-strm(A) = S and
   S>=7200.0
then df-job-status(A) = ok.

if  pattern-jobtype = A and
   pattern-strm(A) = S and
   S<7200.0
then pattern-job-status(A) = late.

if  pattern-jobtype = A and
   pattern-strm(A) = S and
   S>=7200.0
then pattern-job-status(A) = ok.

if  etch-jobtype = A and
   etch-strm(A) = S and
   S<7200.0
then etch-job-status(A) = late.

if  etch-jobtype = A and
   etch-strm(A) = S and
   S>=7200.0
then etch-job-status(A) = ok.

if  sm-jobtype = A and
   sm-strm(A) = S and
   S<7200.0
then sm-job-status(A) = late.

if  sm-jobtype = A and
   sm-strm(A) = S and
   S>=7200.0
then sm-job-status(A) = ok.

if  gp-jobtype = A and
   gp-strm(A) = S and
   S<7200.0
then gp-job-status(A) = late.

if  gp-jobtype = A and
   gp-strm(A) = S and
   S>=7200.0
then gp-job-status(A) = ok.

if  scl-jobtype = A and
   scl-strm(A) = S and
   S<7200.0
then scl-job-status(A) = late.
```



```
if scl-jobtype = A and
   scl-strm(A) = S and
   S >= 7200.0
then scl-job-status(A) = ok.

if cm-jobtype = A and
   cm-strm(A) = S and
   S < 7200.0
then cm-job-status(A) = late.

if cm-jobtype = A and
   cm-strm(A) = S and
   S >= 7200.0
then cm-job-status(A) = ok.

if profile-jobtype = A and
   profile-strm(A) = S and
   S < 7200.0
then profile-job-status(A) = late.

if profile-jobtype = A and
   profile-strm(A) = S and
   S >= 7200.0
then profile-job-status(A) = ok.

if present-date = P and
   bc-duedate(A) = D and
   process-time(A) = S and
   (D-P-S)*24*60 = Slack
then bc-strm(A) = Slack.

if drill-present-time = P and
   drill-duedate(A) = D and
   process-time1(A) = S and
   (D-P-S)*24*60 = Slack
then drill-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = drilling) or
   kind-of-breakdown(drilling) = any-else and
   present-date = P
then drill-present-time = P.

if duration-break(drilling) = H and
   present-date = P and
   H/24+P = L
then drill-present-time = L.

if pth-present-time = P and
   pth-duedate(A) = D and
   process-time2(A) = S and
   (D-P-S)*24*60 = Slack
then pth-strm(A) = Slack.
```

```
if machine-break = no or
   not(operation-breakdown = pth) or
   kind-of-breakdown(pth) = any-else and
   present-date = P
then pth-present-time = P.

if duration-break(pth) = H and
   present-date = P and
    $H/24+P = L$ 
then present-time2 = L.

if panel-present-time = P and
   panel-duedate(A) = D and
   process-time3(A) = S and
    $(D-P-S)*24*60 = \text{Slack}$ 
then panel-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = panel-plating) or
   kind-of-breakdown(panel-plating) = any-else and
   present-date = P
then panel-present-time = P.

if duration-break(panel-plating) = H and
   present-date = P and
    $H/24+P = L$ 
then panel-present-time = L.

if present-date = P and
   df-duedate(A) = D and
   process-time4(A) = S and
    $(D-P-S)*24*60 = \text{Slack}$ 
then df-strm(A) = Slack.

if pattern-present-time = P and
   pattern-duedate(A) = D and
   process-time5(A) = S and
    $(D-P-S)*24*60 = \text{Slack}$ 
then pattern-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = pattern-plating) or
   kind-of-breakdown(pattern-plating) = any-else and
   present-date = P
then pattern-present-time = P.

if duration-break(pattern-plating) = H and
   present-date = P and
    $H/24+P = L$ 
then pattern-present-time = L.

if etch-present-time = P and
   etch-duedate(A) = D and
```

```

    process-time6(A) = S and
    (D-P-S)*24*60 = Slack
then etch-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = etching) or
   kind-of-breakdown(etching) = any-else and
   present-date = P
then etch-present-time = P.

if duration-break(etching) = H and
   present-date = P and
   H/24+P = L
then etch-present-time = L.

if present-date = P and
   sm-duedate(A) = D and
   process-time7(A) = S and
   (D-P-S)*24*60 = Slack
then sm-strm(A) = Slack.

if gp-present-time = P and
   gp-duedate(A) = D and
   process-time8(A) = S and
   (D-P-S)*24*60 = Slack
then gp-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = gold-plating) or
   kind-of-breakdown(gold-plating) = any-else and
   present-date = P
then gp-present-time = P.

if duration-break(gold-plating) = H and
   present-date = P and
   H/24+P = L
then gp-present-time = L.

if scl-present-time = P and
   scl-duedate(A) = D and
   process-time9(A) = S and
   (D-P-S)*24*60 = Slack
then scl-strm(A) = Slack.

if machine-break = no or
   not(operation-breakdown = scl) or
   kind-of-breakdown(scl) = any-else and
   present-date = P
then scl-present-time = P.

if duration-break(scl) = H and
   present-date = P and
   H/24+P = L

```

```

then scl-present-time = L.

if present-date = P and
   cm-duedate(A) = D and
   process-time10(A) = S and
   (D-P-S)*24*60 = Slack
then cm-strm(A) = Slack.

if present-date = P and
   profile-duedate(A) = D and
   process-time11(A) = S and
   (D-P-S)*24*60 = Slack
then profile-strm(A) = Slack.

if bc-jobtype = A and
   board-cut-processing-time(A) = P and
   drilling-processing-time(A) = P1 and
   pth-processing-time(A) = P2 and
   panel-plating-processing-time(A) = P3 and
   dry-film-processing-time(A) = P4 and
   pattern-plating-processing-time(A) = P5 and
   etching-processing-time(A) = P6 and
   solder-mask-processing-time(A) = P7 and
   gold-plating-processing-time(A) = P8 and
   scl-processing-time(A) = P9 and
   component-mark-processing-time(A) = P10 and
   profile-processing-time(A) = P11 and
   bc-wip-quantity(A) = Q and
   (P+P1+P2+P3+P4+P5+P6+P7+P8+P9+P10+P11)*Q/24 = S
then process-time(A) = S.

if drill-jobtype = A and
   drilling-processing-time(A) = P1 and
   pth-processing-time(A) = P2 and
   panel-plating-processing-time(A) = P3 and
   dry-film-processing-time(A) = P4 and
   pattern-plating-processing-time(A) = P5 and
   etching-processing-time(A) = P6 and
   solder-mask-processing-time(A) = P7 and
   gold-plating-processing-time(A) = P8 and
   scl-processing-time(A) = P9 and
   component-mark-processing-time(A) = P10 and
   profile-processing-time(A) = P11 and
   drill-wip-quantity(A) = Q and
   (P1+P2+P3+P4+P5+P6+P7+P8+P9+P10+P11)*Q/24 = S
then process-time1(A) = S.

if pth-jobtype = A and
   pth-processing-time(A) = P2 and
   panel-plating-processing-time(A) = P3 and
   dry-film-processing-time(A) = P4 and
   pattern-plating-processing-time(A) = P5 and
   etching-processing-time(A) = P6 and

```

solder-mask-processing-time(A) = P7 and
 gold-plating-processing-time(A) = P8 and
 scl-processing-time(A) = P9 and
 component-mark-processing-time(A) = P10 and
 profile-processing-time(A) = P11 and
 pth-wip-quantity(A) = Q and
 $(P2+P3+P4+P5+P6+P7+P8+P9+P10+P11)*Q/24 = S$
 then process-time2(A) = S.

if panel-jobtype = A and
 panel-plating-processing-time(A) = P3 and
 dry-film-processing-time(A) = P4 and
 pattern-plating-processing-time(A) = P5 and
 etching-processing-time(A) = P6 and
 solder-mask-processing-time(A) = P7 and
 gold-plating-processing-time(A) = P8 and
 scl-processing-time(A) = P9 and
 component-mark-processing-time(A) = P10 and
 profile-processing-time(A) = P11 and
 panel-wip-quantity(A) = Q and
 $(P3+P4+P5+P6+P7+P8+P9+P10+P11)*Q/24 = S$
 then process-time3(A) = S.

if df-jobtype = A and
 dry-film-processing-time(A) = P4 and
 pattern-plating-processing-time(A) = P5 and
 etching-processing-time(A) = P6 and
 solder-mask-processing-time(A) = P7 and
 gold-plating-processing-time(A) = P8 and
 scl-processing-time(A) = P9 and
 component-mark-processing-time(A) = P10 and
 profile-processing-time(A) = P11 and
 df-wip-quantity(A) = Q and
 $(P4+P5+P6+P7+P8+P9+P10+P11)*Q/24 = S$
 then process-time4(A) = S.

if pattern-jobtype = A and
 pattern-plating-processing-time(A) = P5 and
 etching-processing-time(A) = P6 and
 solder-mask-processing-time(A) = P7 and
 gold-plating-processing-time(A) = P8 and
 scl-processing-time(A) = P9 and
 component-mark-processing-time(A) = P10 and
 profile-processing-time(A) = P11 and
 pattern-wip-quantity(A) = Q and
 $(P5+P6+P7+P8+P9+P10+P11)*Q/24 = S$
 then process-time5(A) = S.

if etch-jobtype = A and
 etching-processing-time(A) = P6 and
 solder-mask-processing-time(A) = P7 and
 gold-plating-processing-time(A) = P8 and
 scl-processing-time(A) = P9 and

```

    component-mark-processing-time(A) = P10 and
    profile-processing-time(A) = P11 and
    etch-wip-quantity(A) = Q and
    (P6+P7+P8+P9+P10+P11)*Q/24 = S
then process-time6(A) = S.

```

```

if    sm-jobtype = A and
     solder-mask-processing-time(A) = P7 and
     gold-plating-processing-time(A) = P8 and
     scl-processing-time(A) = P9 and
     component-mark-processing-time(A) = P10 and
     profile-processing-time(A) = P11 and
     sm-wip-quantity(A) = Q and
     (P7+P8+P9+P10+P11)*Q/24 = S
then process-time7(A) = S.

```

```

if    gp-jobtype = A and
     gold-plating-processing-time(A) = P8 and
     scl-processing-time(A) = P9 and
     component-mark-processing-time(A) = P10 and
     profile-processing-time(A) = P11 and
     gp-wip-quantity(A) = Q and
     (P8+P9+P10+P11)*Q/24 = S
then process-time8(A) = S.

```

```

if    scl-jobtype = A and
     scl-processing-time(A) = P9 and
     component-mark-processing-time(A) = P10 and
     profile-processing-time(A) = P11 and
     scl-wip-quantity(A) = Q and
     (P9+P10+P11)*Q/24 = S
then process-time9(A) = S.

```

```

if    cm-jobtype = A and
     component-mark-processing-time(A) = P10 and
     profile-processing-time(A) = P11 and
     cm-wip-quantity(A) = Q and
     (P10+P11)*Q/24 = S
then process-time10(A) = S.

```

```

if    profile-jobtype = A and
     profile-processing-time(A) = P11 and
     profile-wip-quantity(A) = Q and
     P11*Q/24 = S
then process-time11(A) = S.

```

```

/* ----- APPEND-FUNCTION ----- */

```

```

append([],L) = L.

```

```

if append(L1,L2) = L3
then append([X|L1],L2) = [X|L3].

```

```
/* ----- LENGTH-FUNCTION ----- */
legalvals(length(Y)) = integer.

length([]) = 0.

if length(Y) = W2 and
   W = W2+1
then length([X|Y]) = W.

/* ----- OPERATIONS-BUFFER-DATABASE ----- */

board-cut-buffer = [d1449a,d1086h].
drilling-buffer = [d1086h,d1388b].
pth-buffer = [d1086h,d802c].
panel-plating-buffer = [d802c,d1345b].
dry-film-buffer = [d1345b].
pattern-plating-buffer = [d1333a,d1345b,d938i,d802c,d1403a,
d1242a].
etching-buffer = [d1403a].
solder-mask-buffer = [d804g,d937a].
gold-plating-buffer = [].
scl-buffer = [d1398a,d983g,d1230a,d1388b].
component-mark-buffer = [].
profile-buffer = [d804g,d1086h,d1345b,d1301c,d1398a].

/* ----- WORK-IN-PROCESS-QUANTITY-DATABASE ----- */

bc-wip-quantity(d1449a) = 2667.
bc-wip-quantity(d1086h) = 66.

drill-wip-quantity(d1086h) = 1740.
drill-wip-quantity(d1388b) = 1662.

pth-wip-quantity(d802c) = 1104.
pth-wip-quantity(d1086h) = 419.

panel-wip-quantity(d802c) = 1839.
panel-wip-quantity(d1345b) = 658.

df-wip-quantity(d1345b) = 57.

pattern-wip-quantity(d1333a) = 4160.
pattern-wip-quantity(d938i) = 33.
pattern-wip-quantity(d1403a) = 1930.
pattern-wip-quantity(d1242a) = 770.
pattern-wip-quantity(d802c) = 755.
pattern-wip-quantity(d1345b) = 1665.

etch-wip-quantity(d1403a) = 1616.
```

```
sm-wip-quantity(d937a) = 475.  
sm-wip-quantity(d804g) = 1040.
```

```
scl-wip-quantity(d1398a) = 733.  
scl-wip-quantity(d983g) = 380.  
scl-wip-quantity(d1230a) = 158.  
scl-wip-quantity(d1388b) = 3364.
```

```
profile-wip-quantity(d804g) = 2165.  
profile-wip-quantity(d1086h) = 819.  
profile-wip-quantity(d1301c) = 3370.  
profile-wip-quantity(d1398a) = 480.  
profile-wip-quantity(d1345b) = 510.
```

```
/* ----- JOBTYPES-DUEDATE-DATABASE ----- */
```

```
multivalued(bc-duedate(A)).  
multivalued(drill-duedate(A)).  
multivalued(pth-duedate(A)).  
multivalued(panel-duedate(A)).  
multivalued(df-duedate(A)).  
multivalued(pattern-duedate(A)).  
multivalued(etch-duedate(A)).  
multivalued(sm-duedate(A)).  
multivalued(gp-duedate(A)).  
multivalued(scl-duedate(A)).  
multivalued(cm-duedate(A)).  
multivalued(profile-duedate(A)).
```

```
bc-duedate(d1449a) = 17.  
bc-duedate(d1086h) = 18.
```

```
drill-duedate(d1086h) = 18.  
drill-duedate(d1388b) = 18.
```

```
pth-duedate(d802c) = 16.
```

```
pth-duedate(d1086h) = 18.
```

```
panel-duedate(d802c) = 16.  
panel-duedate(d1345b) = 17.
```

```
df-duedate(d1345b) = 17.
```

```
pattern-duedate(d1333a) = 15.  
pattern-duedate(d1345b) = 17.  
pattern-duedate(d1242a) = 14.  
pattern-duedate(d1403a) = 13.  
pattern-duedate(d802c) = 14.  
pattern-duedate(d938i) = 15.
```

```
etch-duedate(d1403a) = 13.
```


sm-duedate(d937a) = 13.
 sm-duedate(d804g) = 13.

scl-duedate(d1398a) = 12.
 scl-duedate(d983g) = 12.
 scl-duedate(d1230a) = 12.
 scl-duedate(d1388b) = 12.

profile-duedate(d804g) = 4.
 profile-duedate(d1398a) = 7.
 profile-duedate(d1086h) = 10.
 profile-duedate(d1301c) = 9.
 profile-duedate(d1345b) = 11.

/* ----- OPERATIONS-PROCESSING-TIME ----- */

legalvals(board-cut-processing-time(A)) = real.
 multivalued(board-cut-processing-time(A)).

board-cut-processing-time(d1086h) = 0.006.
 board-cut-processing-time(d1230a) = 0.006.
 board-cut-processing-time(d1301c) = 0.006.
 board-cut-processing-time(d1333a) = 0.006.
 board-cut-processing-time(d1345b) = 0.006.
 board-cut-processing-time(d1358a) = 0.006.
 board-cut-processing-time(d1388b) = 0.006.
 board-cut-processing-time(d1398a) = 0.006.
 board-cut-processing-time(d1403a) = 0.006.
 board-cut-processing-time(d1449a) = 0.006.
 board-cut-processing-time(d802c) = 0.006.
 board-cut-processing-time(d804g) = 0.006.
 board-cut-processing-time(d827e) = 0.006.
 board-cut-processing-time(d937a) = 0.006.
 board-cut-processing-time(d983g) = 0.006.
 board-cut-processing-time(d938i) = 0.006.
 board-cut-processing-time(d1220a) = 0.006.
 board-cut-processing-time(d1254b) = 0.006.
 board-cut-processing-time(d1265b) = 0.006.
 board-cut-processing-time(d1242a) = 0.006.

legalvals(drilling-processing-time(A)) = real.
 multivalued(drilling-processing-time(A)).

drilling-processing-time(d1086h) = 0.006.
 drilling-processing-time(d1230a) = 0.008.
 drilling-processing-time(d1333a) = 0.008.
 drilling-processing-time(d1345b) = 0.007.
 drilling-processing-time(d1358a) = 0.007.
 drilling-processing-time(d1388b) = 0.014.
 drilling-processing-time(d1301c) = 0.004.
 drilling-processing-time(d804g) = 0.004.
 drilling-processing-time(d1398a) = 0.007.
 drilling-processing-time(d1403a) = 0.013.

drilling-processing-time(d1449a) = 0.007.
drilling-processing-time(d802c) = 0.003.
drilling-processing-time(d827e) = 0.004.
drilling-processing-time(d937a) = 0.004.
drilling-processing-time(d983g) = 0.008.
drilling-processing-time(d938i) = 0.007.
drilling-processing-time(d1220a) = 0.009.
drilling-processing-time(d1254b) = 0.004.
drilling-processing-time(d1265b) = 0.009.
drilling-processing-time(d1242a) = 0.005.

legalvals(pth-processing-time(A)) = real.
multivalued(pth-processing-time(A)).

pth-processing-time(d1086h) = 0.006.
pth-processing-time(d1230a) = 0.006.
pth-processing-time(d1301c) = 0.006.
pth-processing-time(d1333a) = 0.006.
pth-processing-time(d1345b) = 0.006.
pth-processing-time(d1358a) = 0.006.
pth-processing-time(d1388b) = 0.006.
pth-processing-time(d804g) = 0.006.
pth-processing-time(d1398a) = 0.006.
pth-processing-time(d1403a) = 0.006.
pth-processing-time(d1449a) = 0.006.
pth-processing-time(d802c) = 0.006.
pth-processing-time(d827e) = 0.006.
pth-processing-time(d937a) = 0.006.
pth-processing-time(d983g) = 0.006.
pth-processing-time(d938i) = 0.006.
pth-processing-time(d1220a) = 0.006.
pth-processing-time(d1254b) = 0.006.
pth-processing-time(d1265b) = 0.006.
pth-processing-time(d1242a) = 0.006.

legalvals(panel-plating-processing-time(A)) = real.
multivalued(panel-plating-processing-time(A)).

panel-plating-processing-time(d1086h) = 0.007.
panel-plating-processing-time(d1230a) = 0.007.
panel-plating-processing-time(d1333a) = 0.005.
panel-plating-processing-time(d1345b) = 0.007.
panel-plating-processing-time(d1358a) = 0.006.
panel-plating-processing-time(d1388b) = 0.006.
panel-plating-processing-time(d1301c) = 0.005.
panel-plating-processing-time(d804g) = 0.005.
panel-plating-processing-time(d1398a) = 0.007.
panel-plating-processing-time(d1403a) = 0.007.
panel-plating-processing-time(d1449a) = 0.005.
panel-plating-processing-time(d802c) = 0.007.
panel-plating-processing-time(d827e) = 0.005.
panel-plating-processing-time(d937a) = 0.006.
panel-plating-processing-time(d983g) = 0.007.

panel-plating-processing-time(d938i) = 0.006.
panel-plating-processing-time(d1220a) = 0.005.
panel-plating-processing-time(d1254b) = 0.005.
panel-plating-processing-time(d1265b) = 0.005.
panel-plating-processing-time(d1242a) = 0.007.

legalvals(dry-film-processing-time(A)) = real.
multivalued(dry-film-processing-time(A)).

dry-film-processing-time(d1086h) = 0.004.
dry-film-processing-time(d1230a) = 0.004.
dry-film-processing-time(d1333a) = 0.002.
dry-film-processing-time(d1345b) = 0.004.
dry-film-processing-time(d1358a) = 0.002.
dry-film-processing-time(d1388b) = 0.004.
dry-film-processing-time(d1301c) = 0.004.
dry-film-processing-time(d1398a) = 0.004.
dry-film-processing-time(d1403a) = 0.004.
dry-film-processing-time(d1449a) = 0.002.
dry-film-processing-time(d802c) = 0.004.
dry-film-processing-time(d804g) = 0.002.
dry-film-processing-time(d827e) = 0.004.
dry-film-processing-time(d937a) = 0.002.
dry-film-processing-time(d983g) = 0.004.
dry-film-processing-time(d938i) = 0.004.
dry-film-processing-time(d1220a) = 0.002.
dry-film-processing-time(d1254b) = 0.004.
dry-film-processing-time(d1265b) = 0.004.
dry-film-processing-time(d1242a) = 0.004.

legalvals(pattern-plating-processing-time(A)) = real.
multivalued(pattern-plating-processing-time(A)).

pattern-plating-processing-time(d1086h) = 0.007.
pattern-plating-processing-time(d1230a) = 0.008.
pattern-plating-processing-time(d1333a) = 0.006.
pattern-plating-processing-time(d1345b) = 0.008.
pattern-plating-processing-time(d1358a) = 0.006.
pattern-plating-processing-time(d1388b) = 0.007.
pattern-plating-processing-time(d1301c) = 0.008.
pattern-plating-processing-time(d804g) = 0.006.
pattern-plating-processing-time(d1398a) = 0.008.
pattern-plating-processing-time(d1403a) = 0.007.
pattern-plating-processing-time(d1449a) = 0.006.
pattern-plating-processing-time(d802c) = 0.008.
pattern-plating-processing-time(d827e) = 0.006.
pattern-plating-processing-time(d937a) = 0.008.
pattern-plating-processing-time(d983g) = 0.009.
pattern-plating-processing-time(d938i) = 0.007.
pattern-plating-processing-time(d1220a) = 0.006.
pattern-plating-processing-time(d1254b) = 0.006.
pattern-plating-processing-time(d1265b) = 0.006.
pattern-plating-processing-time(d1242a) = 0.006.

legalvals(etching-processing-time(A)) = real.
multivalued(etching-processing-time(A)).

etching-processing-time(d1086h) = 0.003.
etching-processing-time(d1230a) = 0.004.
etching-processing-time(d1333a) = 0.003.
etching-processing-time(d1345b) = 0.004.
etching-processing-time(d1358a) = 0.003.
etching-processing-time(d1388b) = 0.003.
etching-processing-time(d1301c) = 0.004.
etching-processing-time(d804g) = 0.003.
etching-processing-time(d1398a) = 0.004.
etching-processing-time(d1403a) = 0.002.
etching-processing-time(d1449a) = 0.002.
etching-processing-time(d802c) = 0.004.
etching-processing-time(d827e) = 0.003.
etching-processing-time(d937a) = 0.003.
etching-processing-time(d983g) = 0.004.
etching-processing-time(d938i) = 0.004.
etching-processing-time(d1220a) = 0.003.
etching-processing-time(d1254b) = 0.003.
etching-processing-time(d1265b) = 0.004.
etching-processing-time(d1242a) = 0.004.

legalvals(solder-mask-processing-time(A)) = real.
multivalued(solder-mask-processing-time(A)).

solder-mask-processing-time(d1086h) = 0.007.
solder-mask-processing-time(d1230a) = 0.007.
solder-mask-processing-time(d1333a) = 0.007.
solder-mask-processing-time(d1345b) = 0.007.
solder-mask-processing-time(d1358a) = 0.007.
solder-mask-processing-time(d1388b) = 0.006.
solder-mask-processing-time(d1301c) = 0.007.
solder-mask-processing-time(d804g) = 0.007.
solder-mask-processing-time(d1398a) = 0.006.
solder-mask-processing-time(d1403a) = 0.006.
solder-mask-processing-time(d1449a) = 0.006.
solder-mask-processing-time(d802c) = 0.007.
solder-mask-processing-time(d827e) = 0.007.
solder-mask-processing-time(d937a) = 0.007.
solder-mask-processing-time(d983g) = 0.007.
solder-mask-processing-time(d938i) = 0.0.
solder-mask-processing-time(d1220a) = 0.007.
solder-mask-processing-time(d1254b) = 0.006.
solder-mask-processing-time(d1265b) = 0.006.
solder-mask-processing-time(d1242a) = 0.007.

legalvals(gold-plating-processing-time(A)) = real.
multivalued(gold-plating-processing-time(A)).

gold-plating-processing-time(d1086h) = 0.0.
gold-plating-processing-time(d1230a) = 0.0.

gold-plating-processing-time(d1333a) = 0.009.
 gold-plating-processing-time(d1345b) = 0.007.
 gold-plating-processing-time(d1358a) = 0.0.
 gold-plating-processing-time(d1388b) = 0.0.
 gold-plating-processing-time(d1301c) = 0.007.
 gold-plating-processing-time(d1398a) = 0.007.
 gold-plating-processing-time(d1403a) = 0.0.
 gold-plating-processing-time(d1449a) = 0.005.
 gold-plating-processing-time(d802c) = 0.0.
 gold-plating-processing-time(d804g) = 0.005.
 gold-plating-processing-time(d827e) = 0.004.
 gold-plating-processing-time(d937a) = 0.0.
 gold-plating-processing-time(d983g) = 0.0.
 gold-plating-processing-time(d938i) = 0.0.
 gold-plating-processing-time(d1220a) = 0.006.
 gold-plating-processing-time(d1254b) = 0.009.
 gold-plating-processing-time(d1265b) = 0.009.
 gold-plating-processing-time(d1242a) = 0.0.

legalvals(scl-processing-time(A)) = real.
 multivalued(scl-processing-time(A)).

scl-processing-time(d1086h) = 0.004.
 scl-processing-time(d1230a) = 0.004.
 scl-processing-time(d1333a) = 0.004.
 scl-processing-time(d1345b) = 0.004.
 scl-processing-time(d1358a) = 0.004.
 scl-processing-time(d1388b) = 0.004.
 scl-processing-time(d1301c) = 0.004.
 scl-processing-time(d804g) = 0.004.
 scl-processing-time(d1398a) = 0.004.
 scl-processing-time(d1403a) = 0.004.
 scl-processing-time(d1449a) = 0.004.
 scl-processing-time(d802c) = 0.004.
 scl-processing-time(d827e) = 0.004.
 scl-processing-time(d937a) = 0.004.
 scl-processing-time(d983g) = 0.004.
 scl-processing-time(d938i) = 0.004.
 scl-processing-time(d1220a) = 0.004.
 scl-processing-time(d1254b) = 0.004.
 scl-processing-time(d1265b) = 0.004.
 scl-processing-time(d1242a) = 0.004.

legalvals(component-mark-processing-time(A)) = real.
 multivalued(component-mark-processing-time(A)).

component-mark-processing-time(d1086h) = 0.0.
 component-mark-processing-time(d1230a) = 0.005.
 component-mark-processing-time(d1333a) = 0.005.
 component-mark-processing-time(d1345b) = 0.005.
 component-mark-processing-time(d1358a) = 0.005.
 component-mark-processing-time(d1388b) = 0.005.
 component-mark-processing-time(d1301c) = 0.005.

component-mark-processing-time(d804g) = 0.005.
component-mark-processing-time(d1398a) = 0.005.
component-mark-processing-time(d1403a) = 0.005.
component-mark-processing-time(d1449a) = 0.005.
component-mark-processing-time(d802c) = 0.005.
component-mark-processing-time(d827e) = 0.005.
component-mark-processing-time(d937a) = 0.0.
component-mark-processing-time(d983g) = 0.0.
component-mark-processing-time(d938i) = 0.0.
component-mark-processing-time(d1220a) = 0.005.
component-mark-processing-time(d1254b) = 0.005.
component-mark-processing-time(d1265b) = 0.005.
component-mark-processing-time(d1242a) = 0.005.

legalvals(profile-processing-time(A)) = real.
multivalued(profile-processing-time(A)).

profile-processing-time(d1086h) = 0.007.
profile-processing-time(d1230a) = 0.007.
profile-processing-time(d1333a) = 0.009.
profile-processing-time(d1345b) = 0.006.
profile-processing-time(d1358a) = 0.005.
profile-processing-time(d1388b) = 0.006.
profile-processing-time(d1301c) = 0.011.
profile-processing-time(d804g) = 0.006.
profile-processing-time(d1398a) = 0.006.
profile-processing-time(d1403a) = 0.008.
profile-processing-time(d1449a) = 0.01.
profile-processing-time(d802c) = 0.004.
profile-processing-time(d827e) = 0.005.
profile-processing-time(d937a) = 0.003.
profile-processing-time(d983g) = 0.007.
profile-processing-time(d938i) = 0.007.
profile-processing-time(d1220a) = 0.007.
profile-processing-time(d1254b) = 0.007.
profile-processing-time(d1265b) = 0.008.
profile-processing-time(d1242a) = 0.007.



ประวัติผู้เขียน

นายदनัย จินดารัตน์ เกิดวันที่ 27 มิถุนายน 2504 ที่ จังหวัดชลบุรี สำเร็จการศึกษาปริญญาวิทยาศาสตรบัณฑิต(สาขาวิศวกรรมอุตสาหการ)จากคณะวิศวกรรมศาสตร์มหาวิทยาลัยขอนแก่น ในปีการศึกษา 2526 และเข้าศึกษาต่อในระดับปริญญาโทบัณฑิต ภาควิชาวิศวกรรมอุตสาหการ คณะวิศวกรรมศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ในปีการศึกษา 2529 ปัจจุบันทำงานเป็นผู้จัดการแผนกวางแผนและควบคุมการผลิต บริษัท พี.ซี.บี. เซ็นเตอร์(ประเทศไทย)จำกัด