

ME 413

9/29/2014

ENGINEERING BILL OF MATERIALS (EBOM)

- EVERY PART HAS # ASSOCIATED W/ IT
- ALL PARTS LISTED

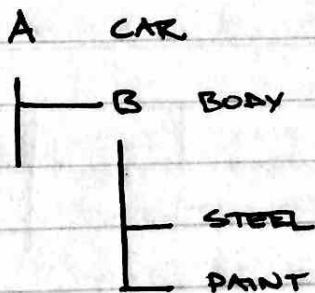
PARTS IMPACT:

- M PLANS
- ASSEMBLY PLANS
- TOOLING

INVENTURED PARTS LIST:

- BEGINS W/ INSTALLATION LEVEL "A"
- PARTS OR ASMS THAT MAKE UP THE INSTAL.
LEVEL ARE LETTERS SUCCESSIVELY

CAR EXAMPLE:



10/1/2014

ME 413
P/20/2014

MANUFACTURING PLANS:

- DETAILED, PRECISE, AND CLEAR SET OF INSTRUCTIONS TO DIRECT HOW THE PRODUCT SHOULD BE MADE
- EVERY PART HAS AN ASSOCIATED MANUFACTURING PLAN
- ALL PARTS LISTED
- PROCESS PARAMETERS
- SEQUENCES OF PROCESSES

BASED ON:

- PART DRAWINGS
- KNOWN FUNCTIONS

TYPES OF PLANS:

PROCESS PLAN

- DETAILED FABRICATION PLANS FOR A PART

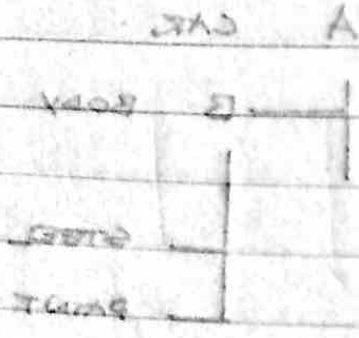
ASSEMBLY PLAN

- PLAN FOR ASSEMBLING PARTS TOGETHER

PROCESS PLAN

- CLEARLY DESCRIBES:

- MATERIAL OR PART INFORMATION
- SEQUENCE
- TOOLS, EQUIPMENT
- TIME TO COMPLETE
- DESCRIPTION
- PROCESS TYPE (OPERATION, INSPECTION, DELAY, TRANSFER, STORAGE)



10/10/10

ASSEMBLY PLAN

DEVELOPED JOINTLY BETWEEN DESIGN & MANUFACTURING

NEED FOR CHANGE → DESIGN AGREEMENT → DESIGN PLAN

INCLUDES

- PARTS, PART NUMBERS
- PLANS, STEP BY STEP INSTRUCTIONS
- TOOLS - TOOLS TO COMPLETE JOB

GENERAL PLANNING STEPS:

1. IDENTIFY THE TASKS NEEDED TO PRODUCE

COFFEE CUP ASSEMBLY PLAN

PARTS

- COFFEE 1
- CUP 2
- LID 3
- JACKET 4

PLAN	UPDATE	NEW	REMOVE
① PLACE JACKET ONTO CUP			
② PLACE CUP ONTO TABLE			
③ POUR COFFEE INTO CUP - UP TO 1/2" BELOW RIM			
④ PLACE LID ON CUP			

TOOLS:

NO TOOLS REQUIRED

10/16/2014

*SCHEDULE DEVELOPMENT LECTURE

NEED FOR CHANGE → DESIGN ASSESSMENT → DESIGN PLAN
→ DETAIL DESIGN → BUILD

CHALLENGES:

- WHEN TO INTERJECT?
- HOW TO BEST MAKE CHANGE

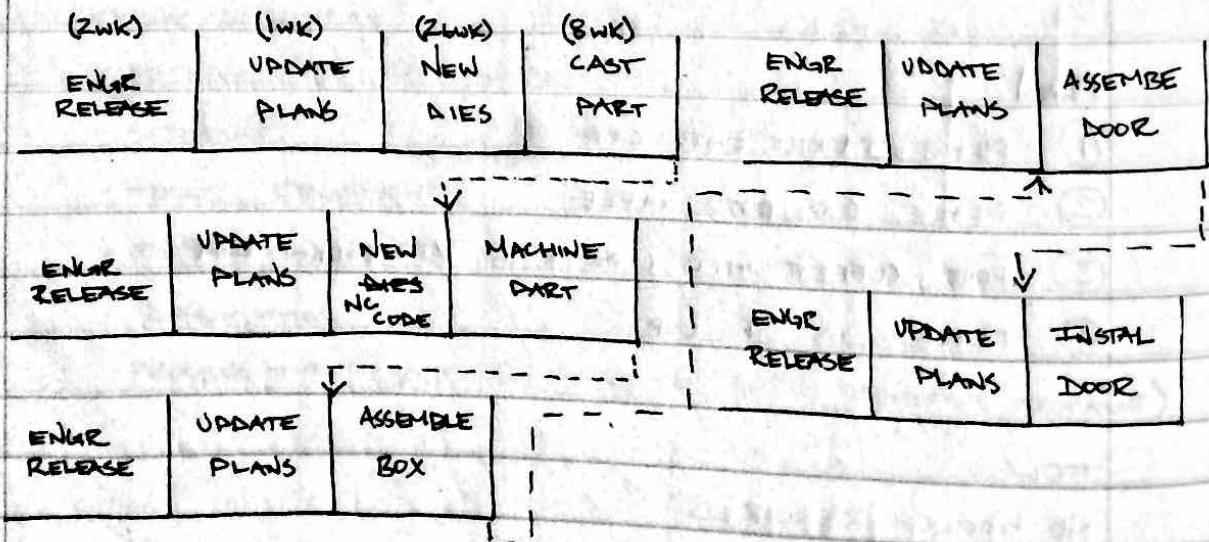
A. DOOR INSTALLATION (OSUSTR36100-751A)

B. DOOR END ITEM ASSEMBLY (#)

C. HANDLE BOX ASSEMBLY (#)

D. HANDLE BOX ASSEMBLY

E. HANDLE BOX CASTING



10/6/2014

NON-MANDATORY DESIGN CHANGES

- CONFIGURATION CONTROL

INVENTORY CONSIDERATIONS

- USUALLY HAVE INVENTORY

- BECOMES A WASTE OF MONEY

- MANDATORY CHANGES

10/7/2014 LAB

- NEXT WEEK IS BRIDGEPORT CERTIFICATION

10/8/2014

DOCUMENT REVISION RECORD

- LIST OLD/NEW PART NUMBERS

- LIST REASON FOR CHANGE

- INCLUDE REWORK INSTRUCTIONS

- LIST PLANS / JOBS AND TOOLS AFFECTED

- REPORT FIELD IMPACT

- WARRANTY RECALL

- SERVICE BULLETIN

10/8/2014

HANDLE BOX EXAMPLE: WHAT TYPE OF INFORMATION ON ECO?

- MANDATORY CHANGE PER FAA (ALL AIRPLANES MUST COMPLY)
- CHANGES TO PARTS: PARTS LISTS (EBOM)
- CHANGES TO MANUFACTURING PLANS
- NEW CASTING MOULD
- NEW CNC CODE
- AIRPLANES 1-540 TO BE REWORKED PER SB

SERVICE BULLETIN

- REWORK AIRPLANES BY DISASSEMBLING PER THE ATTACHED DETAILED INSTRUCTIONS AND REPLACE THE OSUSTR36100-37 MAG CASTING W/ THE OSUSTR36100-37A ALUMINUM CASTING INCLUDED IN THIS KIT

10/20/2014

CNC PROCESS MODELING: MACHINING PARAMETERS

LAB IN DERBORN 115

CNC PROCESS MODELING

- DYNAMIC, SEQUENTIAL ASSOCIATIVE TOOL PATH DATABASE
- 3 COMPONENTS
 - SEQUENCE (WHEN)
 - PARAMETERS (HOW)
 - GEOMETRY (WHERE)
- TOOL PATHS ARE DYNAMICALLY UPDATED W/ PART

10/20/2014

* SEQUENCE

- SPECIFIES ORDER OF OPERATIONS
- ONE OSU BLOCK: FACE \rightarrow MILL

* PARAMETERS / PROPERTIES (HOW)

- ASSIGNS MANUFACTURING PARAMETERS
- TOOL, TOOL OFFSET, SPEED, FEED, DEPTH OF CUT

* GEOMETRY (WHERE)

- DEFINES THE TOOL PATH
- LINEAR / CIRCULAR CUTTING, LEAD IN

FOR EACH OPERATION

- MACHINE TOOL
- CUTTING TOOL
- CUTTING CONDITIONS
 - DEPTH OF CUT
 - FEEDS / SPEEDS
 - CUTTING FLUIDS

MUST ALSO CONSIDER

- WORK PART MACHINABILITY
- TOLERANCES
- SURFACE CONDITION

* SELECTING FEEDS & SPEEDS

- SELECT FEED FIRST, SPEED SECOND
- HARDER TOOLS REQUIRE LOWER FEEDS

10/22/2014

* DEPTH OF CUT:

- IN ROUGHING, DOC IS SET AS HIGH AS POSSIBLE, PENDING:
 - MACHINE HP & RIGIDITY
 - STRENGTH OF CUTTING TOOL

* STEPOVER

- AMOUNT OF OVERLAP WHEN DOING MULTIPLE PASSES

* F/S CALL:

$$f_r = N \cdot n_t \cdot f$$

$$N = \text{SURFACE FT/MIN}$$

$$f = \text{FEED/TOOTH}$$

$$N = \frac{V}{\pi D}$$

$$n_t = \text{\# OF TEETH}$$

10/22/2014 MANUFACTURING TOOLING

10/27/2014 INDUSTRIAL CONTROL SYSTEMS

- NO LAB THIS WEEK

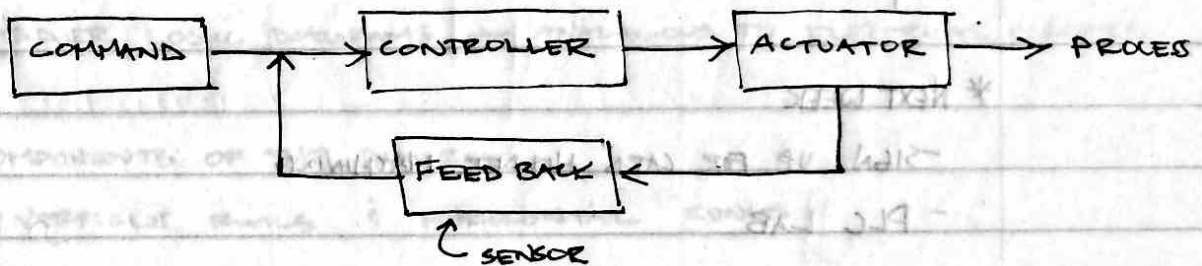
- LOOK @ SYLLABUS FOR LAB SCHEDULE NEXT WEEK

CNC #1 : OSU BLOCK

CNC #2 : CARDHOLDER

CNC #3 : INTERCOSTAL → PLANS, CODE, & TOOLING DUE NOV. 12TH
↳ TOTALLY DONE OUT OF CLASS, WILL TRADE
ON NOV. 12TH

CLOSED LOOP CONTROL SYSTEM MODEL



KEY SYSTEM COMPONENTS :

• SENSORS & TRANSDUCERS

- SENSORS DETECT A PHYSICAL VARIABLE OF INTEREST
- TRANSDUCER CONVERTS VARIABLE OF INTEREST TO ANOTHER FORM
- PROVIDE FEEDBACK TO CONTROLLER

• ACTUATORS

- MANIPULATES THE PROCESS BASED ON CONTROLLER INSTRUCTIONS
- CONVERTS SIGNAL INTO CHANGE OF PHYSICAL PARAMETER

• CONTROLLER

- DEFINES SYSTEM OPERATION BASED ON SENSOR INPUT
- COMPARES INPUTS & OUTPUTS

10/27/2014

TYPES OF SENSORS:

- POSITION
 - VELOCITY / ACCELERATION
 - TEMPERATURE
- } 99%

POSITION SENSOR \Rightarrow POTENTIOMETER OR (LVDT) \rightarrow LINEAR VARIABLE

DIFFERENTIAL TRANSFORMER

- OPTICAL ANGLE ENCODER

- INCREMENTAL ENCODER

10/29/2014

* NEXT WEEK

- SIGN UP FOR CARD HOLDER MACHINING

- PLC LAB

NOTES:

ACTUATORS

- DC MOTORS

A	B	C	AB+C	A+BC	ABC	AA
0	0	0	F	F	F	F
1	0	0	F	T	F	T
0	1	0	F	F	F	F
1	1	0	T	T	F	T
0	0	1	T	F	F	F
1	0	1	T	T	F	T
0	1	1	T	T	F	F
1	1	1	T	T	T	T

11/3/2014

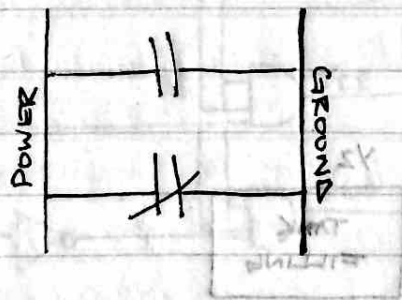
INTERCOSTAL PROJECT DUE NEXT WEDNESDAY - NOV. 12TH

PLC LAB (ROGERS 126) THIS WEEK ? NEXT → BB FOR SCHEDULED TIME

#1
PLC HW DUE 11/10
PLC HW #2 DUE 11/24 (EXTENDED)

PLC PROGRAMMING LANGUAGES

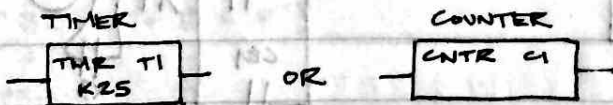
- TEXT BASED
 - GRAPHICAL BASED → FUNCTION BLOCK DIAGRAMS, SEQUENTIAL
 - LADDER LOGIC DIAGRAMS → ANALAGOUS TO ELECTRICAL CIRCUITS
- IX
- COMPONENTS OF THE DIAGRAM
 - VERTICLE RAILS ; HORIZONTAL Rungs



NORMALLY OPEN:

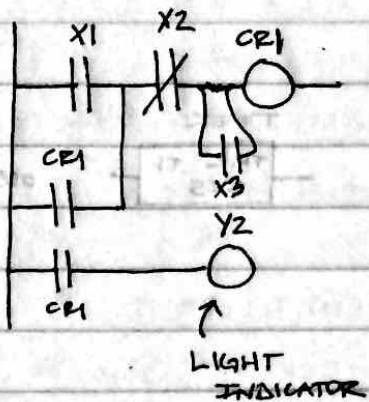
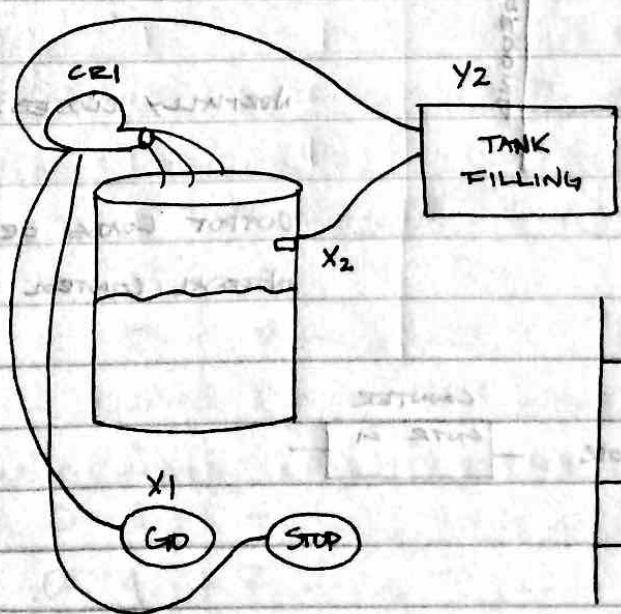
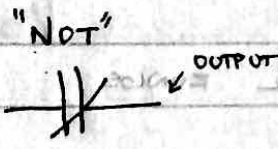
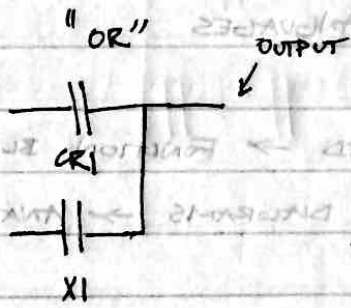
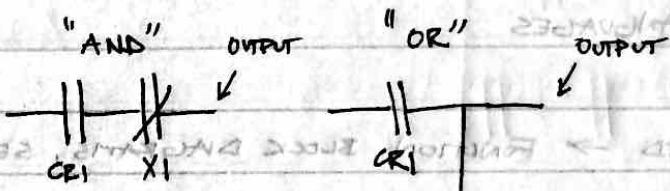
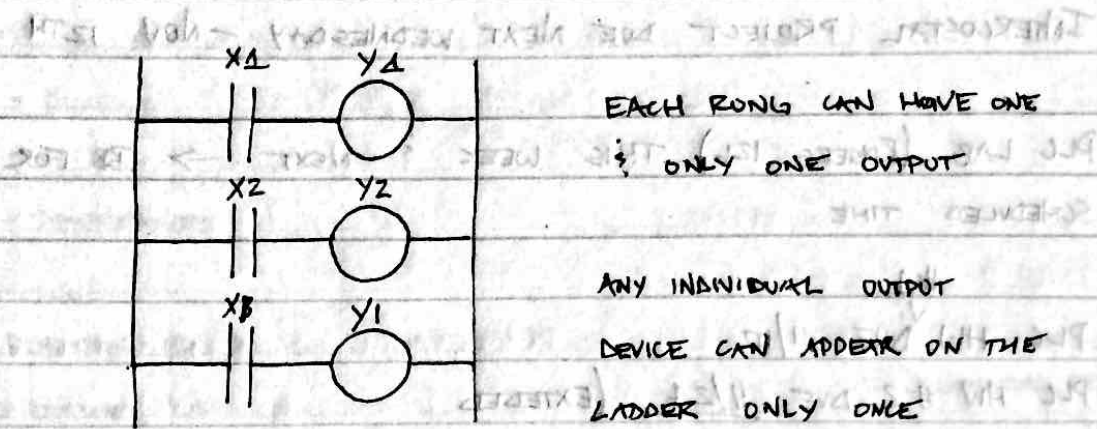
NORMALLY CLOSED:

OUTPUT LOADS OR INTERNAL CONTROL RELAY



11/3/2014

11/3/2014



11/10/2014

1/4 MIN END MILL
SIZE FOR FACIL

1/8 RADII MIN

A.) SIMPLIFY: $Z = [A + BC + D][A + B'C + (D + EF)]$

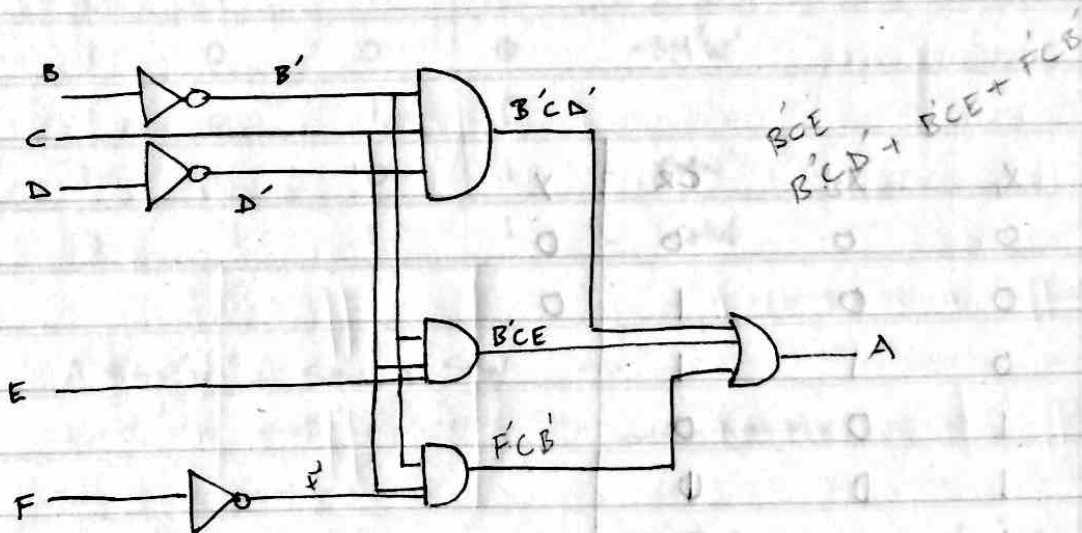
LET $X = A + BC$

$Y = D + EF$

~~$Z = [X + D][X + Y]$~~ $Z = (X + Y)(X + Y')$ → #2

$Z = X = A + BC$

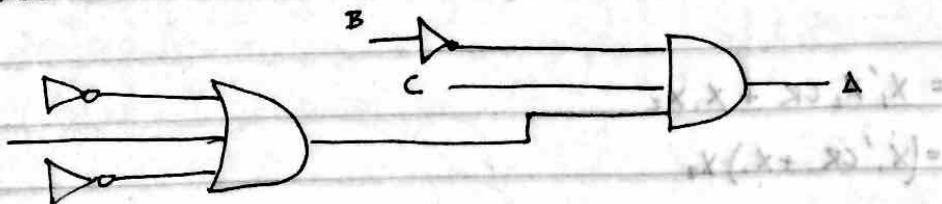
B.)



$A = (B'CD') + (B'CE) + (B'CF')$

$= B'C(D' + E + F')$

↑ AND ↑ OR

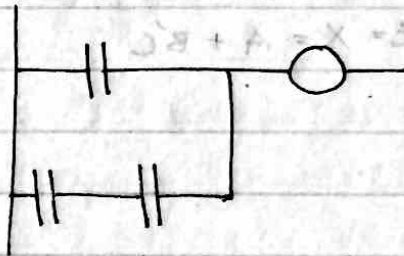


$$D = A'BC + \underbrace{ABC' + ABC}_{XY + XY' = X} + \underbrace{ABC' + ABC}_{AB}$$

$$= A'BC + \underbrace{AB' + AB}_{=A}$$

$$= \underbrace{A'BC}_{X'} + \underbrace{A}_{Y} + \underbrace{A}_{X}$$

$$= A + BC$$



X_1	X_2	CR	Y
0	0	0	0
0	0	1	0
0	1	1	1
1	0	0	0
1	0	0	0
1	1	0	1
1	1	1	1
0	0	0	0

$$Y = (X_1 X_2 CR) + (X_1 X_2 CR') + (X_1 X_2 CR)$$

$$= X_1' X_2 CR + X_1 X_2$$

$$= (X_1' CR + X_1) X_2$$

11/12/2014

PRACTICE: BURGLER ALARM

INPUTS:

- S: ALARM SWITCH (N.O.)
- M: MOTION SENSOR (N.O.)
- W: WINDOW SENSOR (N.C.)

OUTPUTS:

- A: ALARM SIGNAL (1 = SOUND ALARM)

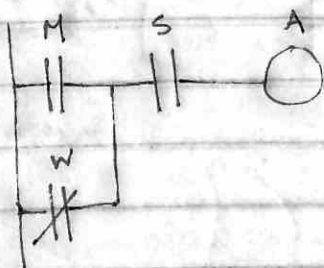
S	M	W	A
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

$$A = SM'W' + SMW' + SMW \Rightarrow$$

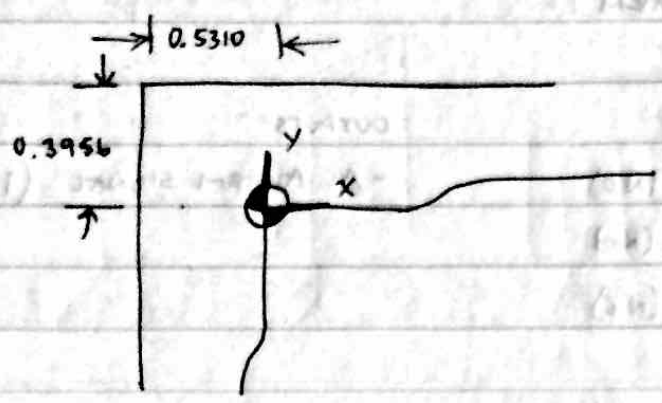
$$A = S(M'W' + MW' + MW) \rightarrow \text{LET } X = MW$$

$$A = S(X' + M)$$

$$A = S(M'W + \underbrace{MW' + MW}_M) \rightarrow A = S(M'W + M) = S(W' + M)$$



405/3/11



INTERCOSTAL REPORT DUE ON DEC 4TH

- MUST TURN IN PARTS/PLANS/TOOLING
- MUST INCLUDE EO

- LABEL DRAWERS
- CLEAN UP
- ORGANIZATION
- SIGNAGE

	W	T	E
	0	0	0
	0	0	0
	0	1	0
	0	1	0
WIRE	1	0	1
WIRE	0	1	1
WIRE	1	0	1
WIRE	1	1	1