

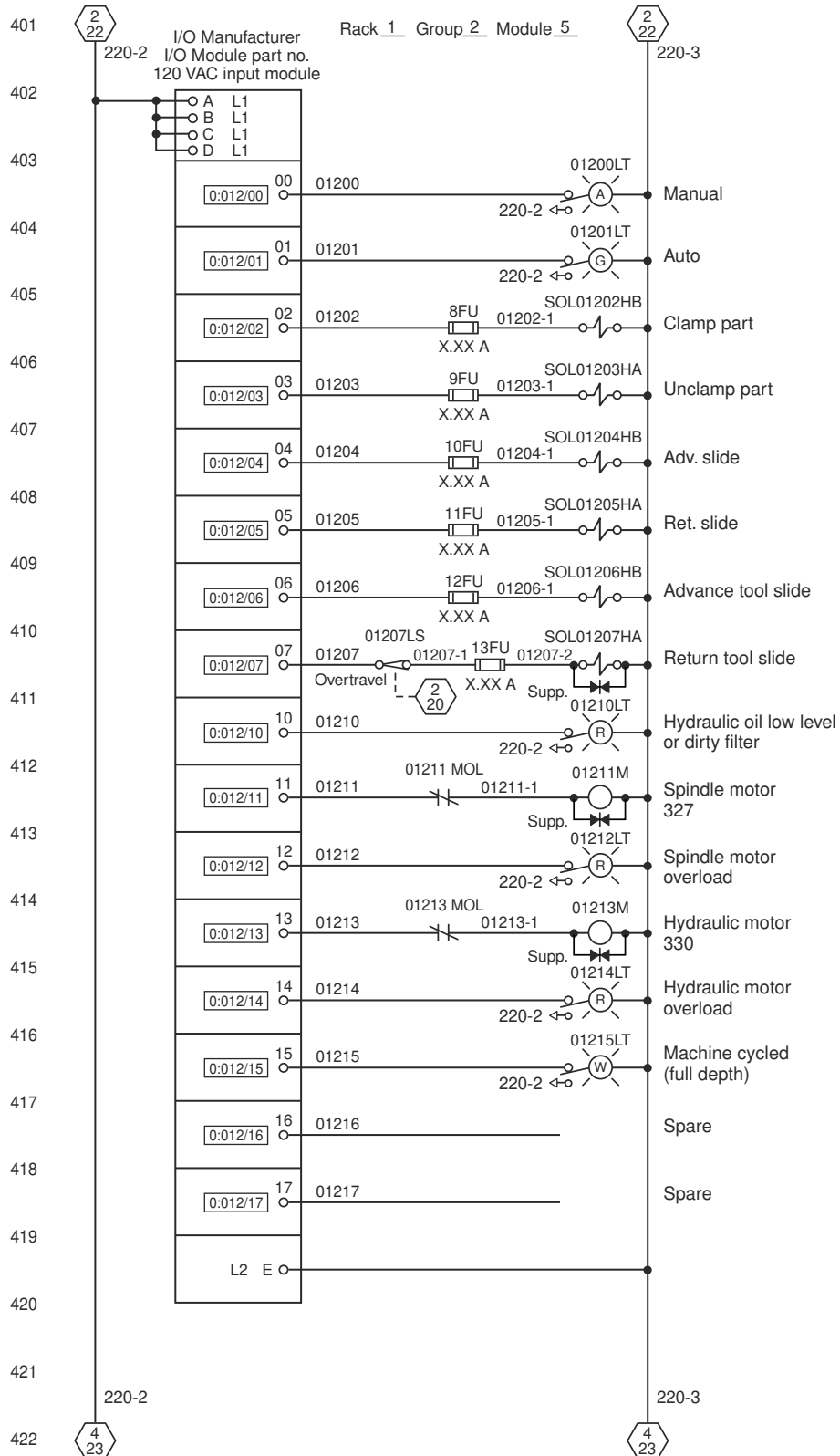


FIGURE D.1(g) PLC Output Diagram.

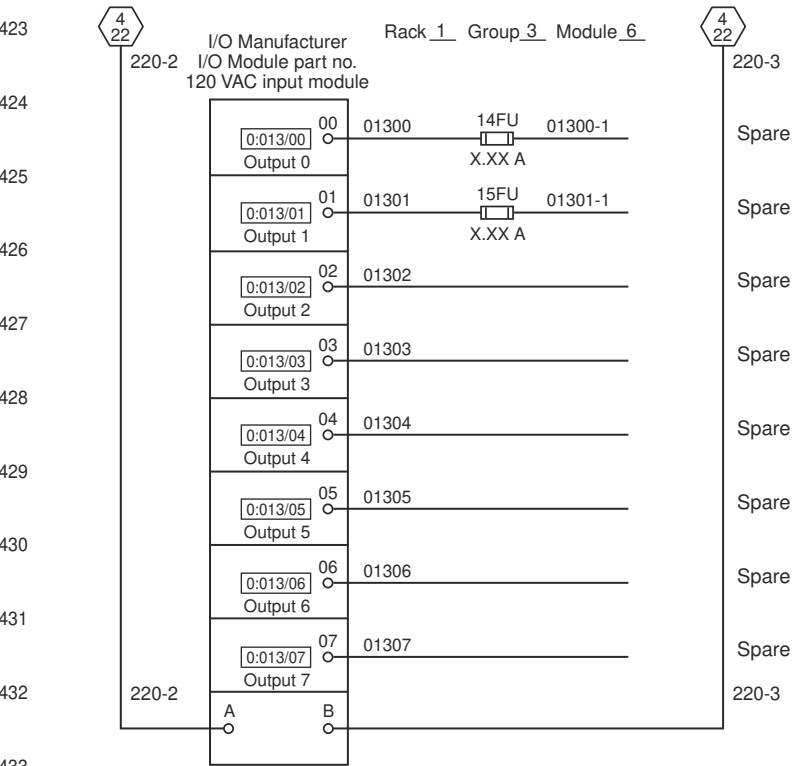


FIGURE D.1(g) Continued

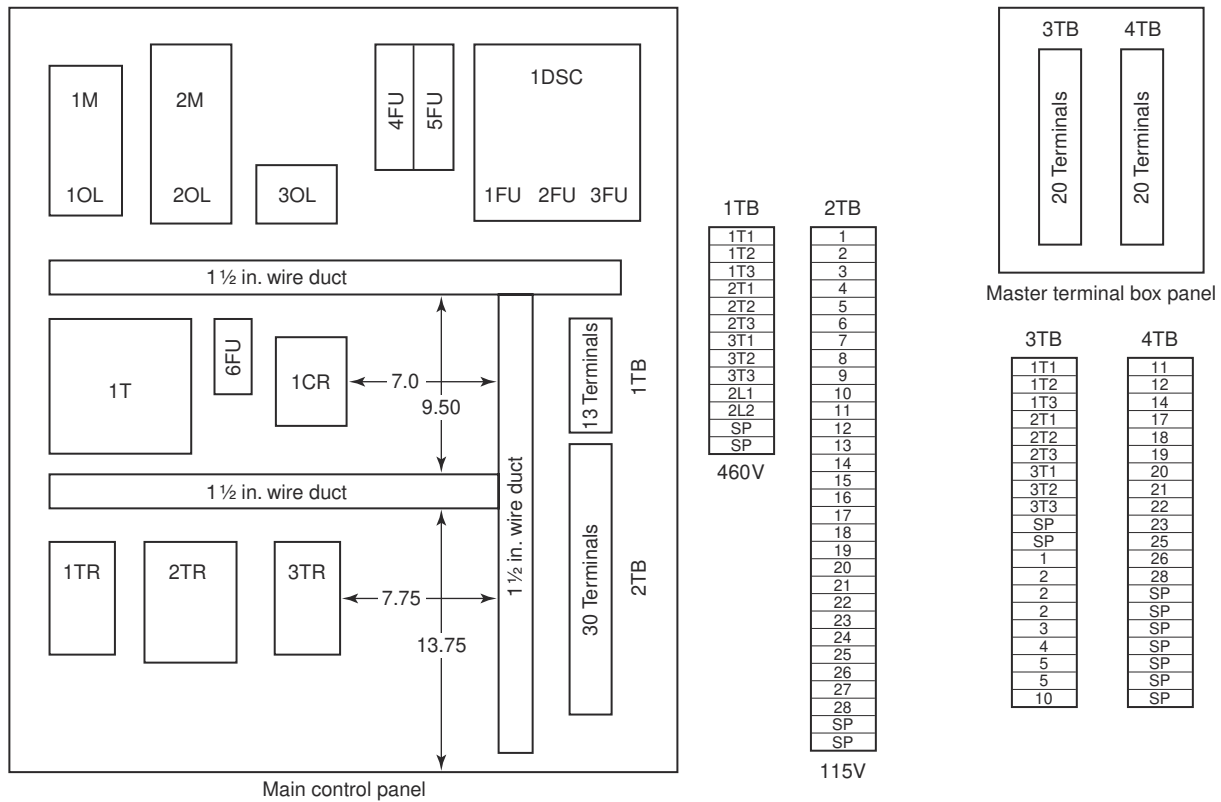


FIGURE D.1(h) Sample Enclosure Layout — Interior.

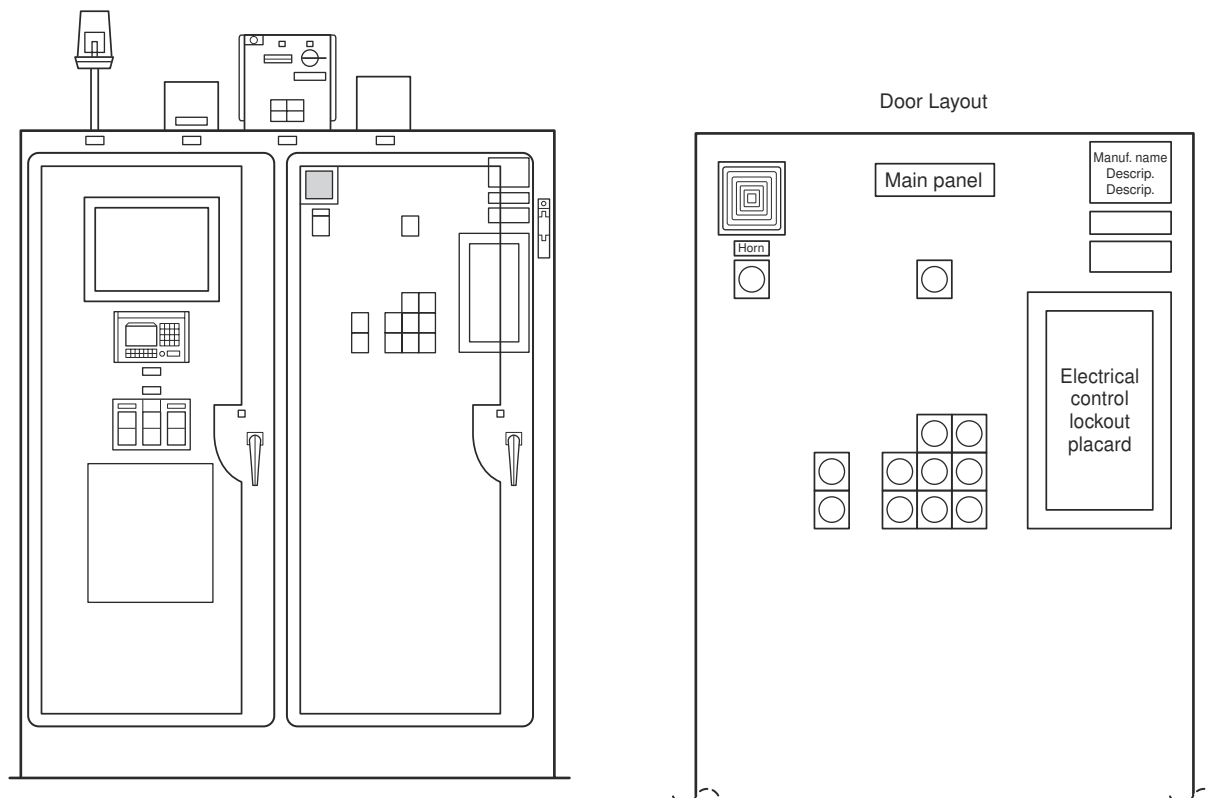


FIGURE D.1(i) Sample Enclosure Layout — Exterior.

Solenoid No.	Air or Hyd	Action Energized Input Sensor No.	Seq. No.	Sequence Description	Cycle Time (sec)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
—	—	I:XXX/XX PRS	1	Part present escapement delay	.5	■																								
0:XXX/XX SOL	AIR	I:XXX/XX PRS	2	Escapement opens	.75		■																							
—	—	—	3	Part travel to shuttle	.75			■																						
—	—	I:XXX/XX PRS	4	Part present shuttle delay	.5				■																					
0:XXX/XX SOL	AIR	I:XXX/XX PRS	5	Escapement closes	.75					■																				
0:XXX/XX SOL	AIR	I:XXX/XX PRS	6	Shuttle shifts to track #1	1.0						■																			
0:XXX/XX SOL	AIR	—	7	Part accel track #1 energizes	3.5							■																		
—	—	I:XXX/XX PRS	8	Part present loader #1 delay	.5									■																
0:XXX/XX SOL	AIR	I:XXX/XX PRS	9	Shuttle shifts to center	1.0										■															
0:XXX/XX SOL	AIR	I:XXX/XX PRS	10	Loader track #1 advances	1.0											■														
—	—	—	11	Loaded track #1 advanced dwell	.5												■													
0:XXX/XX SOL	AIR	I:XXX/XX PRS	12	Loaded track #1 returns	1.0													■												
—	—	—	13	Part present escapement delay	.5																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	14	Escapement opens	.75																									
—	—	—	15	Part travel to shuttle	.75																									
—	—	I:XXX/XX PRS	16	Part present shuttle delay	.5																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	17	Escapement closes	.75																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	18	Shuttle shifts to track #2	1.0																									
0:XXX/XX SOL	AIR	—	19	Part accel track #2 energizes	3.5																									
—	—	I:XXX/XX PRS	20	Part present loader #2 delay	.5																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	21	Shuttle shifts to center	1.0																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	22	Loader track #2 advances	1.0																									
—	—	—	23	Loaded track #2 advanced dwell	.5																									
0:XXX/XX SOL	AIR	I:XXX/XX PRS	24	Loaded track #2 returns	1.0																									

Cycle time for one part/one track = 11.0 sec.

Cycle time for one part each track = 19.0 sec.

FIGURE D.1(j) Sequence of Operations — Graphical.

Sequence of Operation	Switch Operation
A. Machine operation: press "Motors Start" pushbutton 2PB. Motors start.	1LS (115) actuated by spindle direction lever engaged
B. Select spindle speed by turning selector switch to 1SS to 1NC, energizing 3SOL, to increase or to DEC, energizing 4SOL, to decrease setting.	1PS (118) operated when spindle clutch engaged
C. With correct spindle direction selected, limit switch 1LS is actuated. Press "Spindle Start" pushbutton 4PB, energizing relay 1CR, which energizes 1SOL. Spindle starts and pressure switch 1PS is actuated, 1PS energizes 1TR, and after a time delay 2SOL is energized, permitting movement of machine elements at selected feed rates.	2PS (126) operated by normal lube pressure
D. Pressing "Spindle Stop" pushbutton 3PB stops spindle and feeds movements simultaneously.	1FS (129) operated by adequate lube supply
E. Lubrication operation.	For panels and control station layout see <u>Sheet 2</u>
F. Pressure switch 2PS is closed.	For hydraulic diagram see _____
1. Timer 2TR clutch is energized when motors start.	For lubrication diagram see _____
2. Contact 2TR1 closes and energizes timer motor MTR, starting lube timing period.	Last wire number used <u>28</u>
3. Contact 2TR3 closes and energizes timer 3TR.	Last relay number used <u>1CR</u>
G. Timer 2TR times out.	Supplier's dwg. no. _____
1. Contact 2TR1 opens, deenergizing timer motor MTR.	Supplier's name _____
2. Contact 2TR2 closes, energizing 5SOL.	Purchase order no. <u>P.O. 91011</u>
3. Contact 2TR3 opens, deenergizing timer 3TR.	Serial no. of machine <u>TYP 121314</u>
4. Lubrication pressure actuates pressure switch 2PS, deenergizing and resetting timer 2TR. Contacts 2TR1, 2TR2, and 2TR3 open.	These diagrams used for machine no. _____
5. Contact 2TR2 opening, deenergizes 5SOL.	
H. Reduced lubrication pressure deactuates pressure switch 2PS and sequence repeats.	

FIGURE D.1(k) Sequence of Operations — Descriptive Graphical.



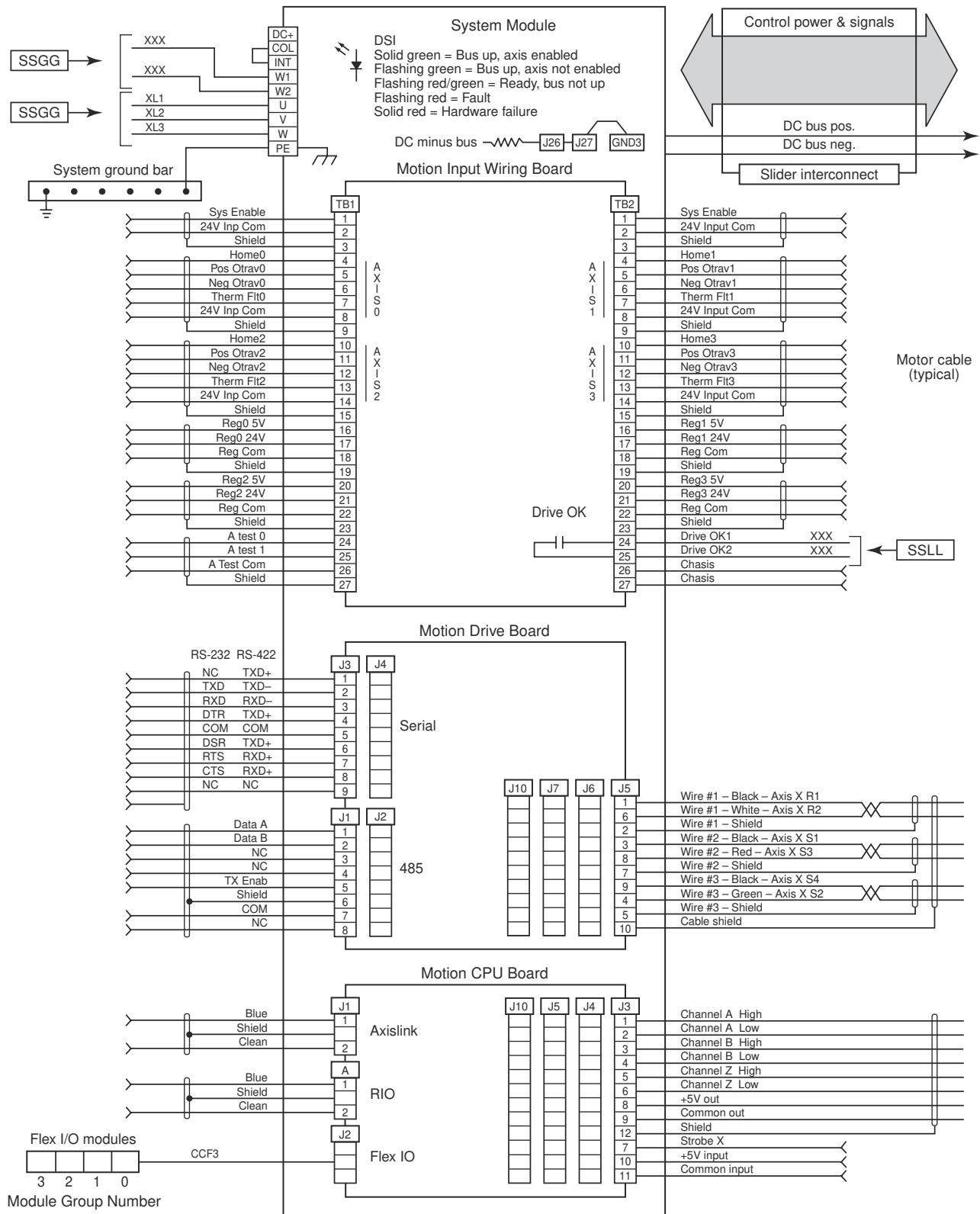


FIGURE D.1(l) Sample Servo Diagram.

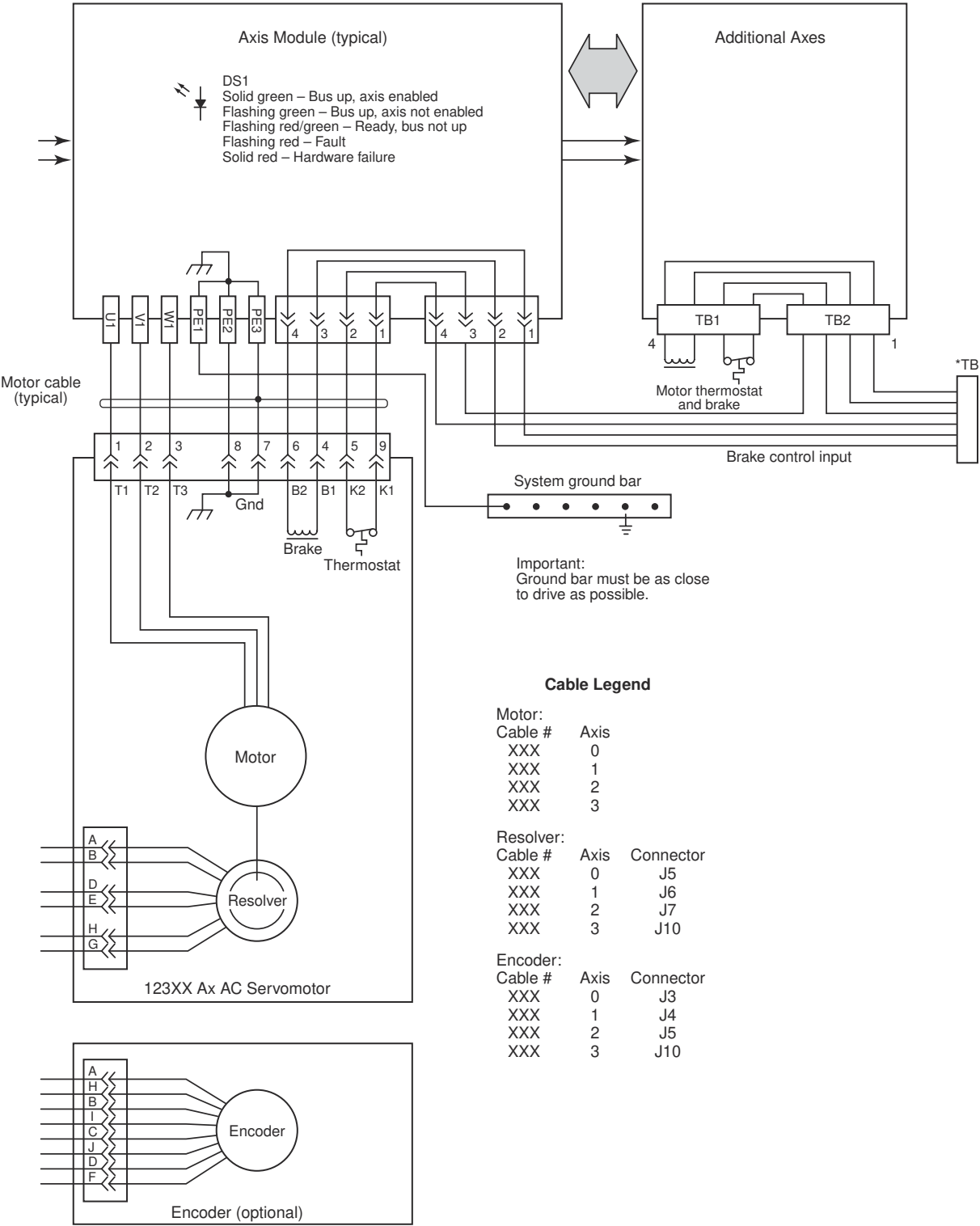


FIGURE D.1(l) Continued

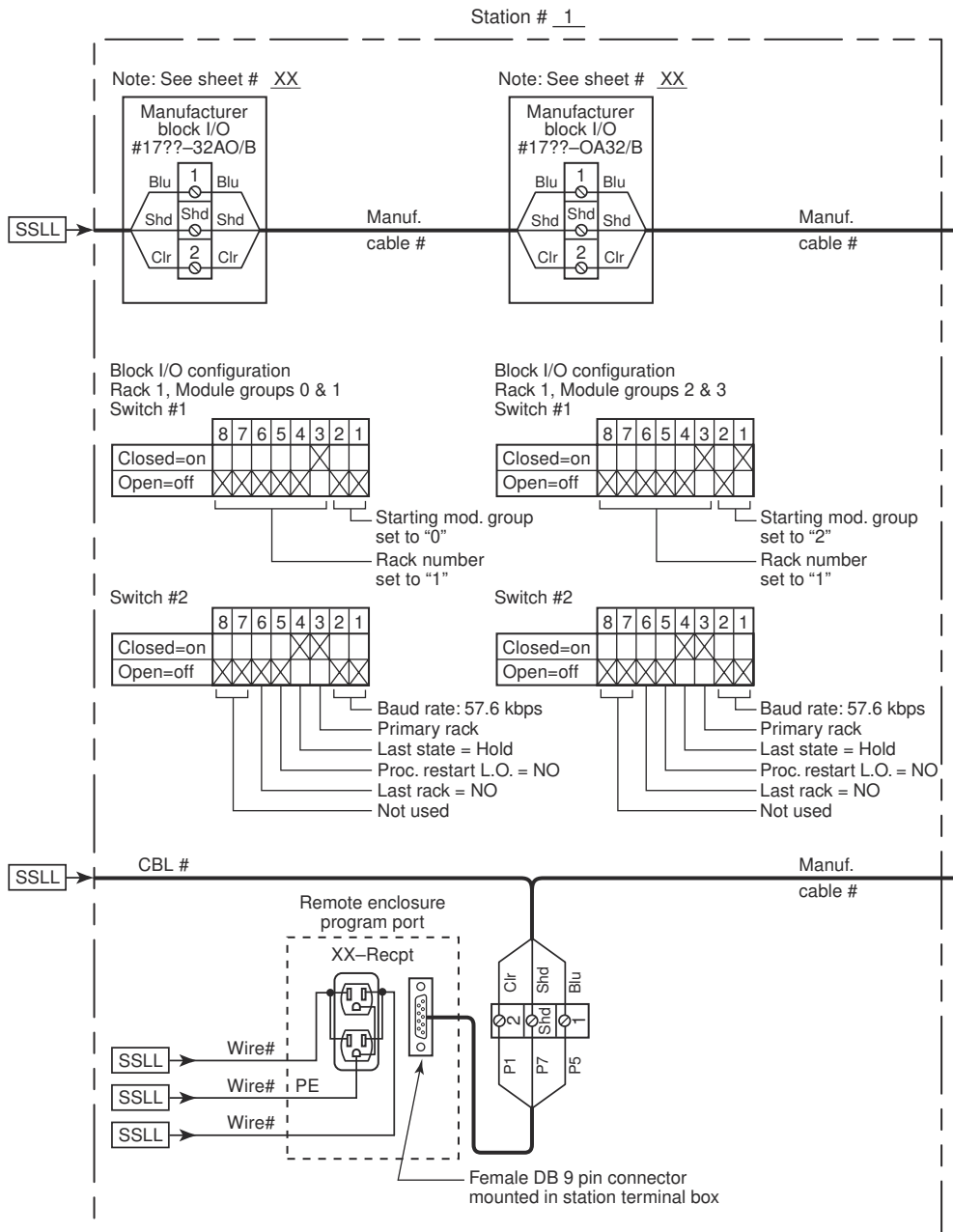


FIGURE D.1(m) Sample PLC Network — Station Layout.

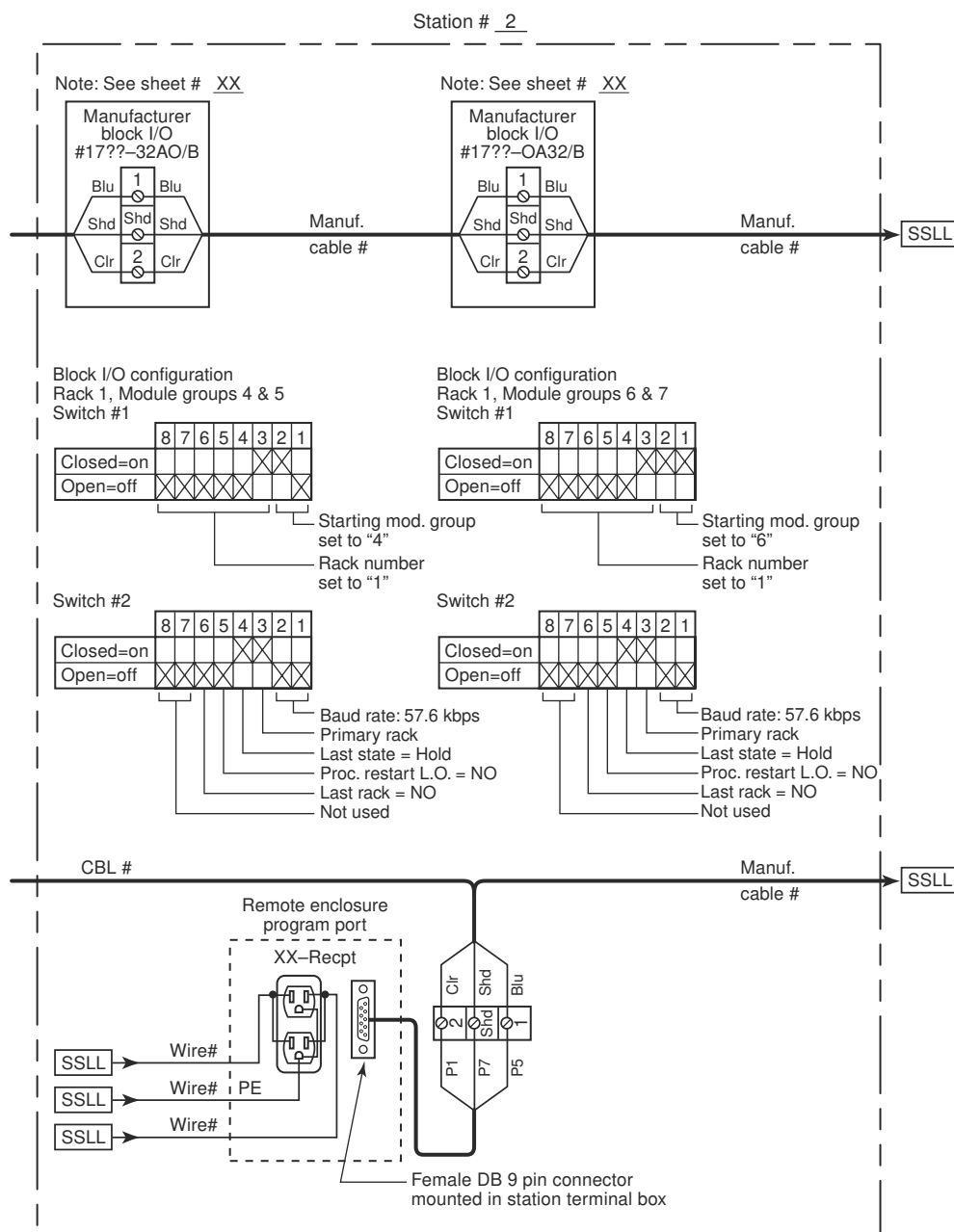
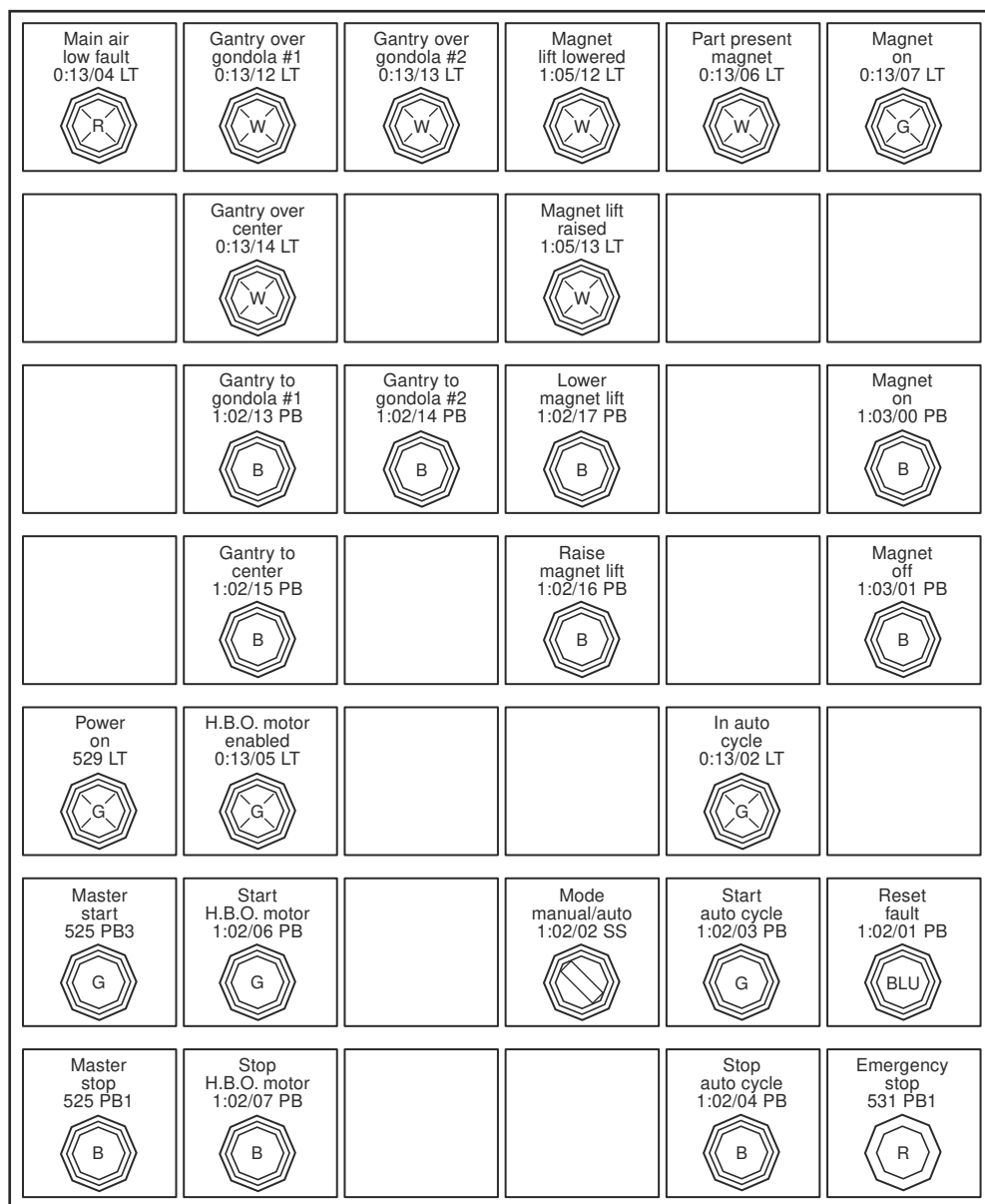


FIGURE D.1(m) Continued



FRONT VIEW

FIGURE D.1(n) Sample Operator Station.

Magnet on 0:13/07 LT 	Part present magnet 0:13/06 LT 	Magnet lift lowered 1:05/12 LT 	Gantry over gondola #2 0:13/13 LT 	Gantry over gondola #1 0:13/12 LT 	Main air low fault 0:13/04 LT
		Raised 1:05/13 LT 		Center 0:13/14 LT 	
Magnet on 1:03/00 PB 		Lower magnet lift 1:02/17 PB 	Gantry to gondola #2 1:02/14 PB 	Gantry to gondola #1 1:02/13 PB 	
Magnet off 1:03/01 PB 		Raise magnet lift 1:02/16 PB 		Gantry to center 1:02/15 PB 	
	In auto cycle 0:13/03 LT 			H.B.O. motor enabled 0:13/05 LT 	Power on 529 LT
Reset fault 1:02/01 PB 	Start auto cycle 1:02/03 PB 	Mode manual/auto 1:02/02 SS 		Start H.B.O. motor 1:02/06 PB 	Master start 525 PB3
Emergency stop 531 PB1 	Stop auto cycle 1:02/04 PB 			Stop H.B.O. motor 1:02/07 PB 	Master stop 525 PB1

REAR VIEW

FIGURE D.1(n) Continued