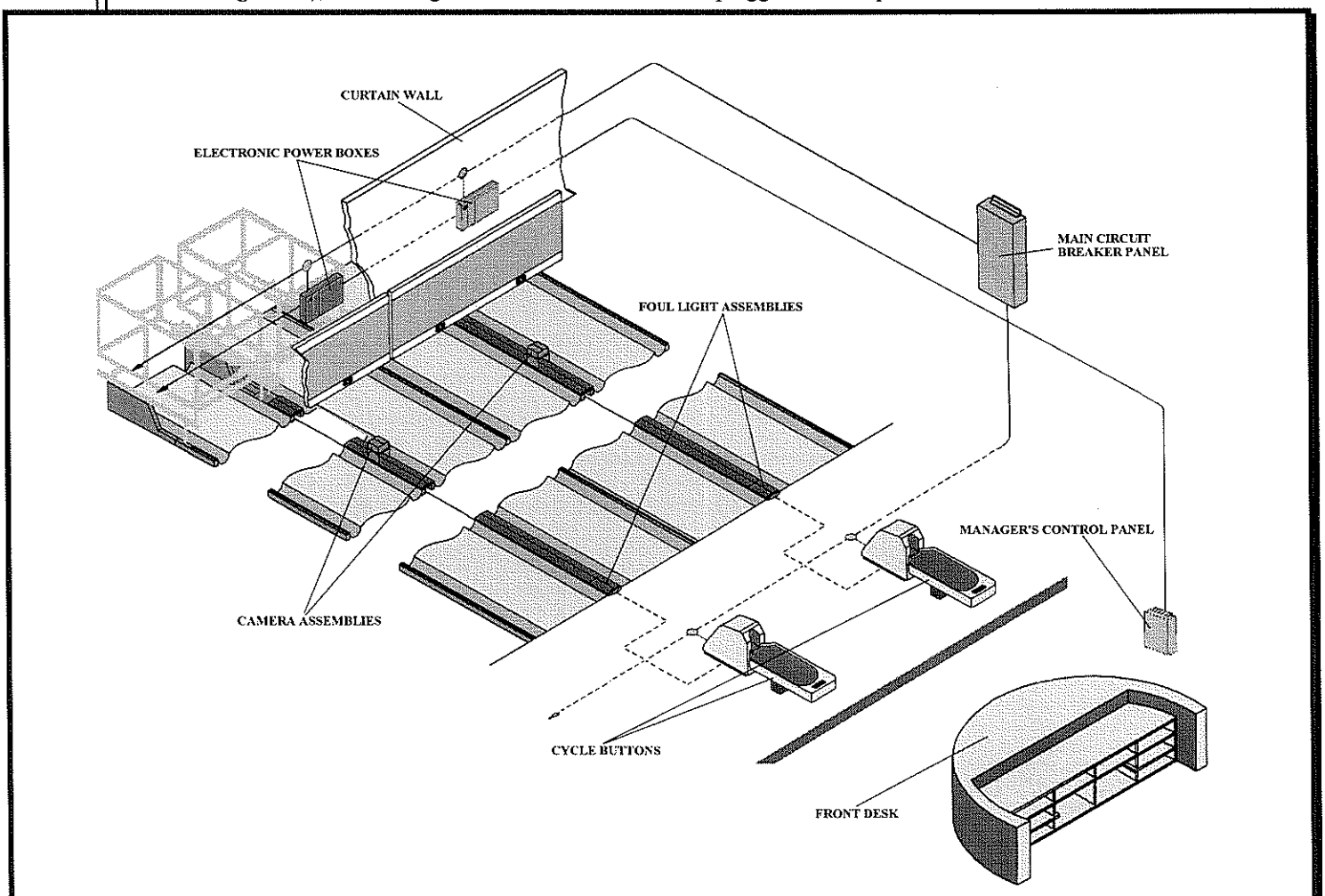
WIRING DIAGRAMS & SCHEMATICS

5

The Mendes MM-2001 Pinsetter is supplied to operate on 240 volts, 50/60 cycles, single phase. The Mendes Ball Return may be supplied to operate on 240 volts, 50/60 cycles, single phase or 120 volts, 60 cycles, single phase. The electrical supply lines must conform to all electrical codes and it is the responsibility of the proprietor to supply power to all the electrical components necessary for the normal function of the pinsetters.

A power supply line is run from the main service circuit breaker distribution panel to a junction box mounted on the rear curtain wall, above each even numbered pinsetter. From each junction box, a three conductor drop cord (2-wires plus an ***insulated ground***), terminating in a twist lock connector, is plugged into the electronic power box of each pair of pinsetters to supply the electrical power necessary. All of the pinsetter's components are controlled through the electronic power box which is connected to the manager's control panel located at the front desk.

A separate power supply line is run from the main service circuit breaker distribution panel to each ball return's power box located under the approach, below each ball return rack. From each ball return's motor, a three conductor power cord (2-wires plus an ***insulated ground***), terminating in a twist loek connector, is plugged into the power box.



If the electrical supply lines in your bowling center are 208 volts, your electronic power boxes have been modified by the accredited Mendes technicians who installed the pinsetters. The wiring modifications concern the transformers and all 4 DC Drive Circuit Board Assemblies. Although all wiring diagrams in this manual assume that the electrical supply lines are 240 volts, variations may occur due to this modification. Refer to the wiring diagrams under the Transformers section of this chapter for the wiring modifications and note them on each wiring plan concerned for future reference on your part.

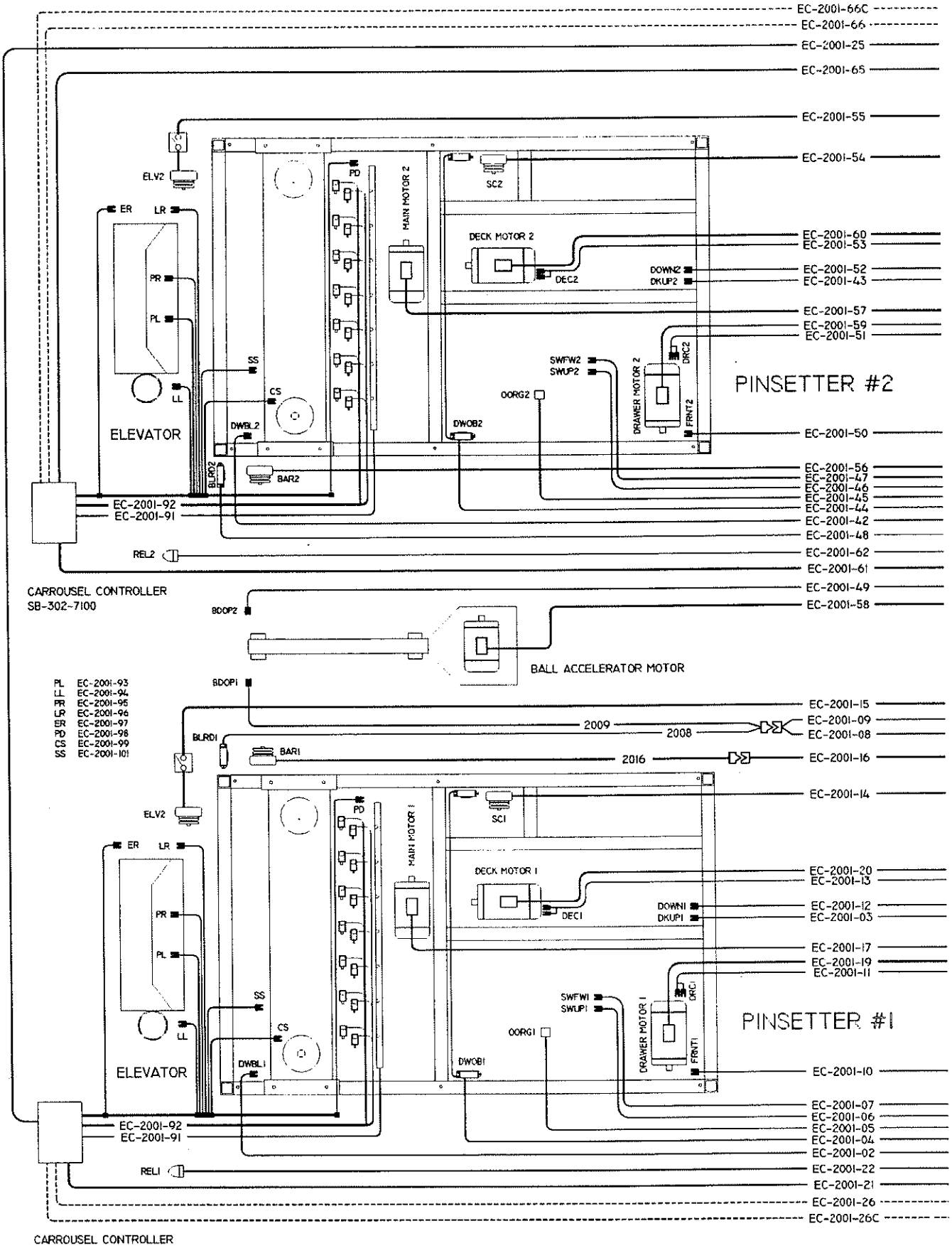
Cable Assemblies

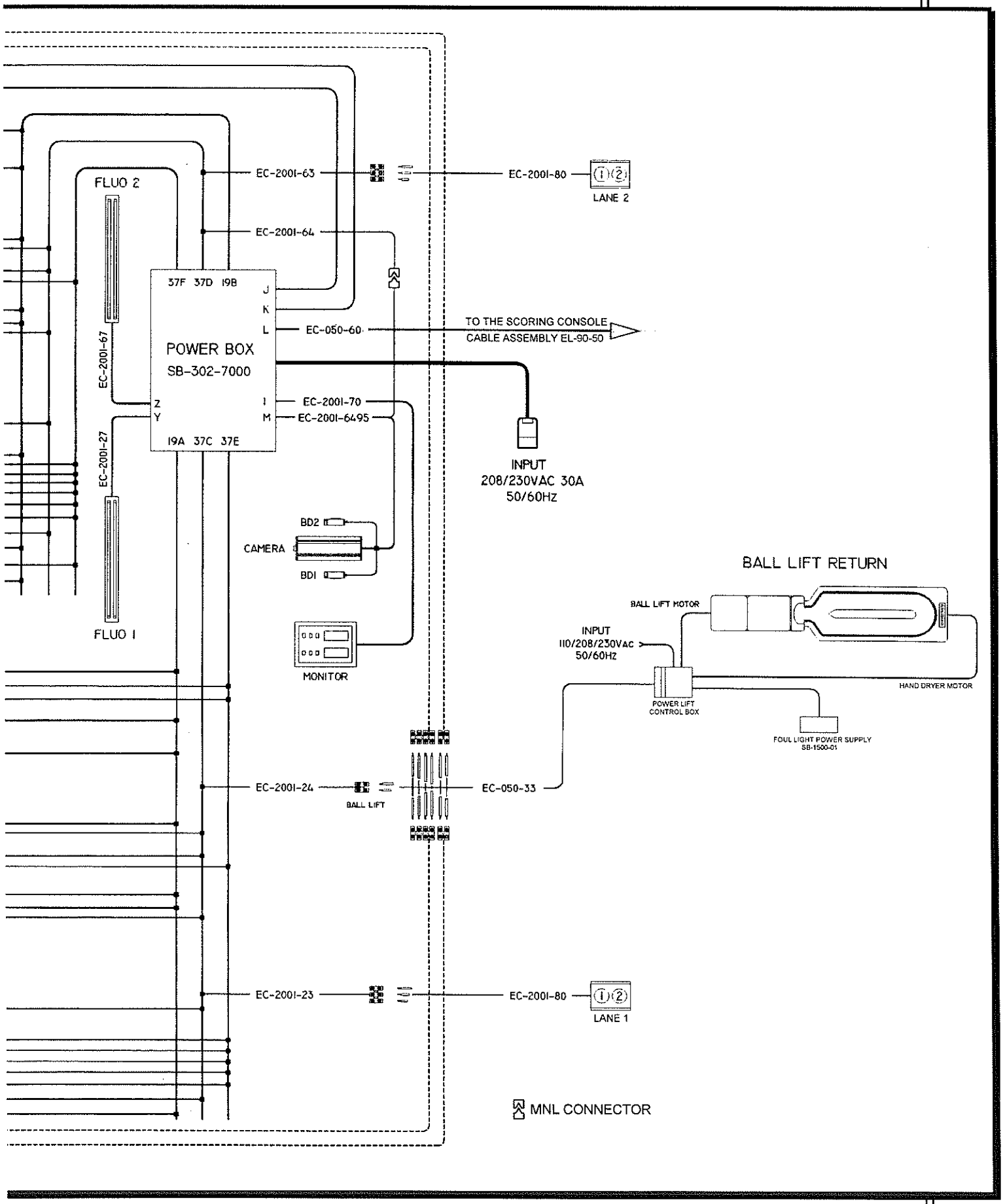
The cable assemblies used with the MM-2001 pinsetter, as with all other Mendes products, are all hand-made and individually tested in order to ensure their continuity. In addition to their precision quality, the cable assemblies may be easily removed and replaced due to their plug compatible characteristics.

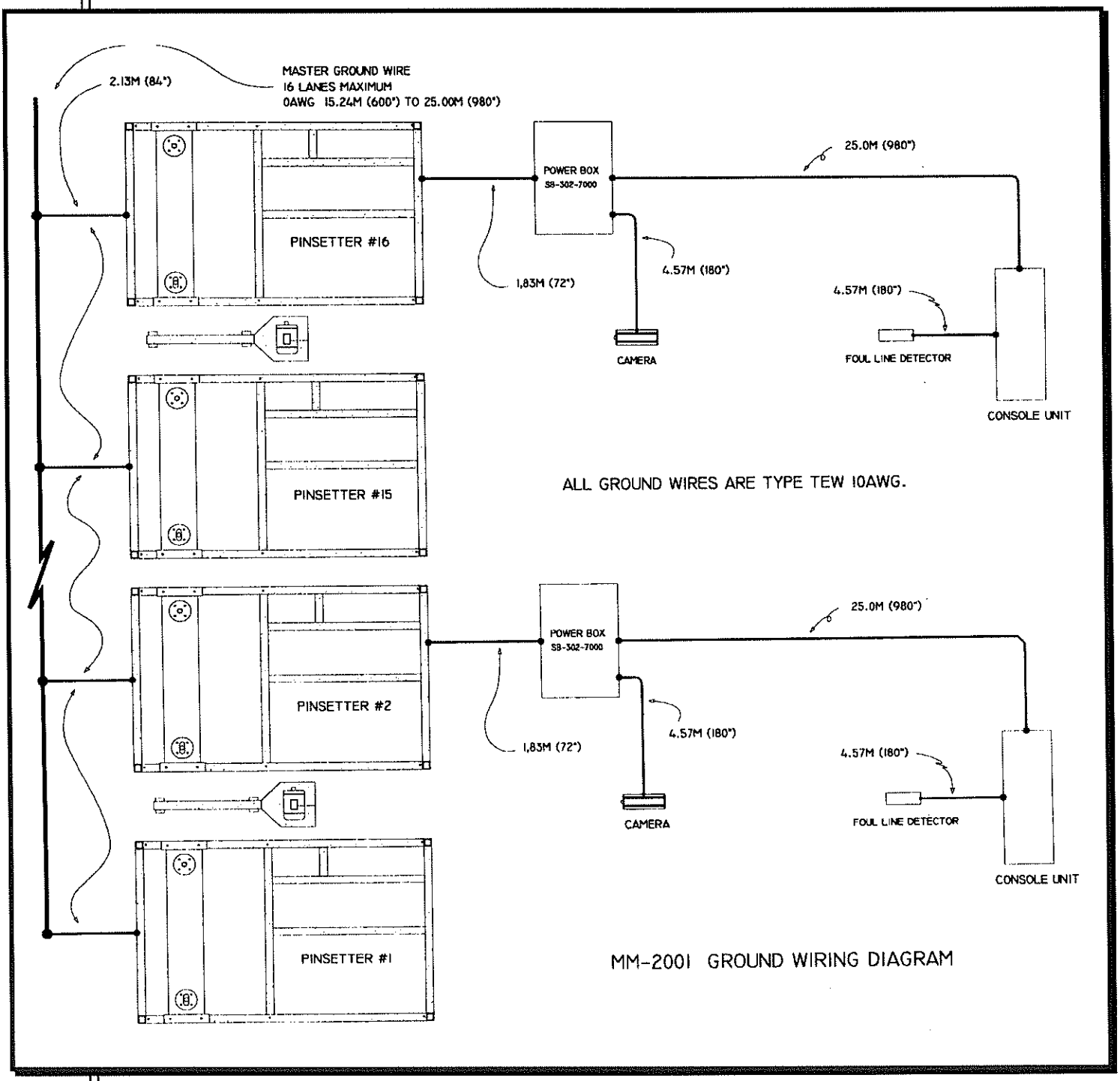
As a matter of fact, each cable assembly may only be plugged into one receptacle which matches the pin-out of the cable assembly. In cases where the pin-out and receptacle are identical, the length of the cable assembly will help determine its location. The electronic power box, being positioned on the even-numbered pinsetter, uses longer cable assemblies in order to reach the odd-numbered pinsetter.

Pages 154B and 154C illustrate a complete pair of pinsetters and their accessories with all the cable assemblies used to communicate between the different components.

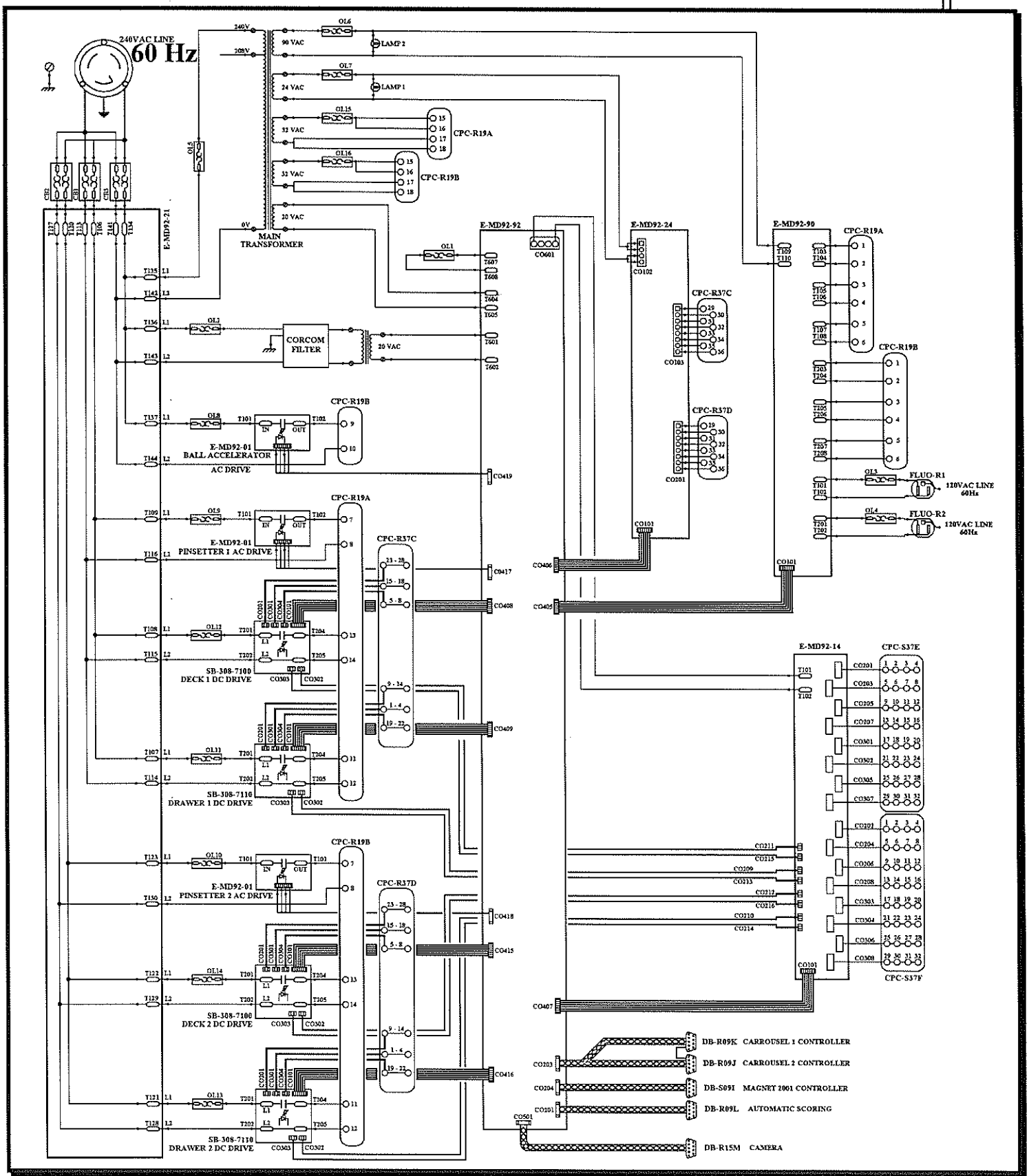
Page 154D illustrates the grounding wires installed with the MM-2001 Magnet Pinsetter.

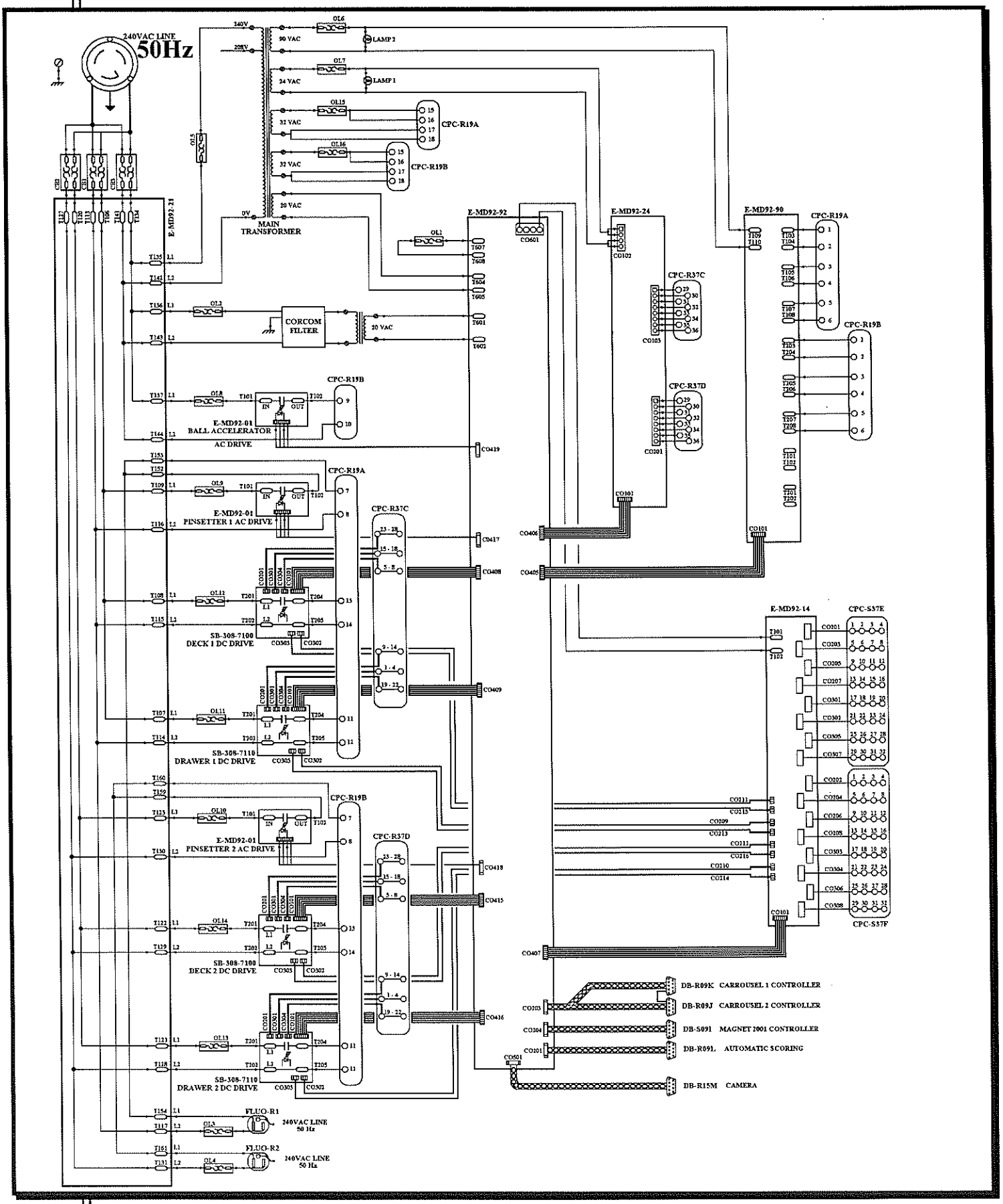

EC-2001-66C
EC-2001-66
EC-2001-25
EC-2001-65
EC-2001-55
EC-2001-54
EC-2001-60
EC-2001-53
EC-2001-52
EC-2001-43
EC-2001-57
EC-2001-59
EC-2001-51
EC-2001-50
EC-2001-56
EC-2001-47
EC-2001-46
EC-2001-45
EC-2001-44
EC-2001-42
EC-2001-48
EC-2001-62
EC-2001-61
EC-2001-49
EC-2001-58
EC-2001-92
EC-2001-91
ELV2
ER
LR
PR
PL
LL
SS
CS
DWBL2
BLRD2
BAR2
PD
MAIN MOTOR 2
SC2
DECK MOTOR 2
DEC2
DOWN2
DKUP2
SWFW2
SWUP2
DRC2
DRAWER MOTOR 2
FRNT2
OORG2
DWOB2
PINSETTER #2
ELEVATOR
REL2
CARROUSEL CONTROLLER
SB-302-7100
BDOP2
BALL ACCELERATOR MOTOR
PL EC-2001-93
LL EC-2001-94
PR EC-2001-95
LR EC-2001-96
ER EC-2001-97
PD EC-2001-98
CS EC-2001-99
SS EC-2001-101
BDOP1
EC-2001-15
2009
2008
EC-2001-09
EC-2001-08
BLRD1
BAR1
2016
EC-2001-16
EC-2001-14
SC1
MAIN MOTOR 1
DECK MOTOR 1
DEC1
EC-2001-20
EC-2001-13
DOWN1
DKUP1
EC-2001-12
EC-2001-03
EC-2001-17
EC-2001-19
EC-2001-11
SWFW1
SWUP1
DRC1
DRAWER MOTOR 1
FRNT1
OORG1
DWOB1
PINSETTER #1
EC-2001-10
EC-2001-07
EC-2001-06
EC-2001-05
EC-2001-04
EC-2001-02
EC-2001-22
EC-2001-21
EC-2001-26
EC-2001-26C
REL1
CARROUSEL CONTROLLER
SB-302-7100


FLUO 2
EC-2001-63
EC-2001-80
LANE 2
EC-2001-64
37F 37D 19B
J
K
L
POWER BOX
SB-302-7000
EC-050-60
TO THE SCORING CONSOLE
CABLE ASSEMBLY EL-90-50
EC-2001-67
Z
Y
I
M
EC-2001-70
EC-2001-6495
19A 37C 37E
EC-2001-27
INPUT
208/230VAC 30A
50/60Hz
BD2
CAMERA
BDI
FLUO 1
MONITOR
BALL LIFT RETURN
BALL LIFT MOTOR
INPUT
110/208/230VAC
50/60HZ
HAND DRYER MOTOR
POWER LIFT
CONTROL BOX
FOUL LIGHT POWER SUPPLY
SB-1500-01
EC-2001-24
BALL LIFT
EC-050-33
EC-2001-23
EC-2001-80
LANE 1
MNL CONNECTOR


2.13M (84")
MASTER GROUND WIRE
16 LANES MAXIMUM
0AWG 15.24M (600") TO 25.00M (980")
PINSETTER #16
POWER BOX
S8-302-7000
25.0M (980")
1.83M (72")
4.57M (180")
CAMERA
4.57M (180")
FOUL LINE DETECTOR
CONSOLE UNIT
PINSETTER #15
ALL GROUND WIRES ARE TYPE TEW 10AWG.
PINSETTER #2
POWER BOX
S8-302-7000
25.0M (980")
1.83M (72")
4.57M (180")
CAMERA
4.57M (180")
FOUL LINE DETECTOR
CONSOLE UNIT
PINSETTER #1
MM-2001 GROUND WIRING DIAGRAM

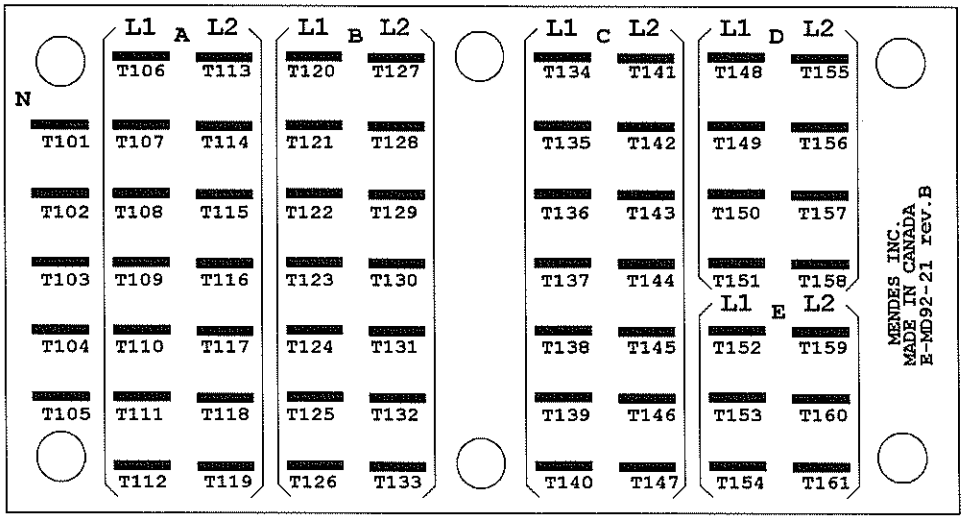
Electronic Power Box Wiring Diagrams




240VAC LINE
50Hz
MAIN TRANSFORMER
CORCOM FILTER
E-MD92-01 BALL ACCELERATOR AC DRIVE
E-MD92-01 PINSETTER 1 AC DRIVE
E-MD92-01 PINSETTER 2 AC DRIVE
SB-308-7100 DECK 1 DC DRIVE
SB-308-7110 DRAWER 1 DC DRIVE
SB-308-7100 DECK 2 DC DRIVE
SB-308-7110 DRAWER 2 DC DRIVE
E-MD92-92
E-MD92-24
E-MD92-90
E-MD92-14
CPC-R19A
CPC-R19B
CPC-R37C
CPC-R37D
CPC-S37E
CPC-S37F
LAMP 1
LAMP 2
FLUO-R1
FLUO-R2
DB-R09K CARROUSEL 1 CONTROLLER
DB-R09J CARROUSEL 2 CONTROLLER
DB-S091 MAGNET 2001 CONTROLLER
DB-R091 AUTOMATIC SCORING
DB-R15M CAMERA

Terminal Circuit Board

The terminal circuit board (E-MD92-21) is used to distribute the high voltage electrical power from the twist lock plug to the pinsetter's different components through a multitude of terminal connectors.



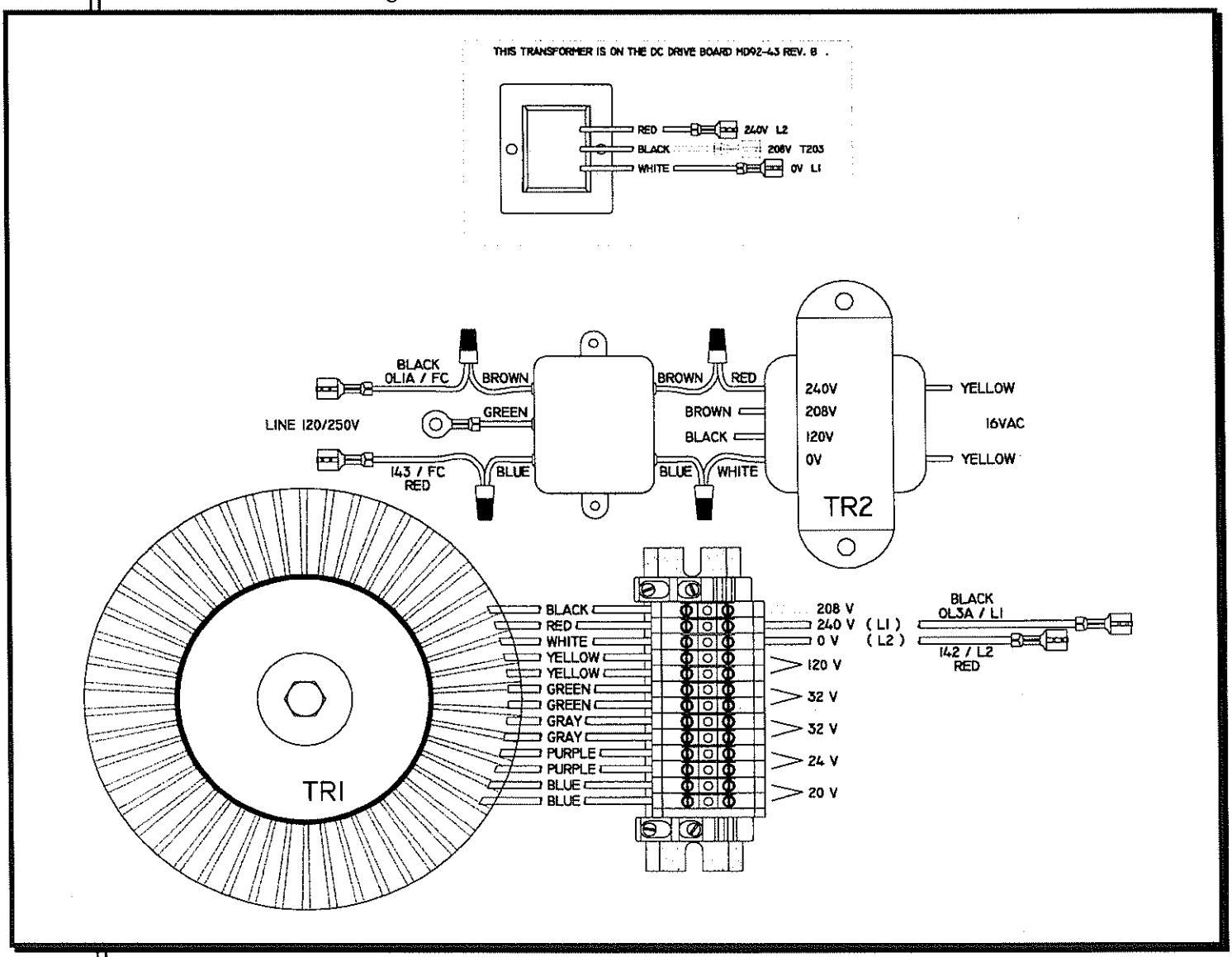
No wiring diagram of the Terminal Circuit Board is presented due to the fact that it appears in almost every other wiring diagram with its corresponding terminal connections.

Transformers

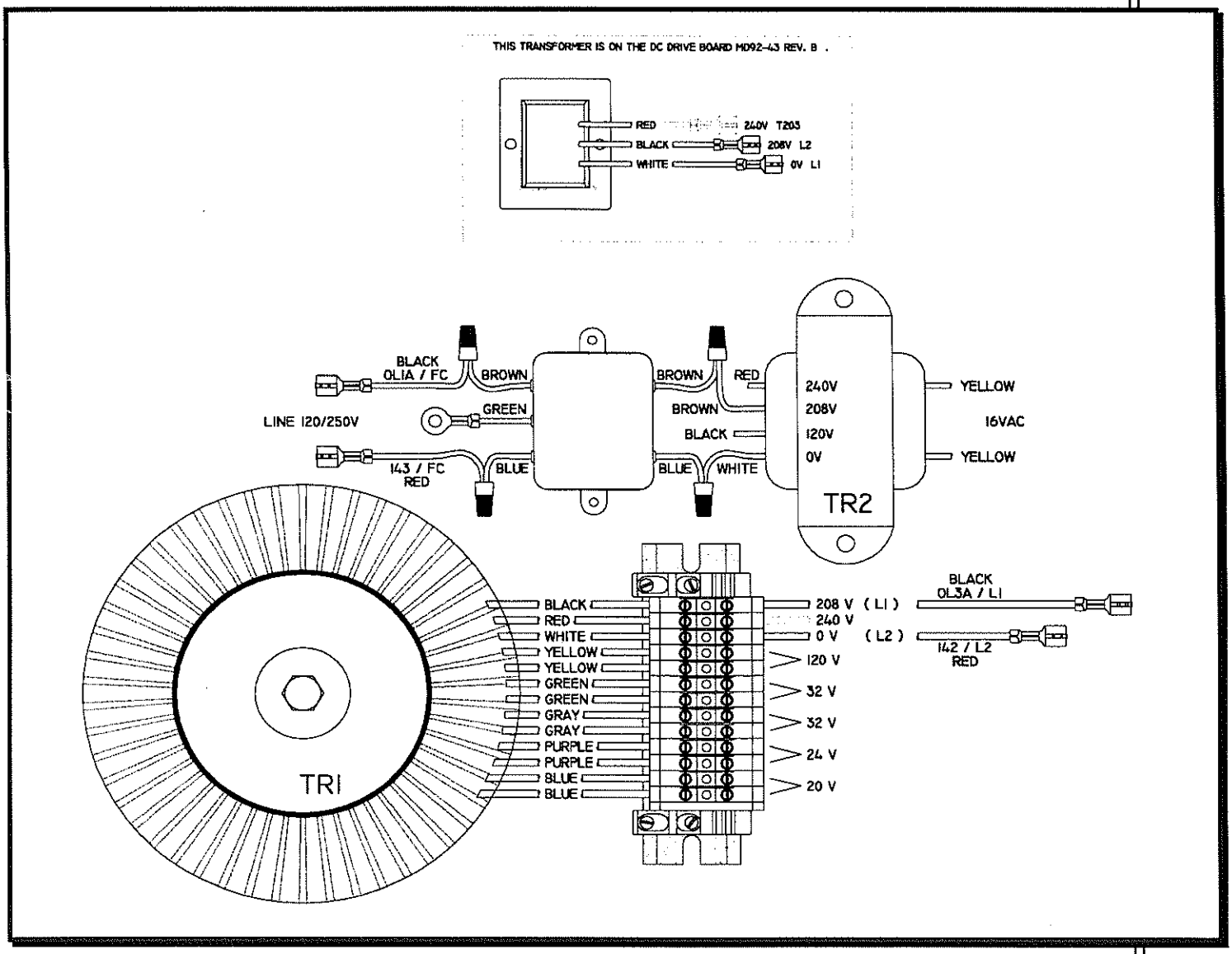
Various transformers are used to convert variations of electrical current in a primary circuit into variations of voltage and current in a secondary circuit.

The main transformer (T1), the smaller transformer (T2), and the four transformers located on each DC Drive Circuit Board Assembly all distribute the necessary voltage to the different components.

The standard 240VAC wiring of the transformers is indicated below:



If the electrical supply lines in your bowling center are 208 volts, your electronic power boxes have been modified by the accredited Mendes technicians who installed the pinsetters. The wiring modifications are as appears below. Although all wiring diagrams in this manual assume that the electrical supply lines are 240 volts, variations may occur due to this modification. Note the modifications on each wiring diagram concerned for future reference.



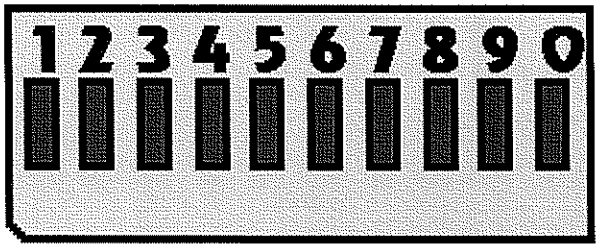
Main Circuit Board

The main circuit board (E-MD92-92) controls both MM-2001 pinsetters and their functions. Located on this board are the EPROMs and dip switch banks used to control the main board's functions. Each and every electronic component communicates in one way or another with the main circuit board, it is the brains behind the brawn of the MM-2001 Pinsetter.

Flat cables with latch connectors, MTA's, terminal connectors and one MNL connector are all used to inter-connect the different components necessary in the running of the pair of pinsetters. Refer to the circuit board layout and the wiring diagram to locate and identify the various connectors.

The main circuit board runs on 20VAC which is supplied through the 20-volt transformer located inside the electronic power box and connected to two terminal connectors (T601 & T602) on the main circuit board. The main circuit board also supplies other components with 20VAC, which is supplied through the main transformer and two terminal connectors (T604 & T605) on the main circuit board. The main circuit board is protected by an overload (OL1) located on the front of the electronic power box.

There are three LED displays (DSP201, DSP301 & DSP302) and seven LEDs (LD301, LD302, LD303, LD304, LD501, LD601 & LD603) located on the main circuit board. LD601 is used to signal the presence of the necessary 5-volt electrical power, while LD603 is used to signal the presence of the necessary 12 volt electrical power. LD501 signals the presence of the necessary 24-volt electrical power to the camera assembly. DSP301 and DSP302 are used for debugging purposes by Mendes technicians and are not explained here in order to avoid unnecessary complicated jargon. The most important LEDs for the user are LD301-LD304, which are grouped together and are constantly flashing. If these LEDs ever cease to flash, you must reset the main circuit board by pressing the RESET button located just under the LEDs.



DSP201 is used to signal communication between electronic components and is described in the table below.

LED NUMBER	SIGNALS
1	Magnet 2001 Controller (CO204) transmission communication
2	Magnet 2001 Controller (CO204) reception communication
3	Carrousel (CO203) transmission communication
4	Carrousel (CO203) reception communication
5	(CO202) transmission communication
6	(CO202) reception communication
7	Automatic Scoring Console (CO201) transmission communication
8	Automatic Scoring Console (CO201) reception communication
9	not used
0	CPU heartbeat: this LED constantly flashes, if it ceases to flash, you must reset the main circuit board.

Software contained in the two user changeable EPROMs (U102 & U103) will react differently under specific conditions established through dip switches and the dip switches will affect the software differently depending on the version of the software contained on the EPROMs.

The tables on the following pages indicate the value for each dip switch depending on whether it is ON or OFF and specifies the version of the EPROMs in which the setting was introduced. The latest software version contains all of the previous selections, therefore you must have the version number indicated or a later one in order for the setting to be valid.

A dip switch which has no identified settings should always be set to OFF.

Dip Switch Bank SW101

Switch	Version	Position	Result
101-1		ON	
		OFF	
101-2		ON	
		OFF	
101-3		ON	
		OFF	
101-4		ON	
		OFF	
101-5		ON	
		OFF	
101-6		ON	
		OFF	
101-7		ON	
		OFF	
101-8		ON	
		OFF	

Dip Switch Bank SW301

Switch	Version	Position	Result
301-1	1.12	ON	Automatic Test Mode
		OFF	***Normal*** Mode
301-2	1.12	ON	***Without*** Mendes 2001 Automatic Scoring
		OFF	***With*** Mendes 2001 Automatic Scoring System
301-3	1.12	ON	A problem caused by the carrousel solenoids will automatically stop the pinsetter.
		OFF	A problem caused by the carrousel solenoids will give the operator the choice of continuing the pinsetter's cycle or aborting the cycle.
301-4	1.13	ON	A problem caused by the drawer obstruction detector will automatically stop the pinsetter.
		OFF	A problem caused by the drawer obstruction detector will give the operator the choice of continuing the pinsetter's cycle or aborting the cycle.
301-5	1.16	ON	Elevator jams ***will not*** stop the main motor.
		OFF	Elevator jams ***will*** stop the main motor after 30 seconds.
301-6 **301-7** **301-8**	1.14		Used to determine the delay between the detection of a ball and the lowering of the sweep. Refer to the "Sweep Pause Time" table for details. Factory setting is ¼ second.

Sweep Pause Time

301-6	301-7	301-8	Sweep Delay Obtained
OFF	OFF	OFF	¼ second
OFF	OFF	ON	½ second
OFF	ON	OFF	¾ second
OFF	ON	ON	1 second
ON	OFF	OFF	1¼ seconds
ON	OFF	ON	1½ seconds
ON	ON	OFF	1¾ seconds (version 1.14) 2 seconds (version 1.15)
ON	ON	ON	2 seconds (version 1.14) Sweep is not lowered on first delivery gutter balls nor on first delivery corner pins (version 1.15)

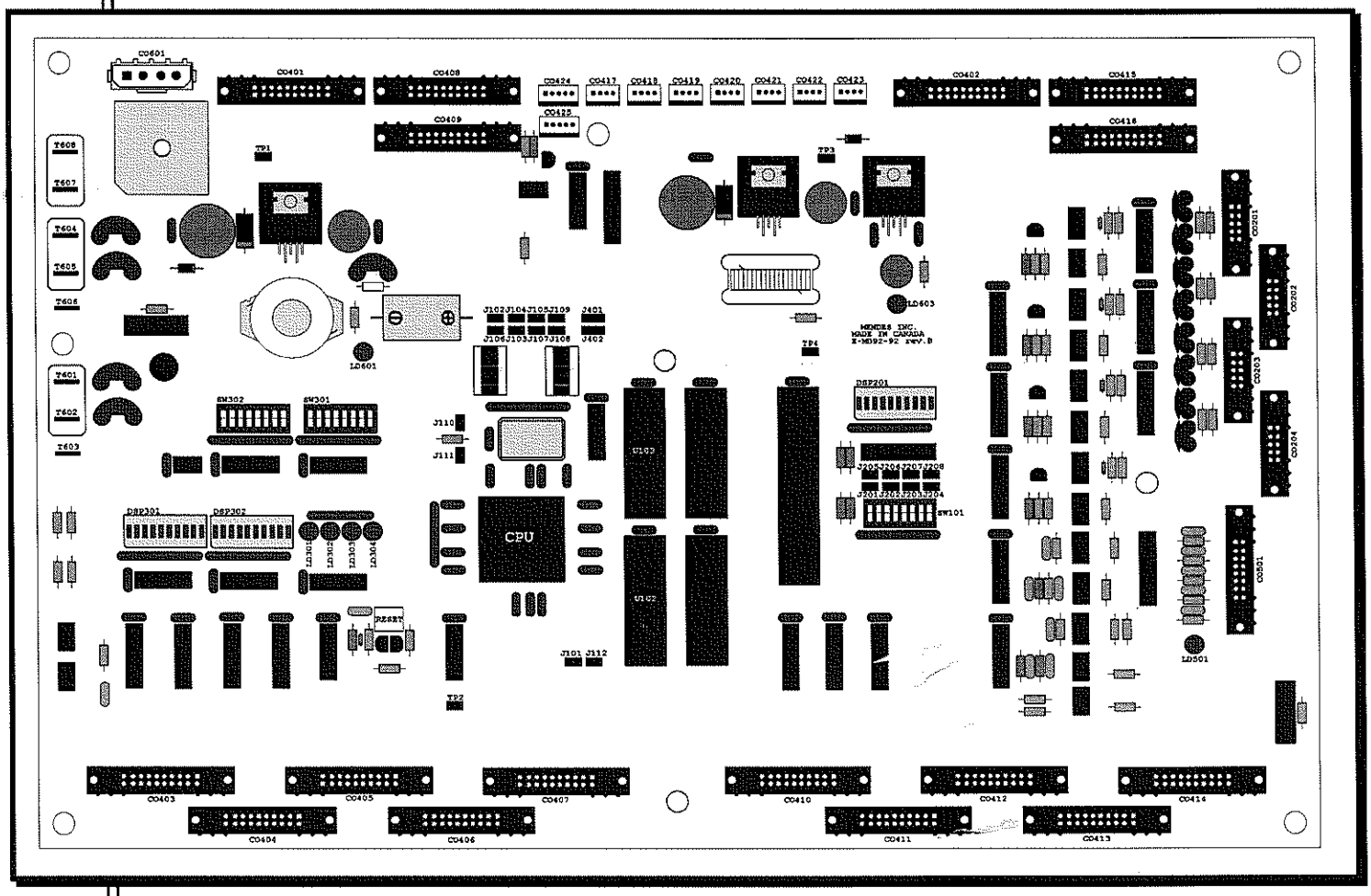
Dip Switch Bank SW302

Switch	Version	Position	Result
302-1 302-2 302-3	1.12		Used to determine the delay used by the pin detection camera to correctly take its reading. Refer to the "Camera Pause Time" table for details. Factory setting is 1½ seconds (version 1.12) and 2 seconds (version 1.14).
302-4	1.12	ON OFF	Main circuit board battery ***deactivated.*** Main circuit board battery ***activated.***
302-5	1.18	ON OFF	Camera ***deactivated.*** Use this setting if you have a problem with your camera which you are unable to solve. This mode will cycle the pinsetter according to ball detection only. (DS301-2 must be ON in order for this setting to function. ***Normal*** mode. Camera activated.
302-6		ON OFF	
302-7		ON OFF	
302-8		ON OFF	

Camera Pause Time

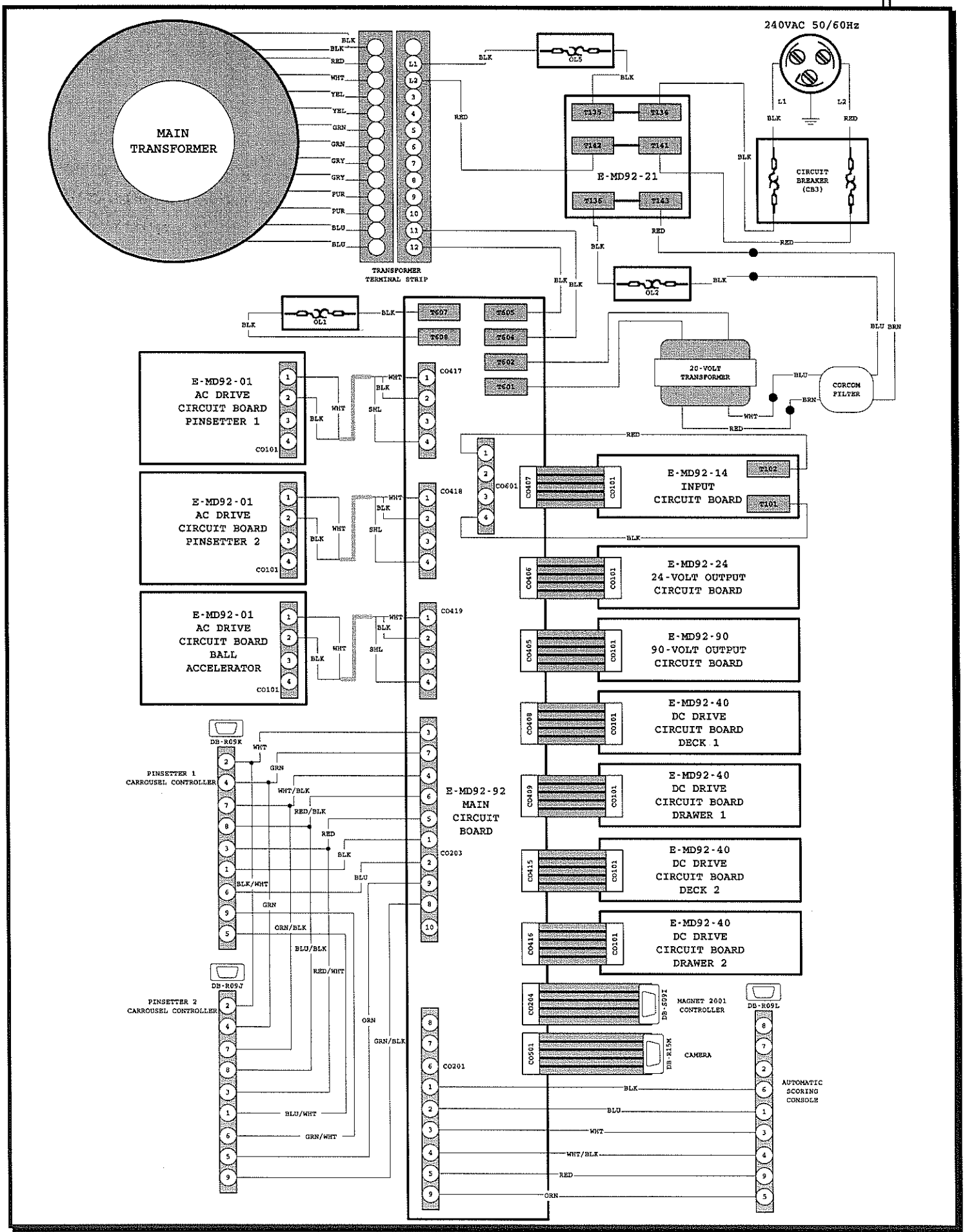
302-1	302-2	302-3	Camera Reading Delay Obtained
OFF	OFF	OFF	1.5 seconds (version 1.12) 2 seconds (version 1.14)
OFF	OFF	ON	2.5 seconds (version 1.12) 2.3 seconds (version 1.14)
OFF	ON	OFF	3.5 seconds (version 1.12) 2.6 seconds (version 1.14)
OFF	ON	ON	4.5 seconds (version 1.12) 3 seconds (version 1.14)
ON	OFF	OFF	5.5 seconds (version 1.12) 3.3 seconds (version 1.14)
ON	OFF	ON	6 seconds (version 1.12) 3.6 seconds (version 1.14)
ON	ON	OFF	6.5 seconds (version 1.12) 4 seconds (version 1.14)
ON	ON	ON	7 seconds (version 1.12) 4.3 seconds (version 1.14)

Main Circuit Board Layout & Wiring Diagram



The opposite page illustrates the Main Circuit Board's wiring diagram.

Refer to the Carrousel Circuit Board Wiring Diagrams and the Camera Circuit Board Wiring Diagram for the remaining wiring which connects with DB-R09K, DB-R09J, DB-R09L and DB-R15M.


240VAC 50/60Hz
MAIN TRANSFORMER
TRANSFORMER TERMINAL STRIP
OL5
OL2
OL1
E-MD92-21
CIRCUIT BREAKER (CB3)
20-VOLT TRANSFORMER
CORCOM FILTER
E-MD92-01 AC DRIVE CIRCUIT BOARD PINSETTER 1
E-MD92-01 AC DRIVE CIRCUIT BOARD PINSETTER 2
E-MD92-01 AC DRIVE CIRCUIT BOARD BALL ACCELERATOR
E-MD92-14 INPUT CIRCUIT BOARD
E-MD92-24 24-VOLT OUTPUT CIRCUIT BOARD
E-MD92-90 90-VOLT OUTPUT CIRCUIT BOARD
E-MD92-40 DC DRIVE CIRCUIT BOARD DECK 1
E-MD92-40 DC DRIVE CIRCUIT BOARD DRAWER 1
E-MD92-40 DC DRIVE CIRCUIT BOARD DECK 2
E-MD92-40 DC DRIVE CIRCUIT BOARD DRAWER 2
E-MD92-92 MAIN CIRCUIT BOARD
PINSETTER 1 CARROUSEL CONTROLLER
PINSETTER 2 CARROUSEL CONTROLLER
MAGNET 2001 CONTROLLER
CAMERA
AUTOMATIC SCORING CONSOLE

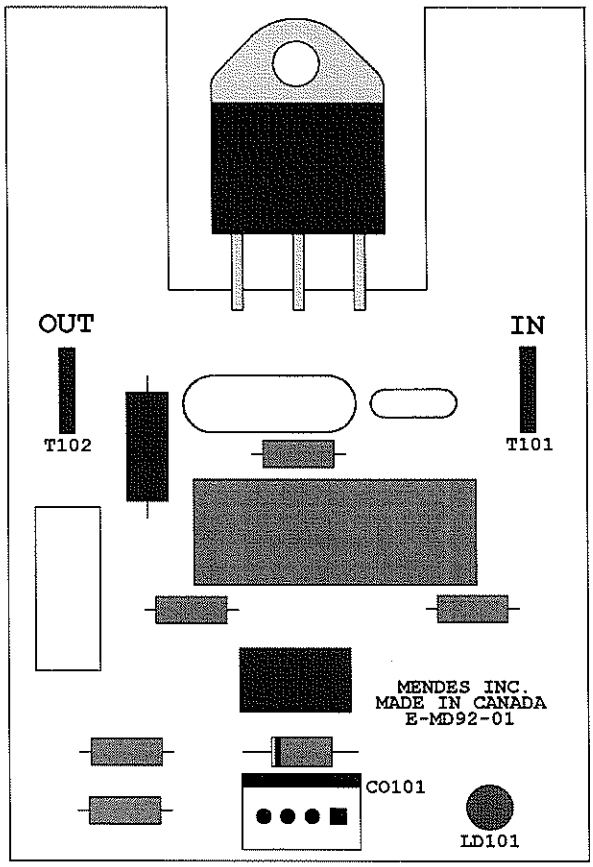
AC Drive Circuit Boards

There are three inter-changeable AC drive circuit boards (E-MD92-01) located inside each power box. These circuit boards are used to power on and off their respective AC motors; one for pinsetter 1, one for the ball accelerator, and one for pinsetter 2.

Each AC drive circuit board communicates with the main circuit board (E-MD92-92) through an MTA connected to CO101. It is through the main circuit board that each motor is turned ON and OFF.

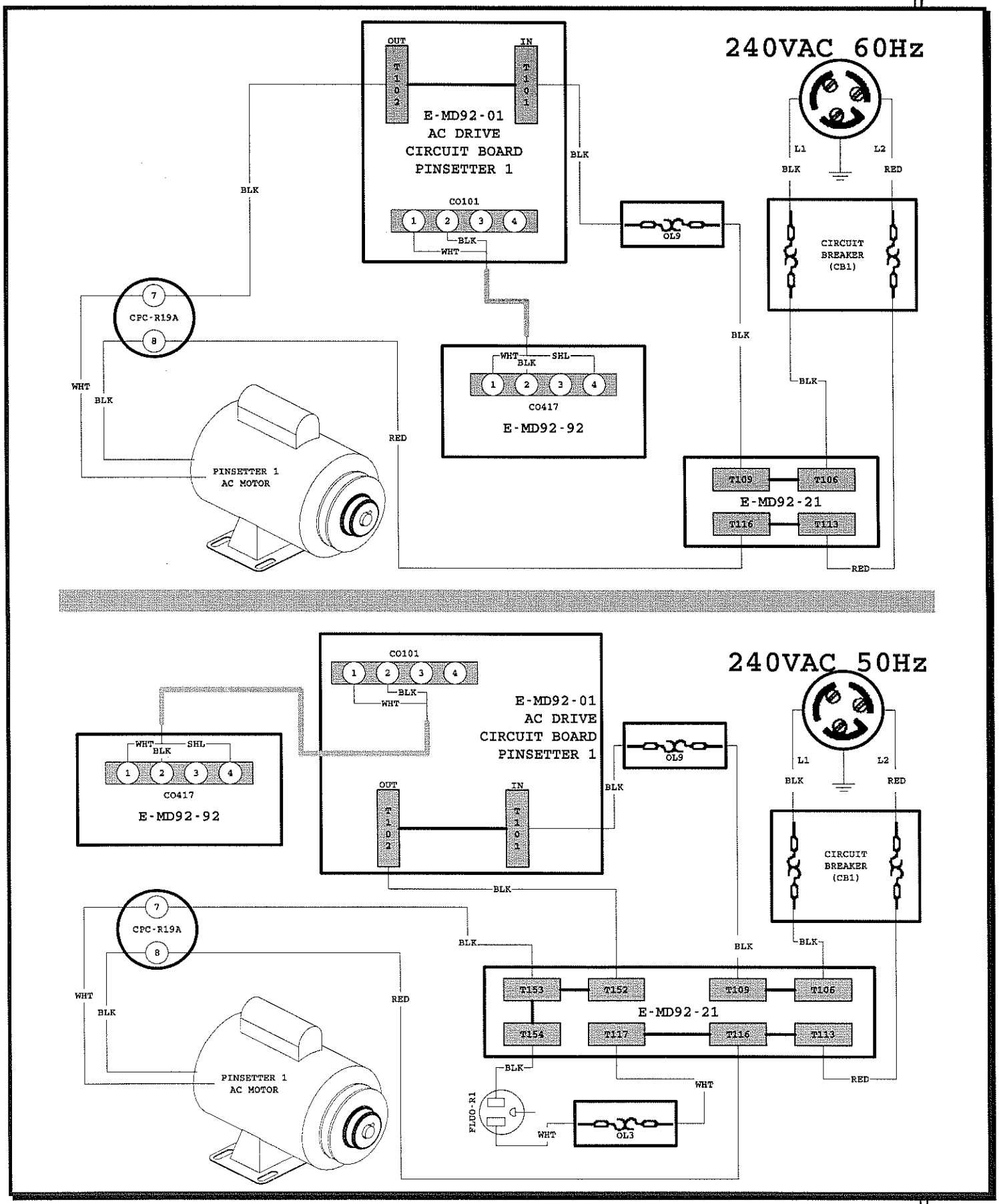
When the LED (LD101) located on the AC drive circuit board is ON, it signifies that the main circuit board has powered ON its corresponding motor.

The electrical power to each AC motor is supplied through the two terminal connectors (T101 & T102) located on each AC drive circuit board. Each motor is protected by an overload located on the front of the electronic power box with the electric circuit being completed through the terminal circuit board (E-MD92-21).

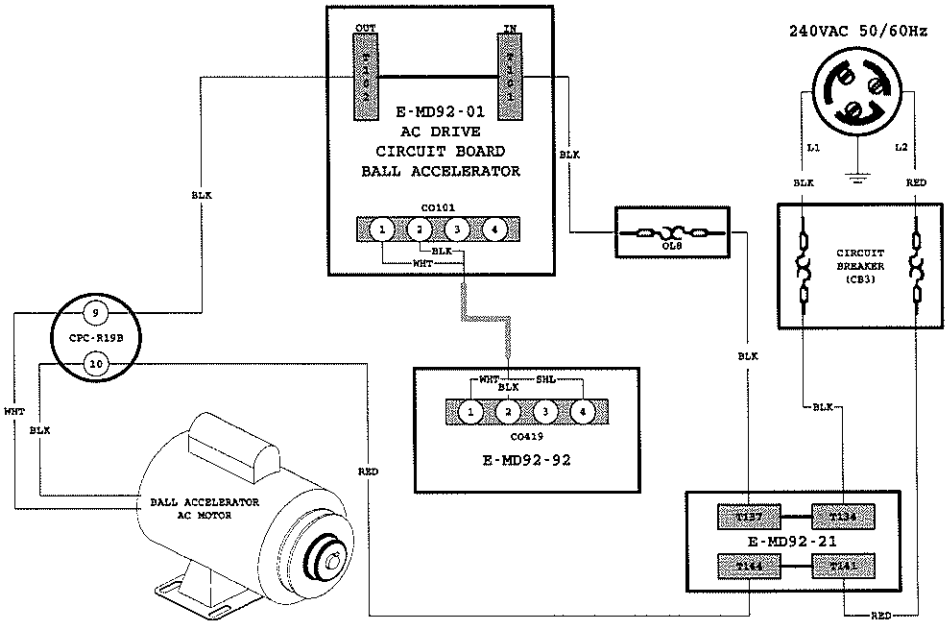


The following pages illustrate the different wiring diagrams for the three AC Drive Circuit Boards. Note that the ball accelerator's AC Drive wiring is the same for both 50 and 60 Cycle electrical supply, while each pinsetter's AC Drive wiring is different according to whether it runs on 50 or 60 Cycles.

Pinsetter 1 AC Drive Wiring Diagrams

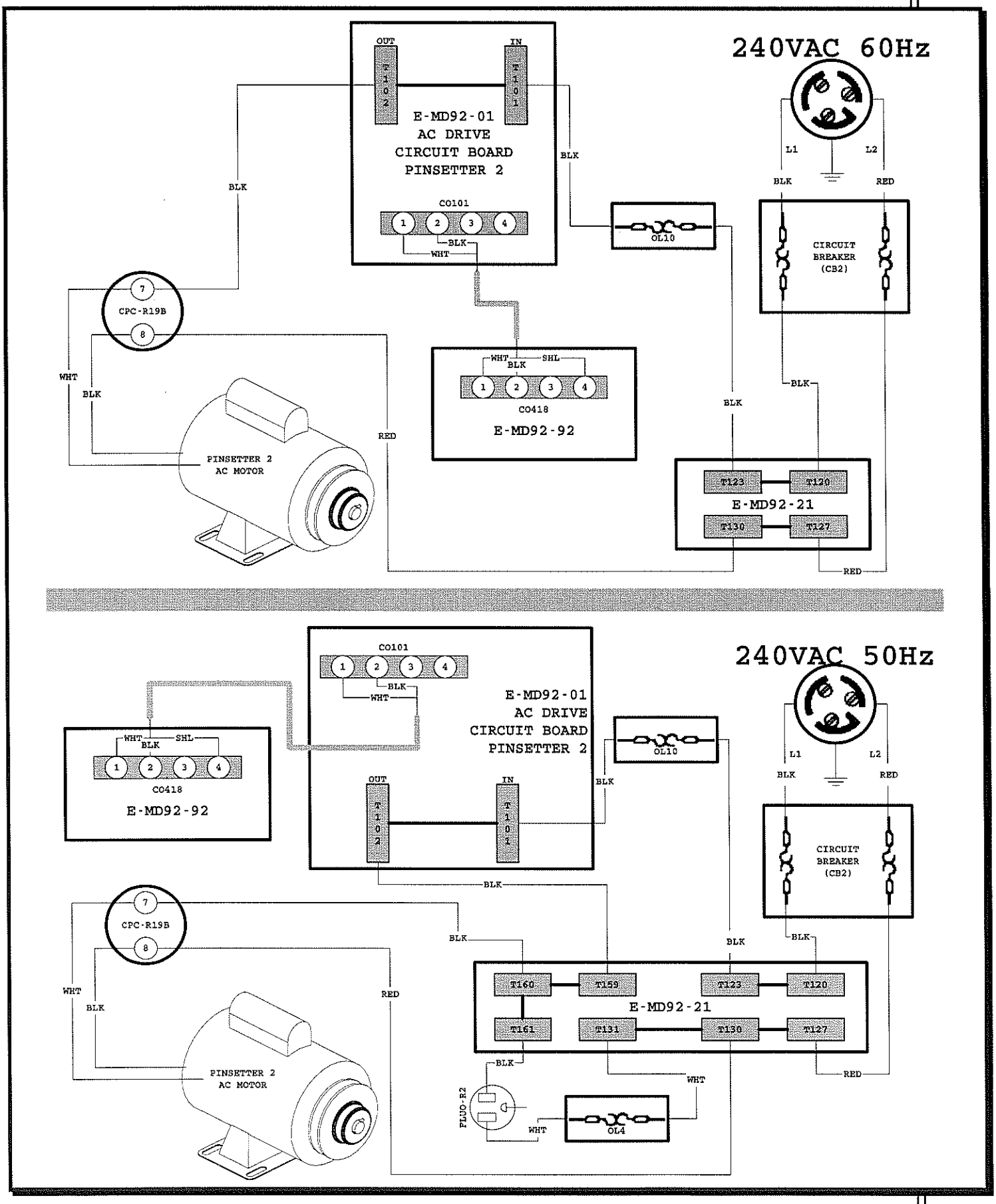


Ball Accelerator AC Drive Wiring Diagram



AC Drive Notes

Pinsetter 2 AC Drive Wiring Diagrams



DC Drive Circuit Boards

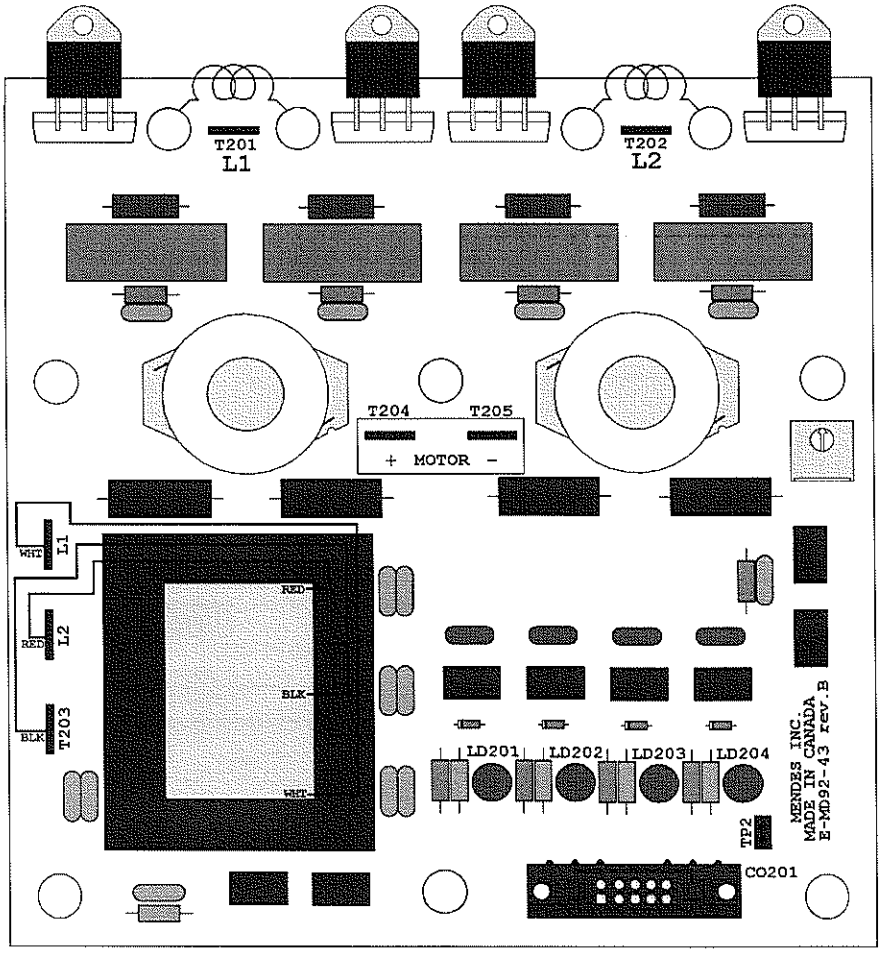
There are two inter-changeable ***drawer*** DC drives (SB-308-7110) located inside each electronic power box. The only difference between each assembly is the length of the flat cable which is used to communicate with the main circuit board (E-MD92-92). Pinsetter 1's drawer DC drive uses a 20-inch flat cable while pinsetter 2's DC drive uses a 14-inch flat cable.

There are also two inter-changeable ***deck*** DC drives(SB-308-7100) located inside each electronic power box. The only difference between each of these assemblies is once again in the length of the flat cable used to communicate with the main circuit board (E-MD92-92). Pinsetter 1's deck DC drive uses a 16-inch flat cable while pinsetter 2's DC drive uses a 10-inch flat cable.

Each assembly is made up of two electronic circuit boards (E-MD92-43 and E-MD92-40) along with a mounting plate and the necessary hardware to join both circuit boards together. If a problem arises with one of these assemblies, do not attempt to swap boards with another assembly. This could result in having two non-functioning assemblies. Always replace a complete assembly and return the faulty assembly for repairs since each board is dependent of the other in order to perform correctly. For the same reasons, you may not order one board but must order a complete DC drive (SB-308-7100 or SB-308-7110).

The spare parts kits and any replacement orders are always supplied as follows: The SB-308-7110 with a 20-inch flat cable and SB-308-7100 with a 16-inch flat cable.

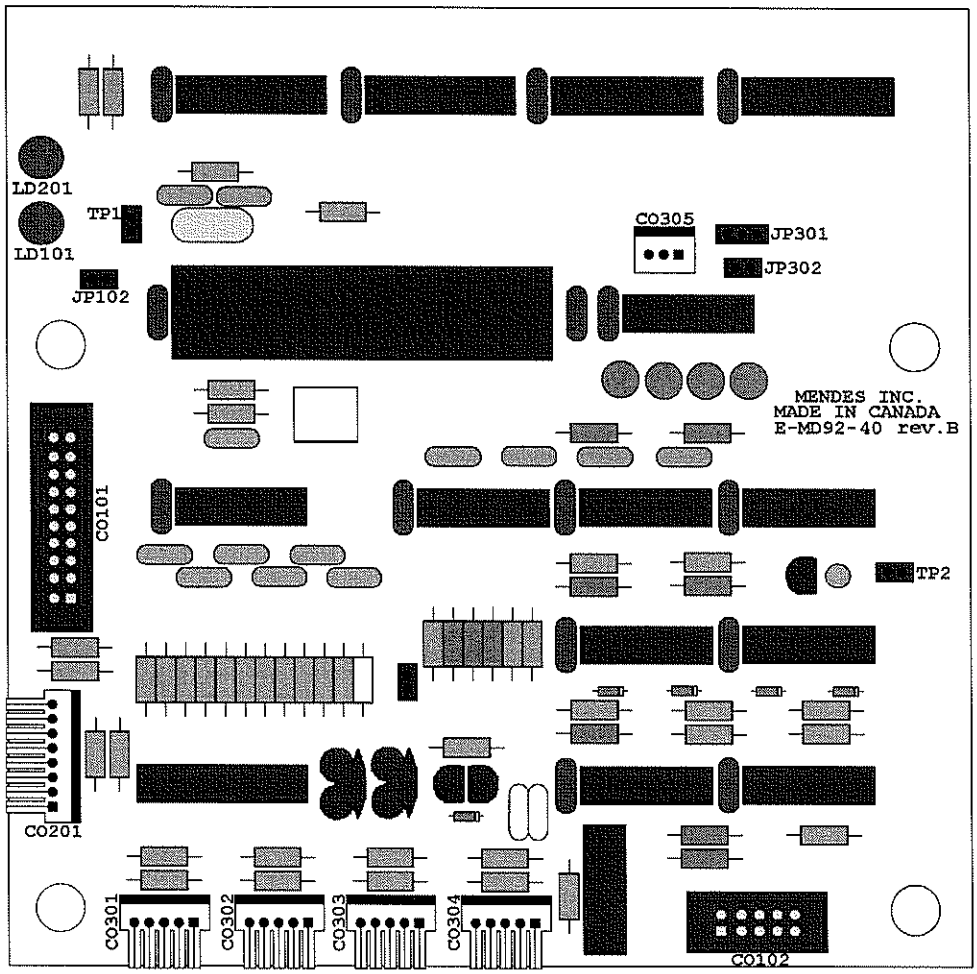
The top circuit board on each DC drive is the E-MD92-43.



The electrical power to each DC motor is supplied through the E-MD92-43 using four terminal connectors (T201, T202, T203 & T204). Each DC motor is protected by an overload located on the front of the electronic power box with the electric circuit being completed through the terminal circuit board (E-MD92-21).

When the LEDs (LD201, LD202, LD203 & LD204) located on E-MD92-43 are ON, it signifies that the main circuit board has powered on its corresponding DC motor.

The E-MD92-43 communicates with the E-MD92-40 through a flat cable connected to CO201 and CO102 respectively.

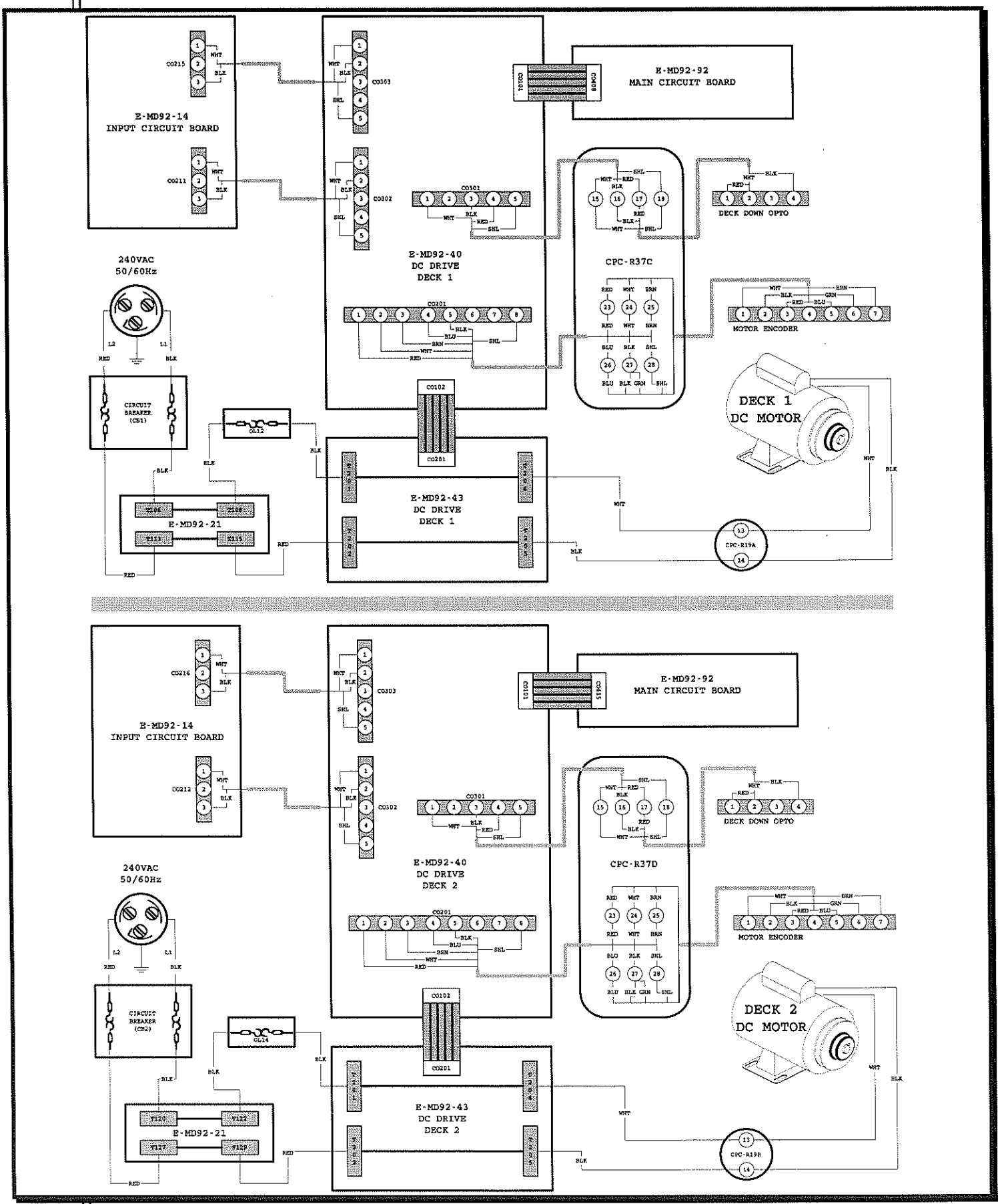


The E-MD92-40 communicates with the main circuit board (E-MD92-92) through an MTA connected to CO101. It is through the main circuit board that each motor is turned ON and OFF.

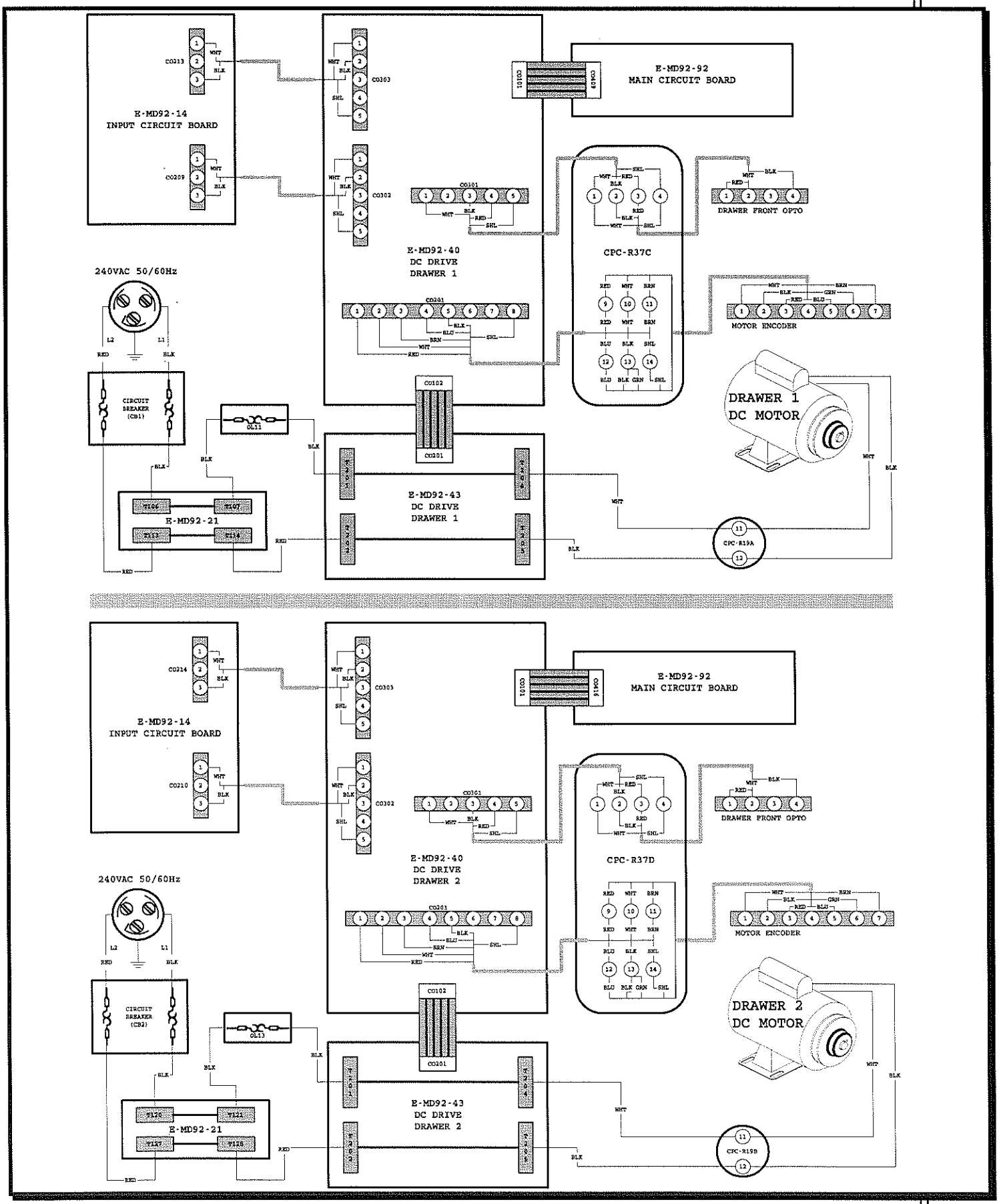
Each DC motor has an encoder used to control the revolution of the motor according to the software. This encoder communicates with E-MD92-40 through an MTA located on CO201. The four remaining MTA's are used for input signals with CO301 and CO304 being connected directly to optical sensors while CO302 and CO303 are used as bypasses communicating with the input circuit board (E-MD92-14).

The two LEDs (LD101 & LD201) along with the two test points (TP1 & TP2) located on MD92-40 are for analysis purposes only and are of no significance in the normal functioning of this circuit board's components.

Deck DC Drive Wiring Diagrams



Drawer DC Drive Wiring Diagrams



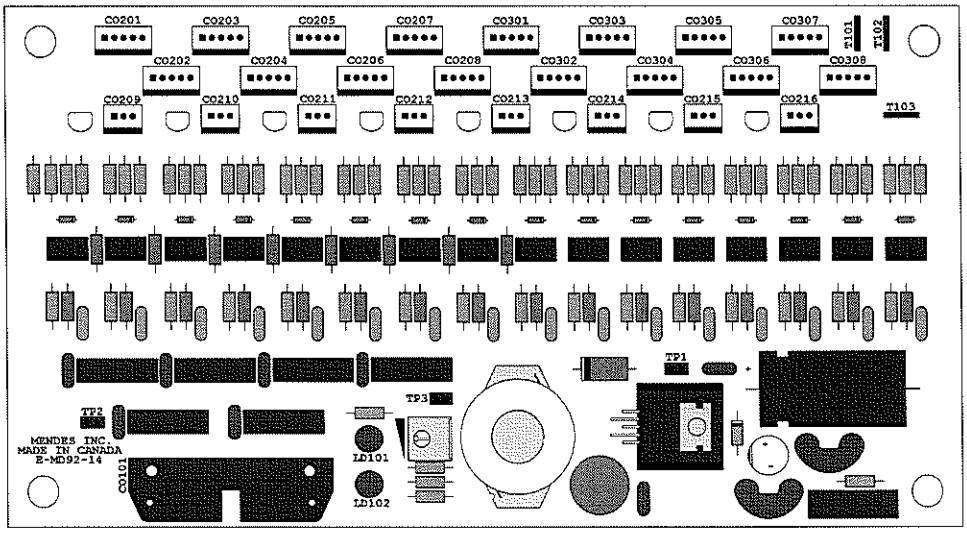
Input Circuit Board

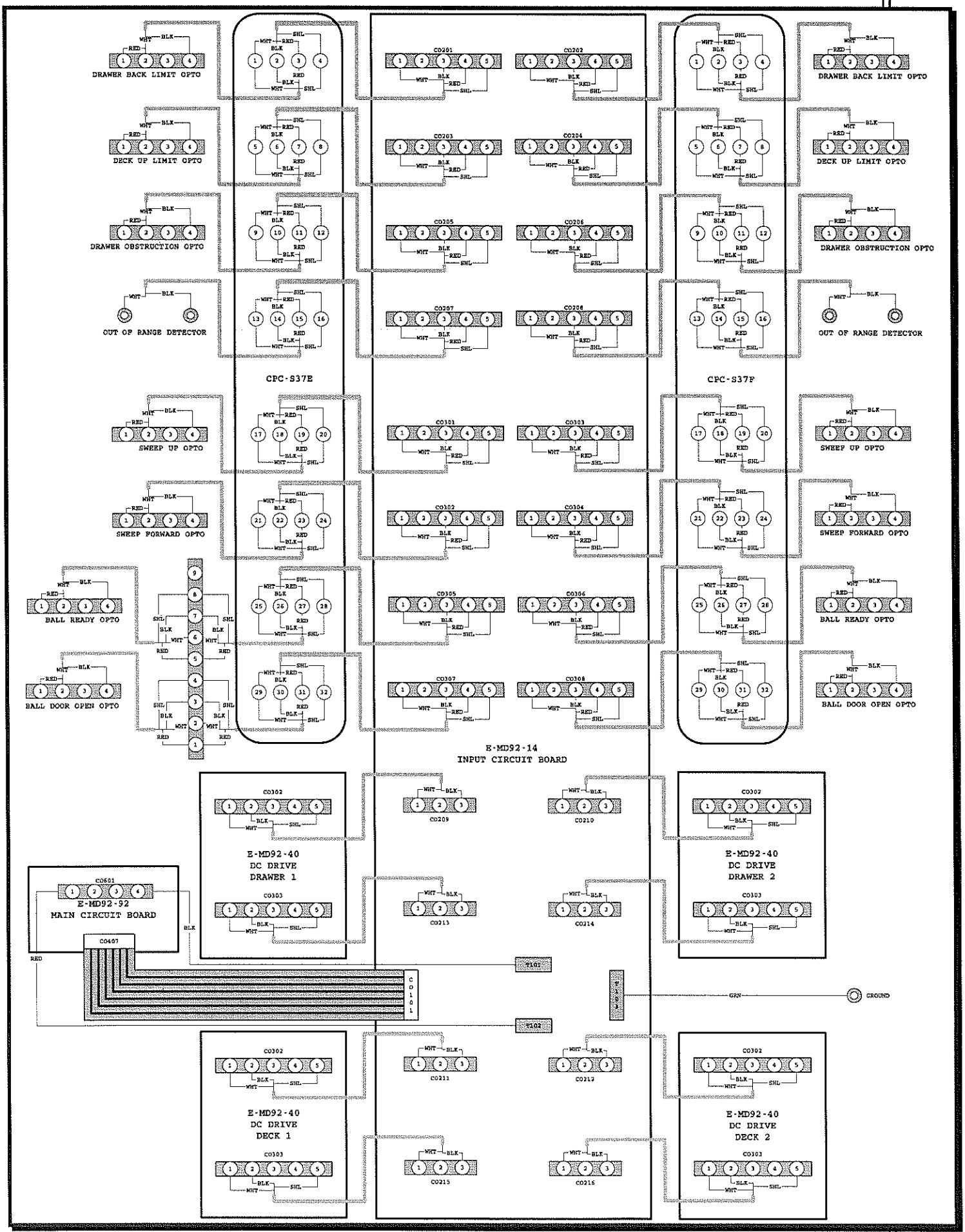
The input circuit board (E-MD92-14) located inside the electronic power box receives pulse signals from the different optical sensors located on both pinsetters. The optical sensors use 4-position MNL connectors to communicate with the input circuit board through CPC-S37E for pinsetter 1 and CPC-S37F for pinsetter 2. Completing the circuits are sixteen MTA assemblies located on CO201, CO202, CO203, CO204, CO205, CO206, CO207, CO208, CO301, CO302, CO303, CO304, CO305, CO306, CO307 and CO308.

The two LEDs (LD101 & LD102) located on the circuit board are used to signal the presence of the necessary voltage. LD101 is ON when the 5-volt power supply is present and LD102 is ON when the 12-volt power supply is present.

The input circuit board communicates with the main circuit board (E-MD92-92) through a flat cable and latch connector located on CO101. This flat cable also supplies 5 volts of electrical power to different components on the circuit board. The 12-volt electrical power to the input circuit board is supplied through the two terminal connectors (T101 & T102) which are powered from the main circuit board.

The input circuit board also communicates with each DC drive (drawer 1 & 2 and deck 1 & 2) through eight MTA assemblies located on CO209, CO210, CO211, CO212, CO213, CO214, CO215 and CO216. These bypasses are used to capture the signals from the various optical sensors which communicate directly with the DC drive assemblies.




DRAWER BACK LIMIT OPTO
DECK UP LIMIT OPTO
DRAWER OBSTRUCTION OPTO
OUT OF RANGE DETECTOR
CPC-S37E
CPC-S37F
SWEEP UP OPTO
SWEEP FORWARD OPTO
BALL READY OPTO
BALL DOOR OPEN OPTO
E-MD92-14
INPUT CIRCUIT BOARD
E-MD92-40
DC DRIVE
DRAWER 1
E-MD92-40
DC DRIVE
DRAWER 2
E-MD92-40
DC DRIVE
DECK 1
E-MD92-40
DC DRIVE
DECK 2
E-MD92-92
MAIN CIRCUIT BOARD
GROUND

24-Volt Output Circuit Board

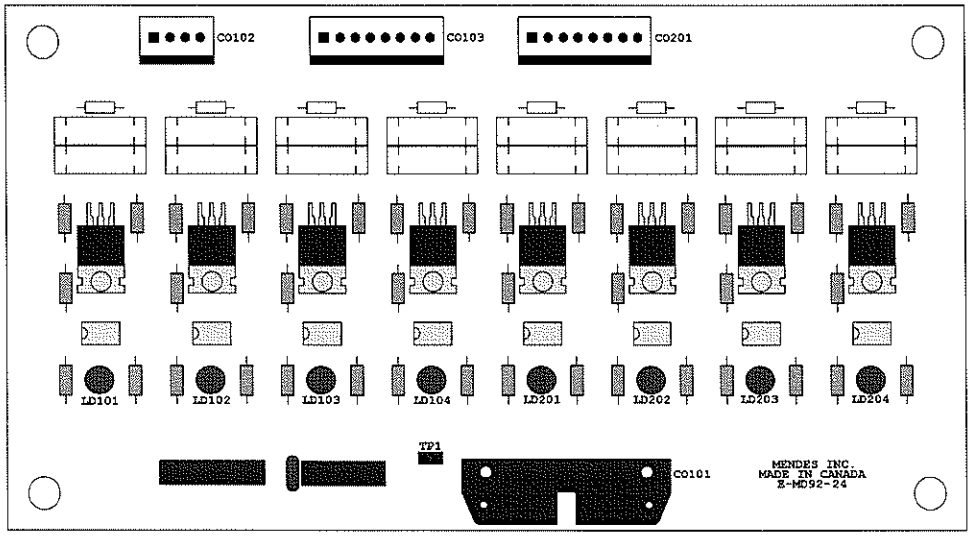
The ball 1 / ball 2 lights, the trouble lights, the ball lift's 24-volt relay, and the camera's power supply are all controlled through the 24-volt output circuit board (E-MD92-24) located inside the electronic power box.

The 24-volt output circuit board communicates with the main circuit board (E-MD92-92) through a flat cable and latch connector located on CO101.

The eight LEDs, LD101 (*pinsetter 1 - ball 1*), LD102 (*pinsetter 1 - ball 2*), LD103 (*pinsetter 1 - trouble light*), LD104 (*ball lift*), LD201 (*pinsetter 2 - ball 1*), LD202 (*pinsetter 2 - ball 2*), LD203 (*pinsetter 2 - trouble light*), and LD204 (*camera*) located on the circuit board are used to signal the presence of electrical power to its component. In other words, when the LED is ON, the main circuit board has sent a power on command to the component.

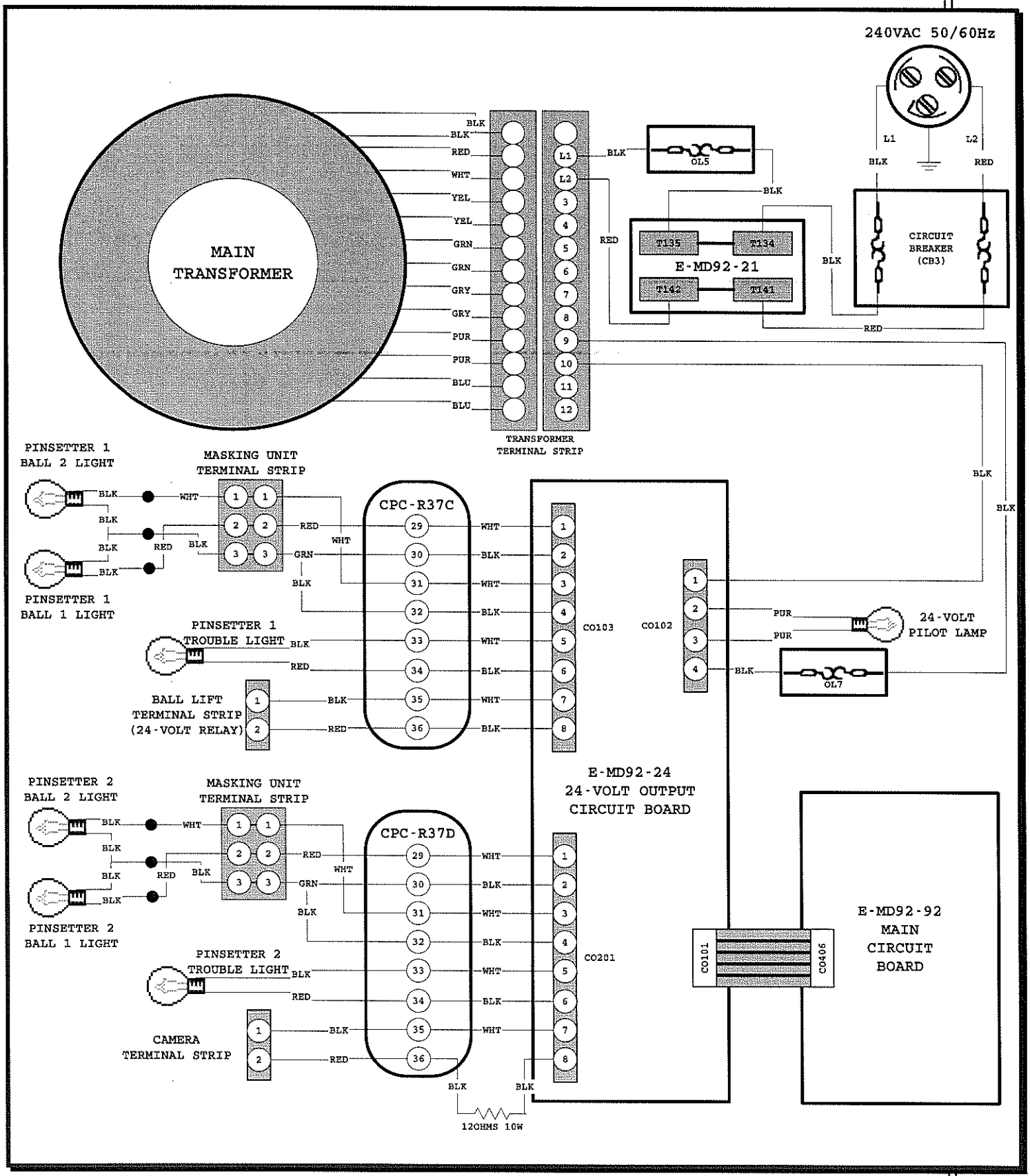
The low voltage accessories are wired to the 24-volt output circuit board through CPC-R37C for pinsetter 1 and the ball lift, while CPC-R37D is used for pinsetter 2 and the camera. Completing the circuits are two MTA assemblies located on CO103 and CO201.

The low voltage electrical power to each component is supplied through the main transformer using an MNL connector located on CO102. The circuit board is protected by an overload (OL7) located on the front of the electronic power box with the electric circuit being completed through the terminal circuit board (E-MD92-21).



The opposite page illustrates the 24-Volt Circuit Board's wiring diagram.

Refer to the Carrousel Circuit Board Wiring Diagrams and the Camera Circuit Board Wiring Diagrams for the remaining wiring of the Ball Lift Terminal Strip and the Camera Terminal Strip..


240VAC 50/60Hz
L1
L2
BLK
RED
MAIN TRANSFORMER
BLK
BLK
RED
WHT
YEL
YEL
GRN
GRN
GRY
GRY
PUR
PUR
BLU
BLU
TRANSFORMER TERMINAL STRIP
OL5
T135
T134
E-MD92-21
T142
T141
CIRCUIT BREAKER (CB3)
PINSETTER 1 BALL 2 LIGHT
PINSETTER 1 BALL 1 LIGHT
MASKING UNIT TERMINAL STRIP
CPC-R37C
PINSETTER 1 TROUBLE LIGHT
BALL LIFT TERMINAL STRIP (24-VOLT RELAY)
CO103
CO102
24-VOLT PILOT LAMP
OL7
E-MD92-24 24-VOLT OUTPUT CIRCUIT BOARD
PINSETTER 2 BALL 2 LIGHT
PINSETTER 2 BALL 1 LIGHT
CPC-R37D
PINSETTER 2 TROUBLE LIGHT
CAMERA TERMINAL STRIP
CO201
CO101
CO406
E-MD92-92 MAIN CIRCUIT BOARD
120HMS 10W

90-Volt Output Circuit Board

The sweep clutches, the pin elevator clutches, the ball door clutches, and the fluorescent lights are all controlled through the 90-volt output circuit board (E-MD92-90) located inside the electronic power box.

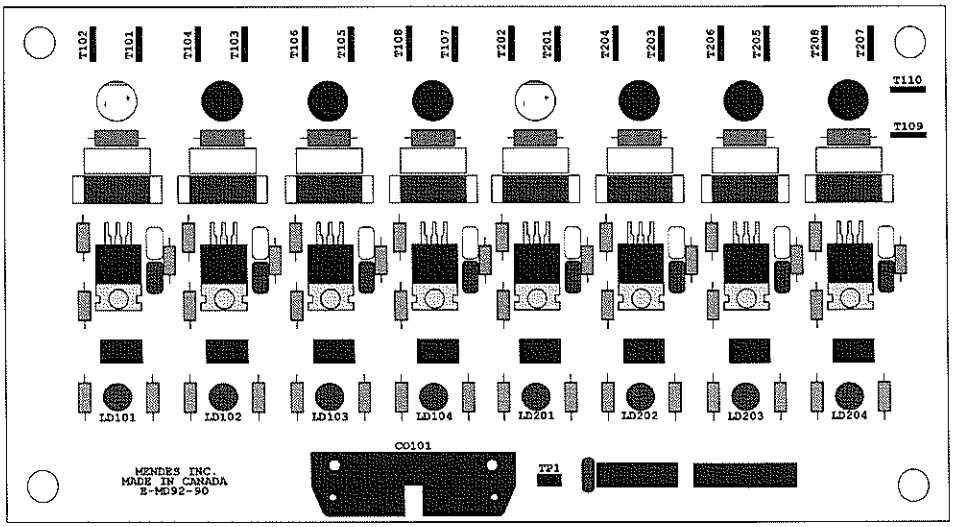
The 90-volt output circuit board communicates with the main circuit board (E-MD92-92) through a flat cable and latch connector located on CO101.

The eight LEDs, LD101 (*fluorescent 1*), LD102 (*sweep clutch 1*), LD103 (elevator *clutch 1*), LD104 (*ball door clutch 1*), LD201 (*fluorescent 2*), LD202 (*sweep clutch 2*), LD203 (*elevator clutch 2*), and LD204 (*ball door clutch 2*) located on the circuit board are used to signal the presence of electrical power to its component. In other words, when the LED is ON, the main circuit board has sent a power on command to the component.

The above mentioned components are wired to the 90-volt circuit board through CPC-R19A for pinsetter 1 and CPC-R19B for pinsetter 2. Terminal connectors (T101-T108 & T201-T208) are used to complete the circuits.

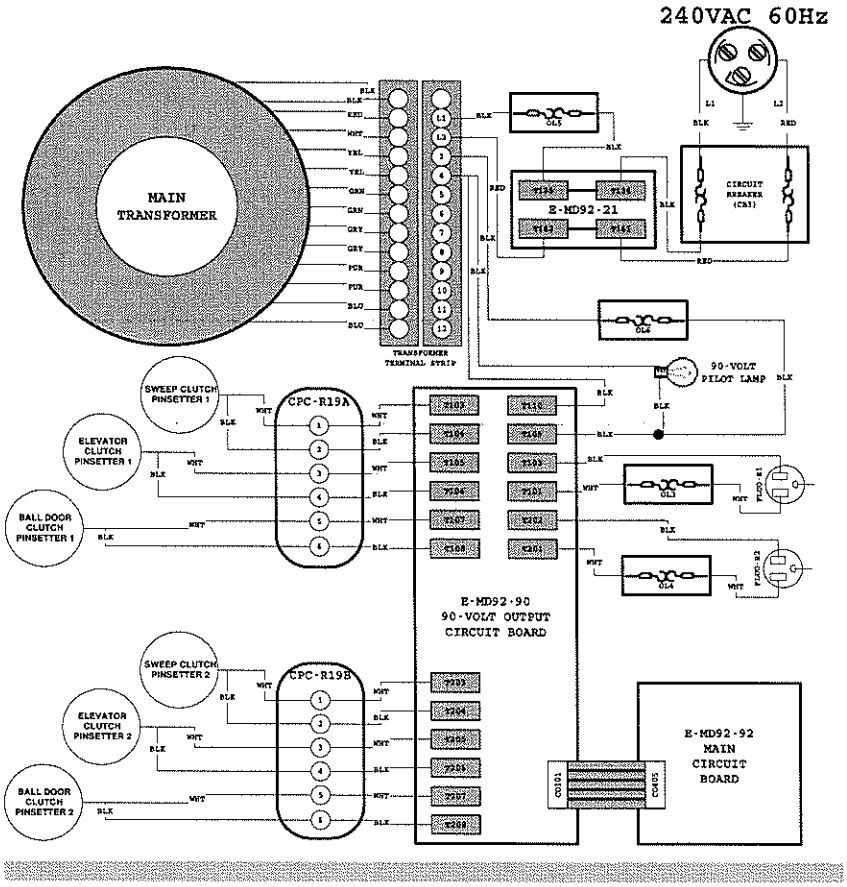
The electrical power to each component is supplied through the main transformer using terminal connectors T109 & T110. The circuit board is protected by an overload (OL6) located on the front of the electronic power box with the electric circuit being completed through the terminal circuit board (E-MD92-21).

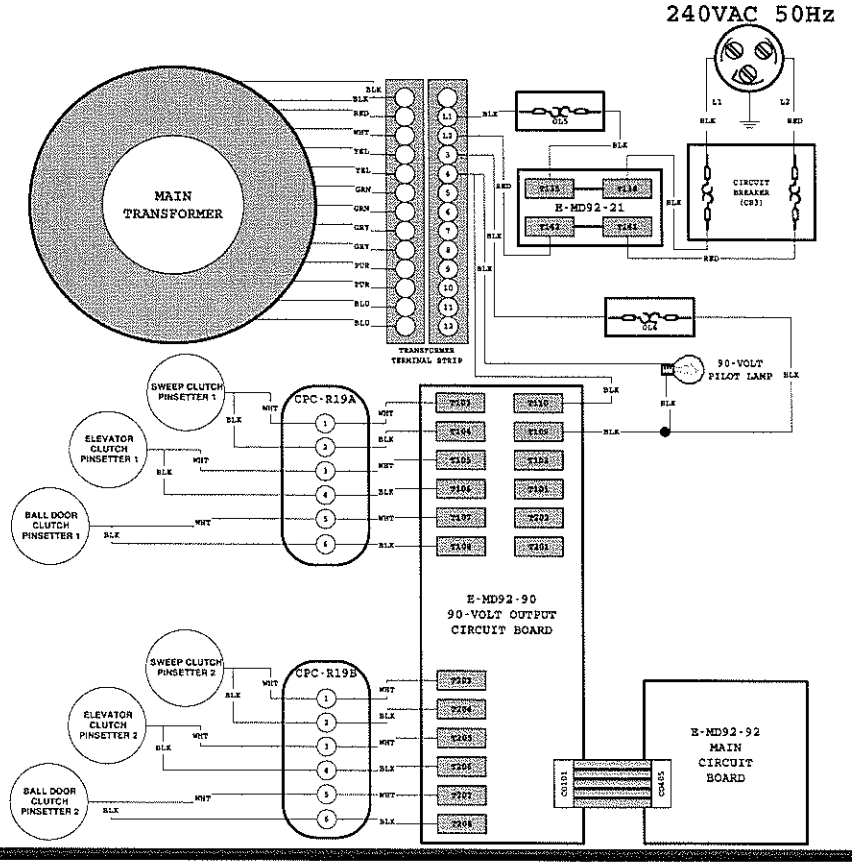
Each fluorescent light is also protected by an overload (OL3 & OL4) located on the front of the electronic power box.



Installations which are supplied with 50Hz electrical cycles have been modified. The fluorescent lights are not activated by the 90-Volt Circuit Board, but through the pinsetter's AC Drive. The opposite page illustrates both 60Hz and 50Hz installations. Refer to the 240VAC 50Hz Electronic Power Box wiring diagram for the fluorescent lighting wiring.

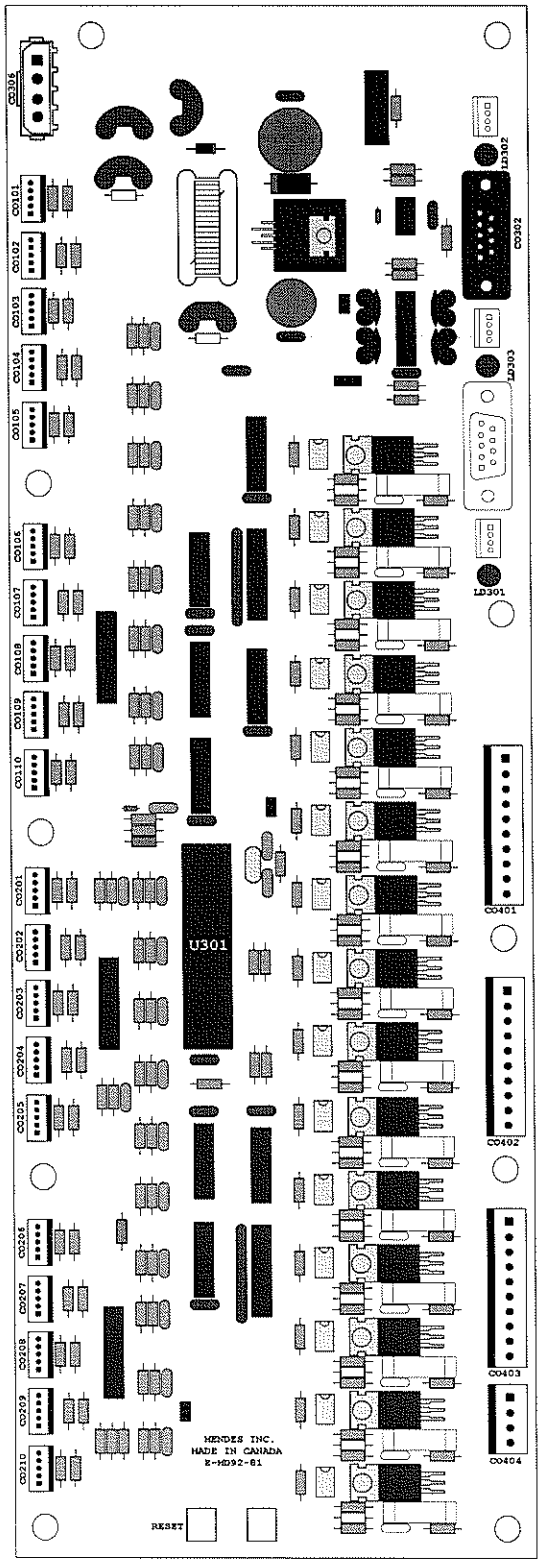
90-Volt Output Circuit Board Wiring Diagrams





Carrousel Controllers

Each pinsetter has its own carrousel controller (SB-302-7100) located on the pinsetter's frame below the trouble light at the rear of the pinsetter.



Each controller contains a carrousel circuit board (E-MD92-81) which is mounted on a metal frame with insulators in order to protect it from metal to metal contact. Your spare parts kit contains a carrousel controller, if a problem arises with one of your controllers, do not attempt to swap boards with your spare. Doing so could result in having two non-functioning controllers. Always replace a complete carrousel controller and return the faulty controller for repairs. For this same reason, you may not order a single carrousel circuit board but must order a complete carrousel controller (SB-302-7100).

The carrousel receives pulse signals from the different carrousel related optical sensors and then reacts according to the software contained in EPROM U301. The optical sensors use 4-position MNL connectors to communicate with the carrousel circuit board through connectors CO109, CO110, CO201, CO202, CO203, CO204, CO205 and CO206.

The carrousel controller runs on 32VAC which is supplied through the main transformer located inside the electronic power box and connected to CO404 through CPC-R19A on pinsetter 1 and CPC-R19B on pinsetter 2. Each carrousel controller is protected through an overload (OL15 on carrousel 1 and OL16 on carrousel 2) located on the front of the electronic power box.

The three LEDs (LD301, LD302 & LD303) located on the carrousel circuit board are used to signal the carrousel's heartbeat, in-coming communication signals (reception) and out-going communication signals (transmission) respectively. The heartbeat (LD301) constantly flashes, if it ceases to flash, you must reset the carrousel controller.

The carrousel controllers are used to activate the carrousel solenoids used to load the magazine and the magazine solenoids used to load the drawer. The 14 solenoids are connected to the carrousel controller through connectors CO401, CO402 and CO403. The 7 read switches (E-MD92-35) located inside the detection bar assembly (SB-308-5700) are also connected to the carrousel controller. A miniature D connector is used to distribute each read switch to connectors CO101, CO102, CO103, CO104, CO105, CO106 and CO107 respectively.

The Manager's Control Panel uses the carrousel controller to turn pinsetters on and off and also to count the number of full sets performed by each pinsetter. The 24-volt signal which activates the Manager's Control counter is sent through pins 9 and 10 of CO403 while CO210 is used to close the electric circuit connected to the on/off switches.

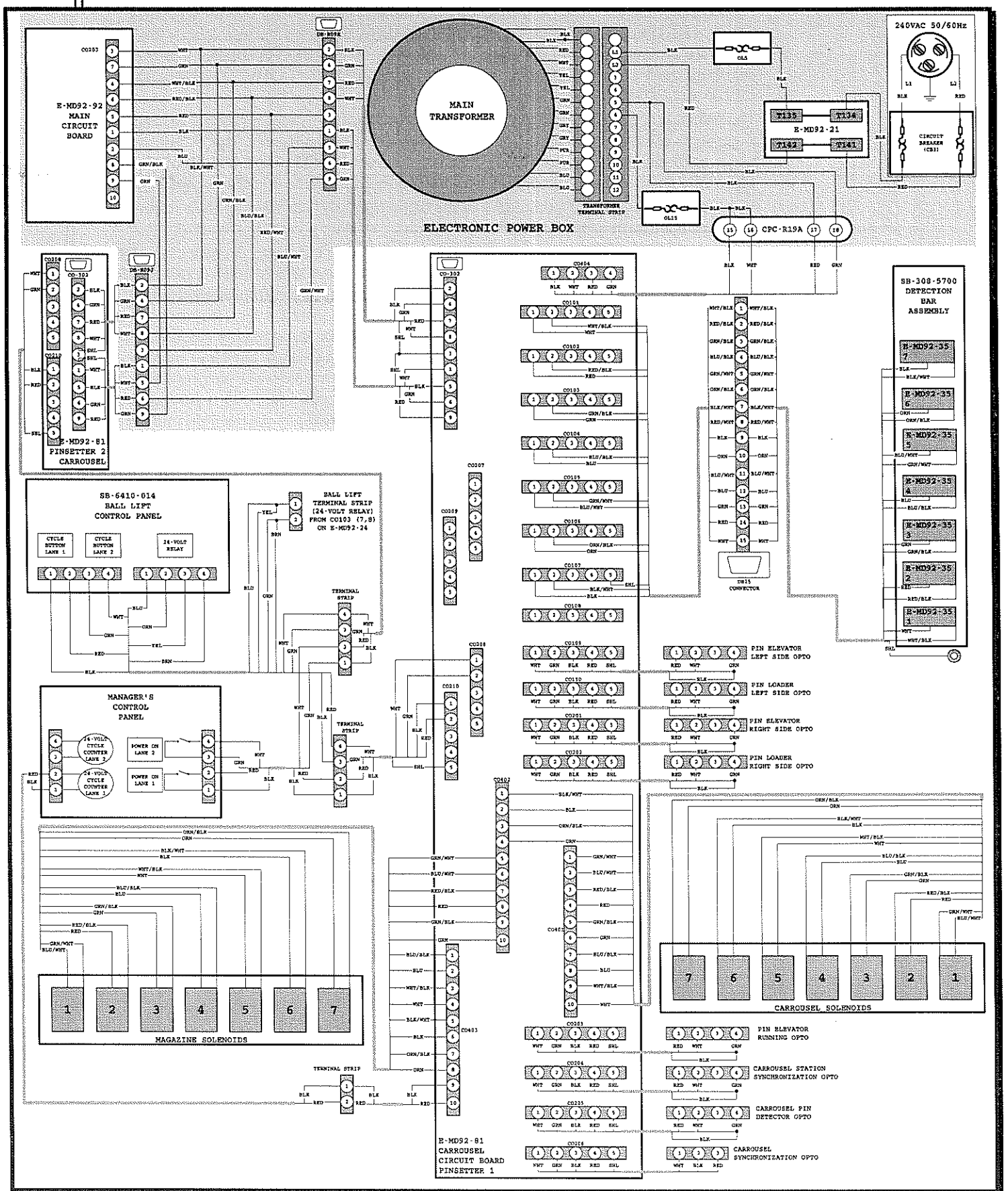
The cycle buttons located on the sides of the ball return trays are wired to their respective carrousel controllers through CO208.

Both carrousel controllers are inter-connected through two miniature D connectors (DB-R09K & DB-R09J) located on the electronic power box and also communicate with the main circuit board (E-MD92-92) through CO302. Although all carrousel controllers are physically the same, they must be correctly identified in order for the electronic power box to distribute its commands correctly. All commands for the carrousel controllers are transmitted to both carrousel controllers (pinsetter 1 & 2) through the afore mentioned connectors. The correct controller must capture its own commands and react accordingly. On each even numbered carrousel controller, an MTA connector with a jumper wire joining pins 1 and 2 is connected to CO108 in order to identify it. The odd numbered carrousel controllers have no such jumper. When, if ever, you replace a carrousel controller, make sure it is correctly identified (jumper or no jumper).

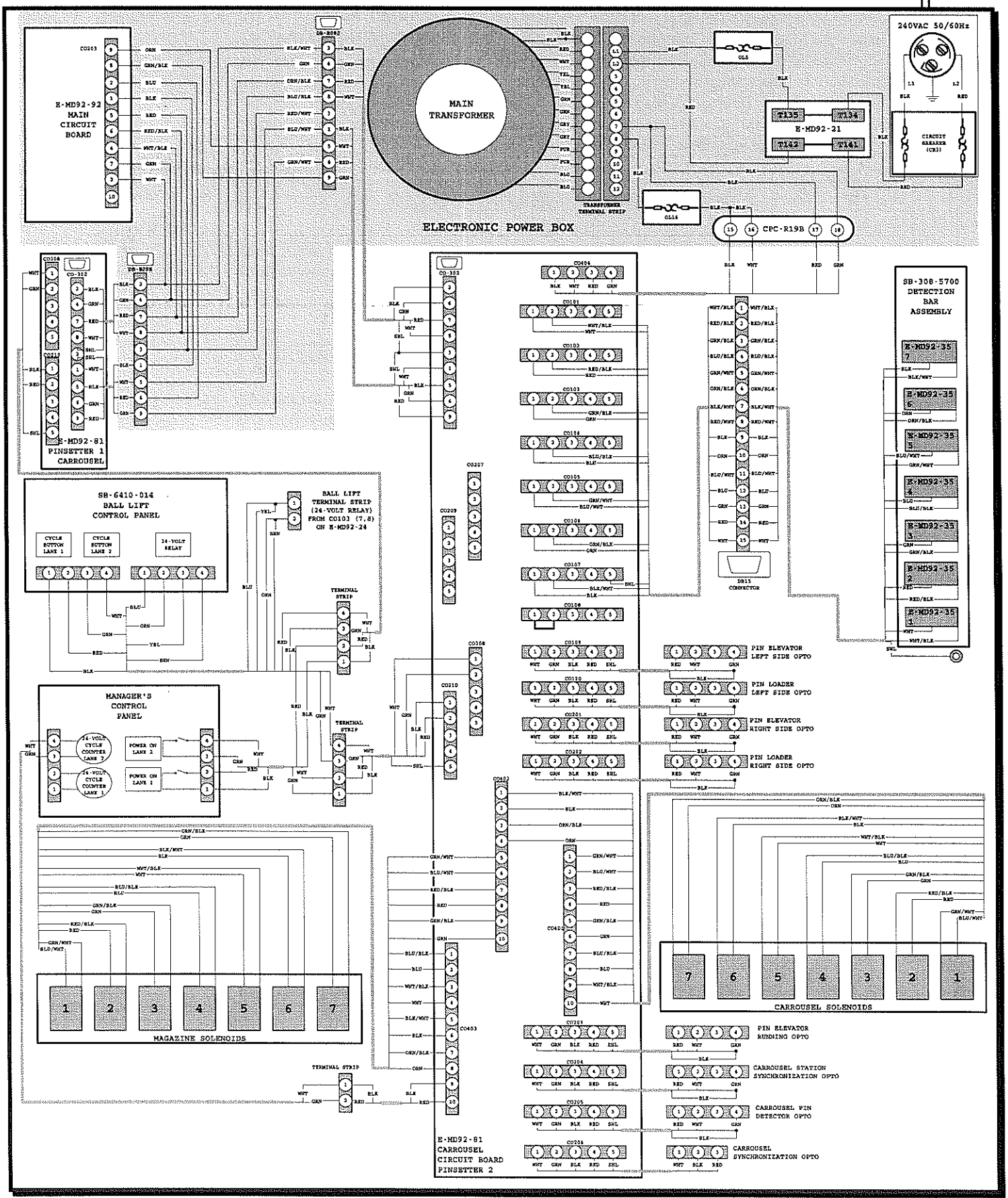
Prior to Carrousel version 1.20, each carrousel circuit board had to have its own specific EPROM, identified LANE 1 and LANE 2 in order for them to recognize their respective commands.

The wiring diagrams on the following pages represent Carrousel 1 and Carrousel 2 respectively. Refer to the 24-Volt Output Circuit Board wiring diagram for the remaining wiring of the Ball Lift Terminal Strip.

Pinsetter 1 Carrousel Controller Wiring Diagram



Pinsetter 2 Carrousel Controller Wiring Diagram



Magnet 2001 Controller

Inside the Magnet 2001 Controller are two circuit boards (E-MD92-79 and E-MD92-80) which are used to communicate with the Main Circuit Board and to display the necessary information. The wiring is simple, one DB-9 cable runs from connector DB-S09I on the Electronic Power Box to the Magnet 2001 Controller. No wiring diagrams are supplied for the Magnet 2001 Controller. If a problem arises, replace the complete module (SB-302-7200). Do not attempt to interchange circuit boards.

Manager's Control Panel

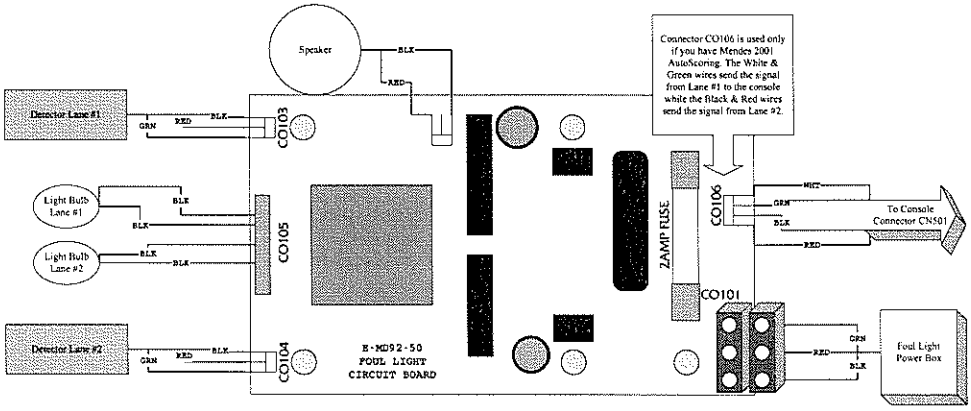
Refer to the Carrousel Controllers' Wiring Diagrams for wiring on a pair of lanes. Each box supports eight lanes, so the wiring indicated is multiplied by four in order to obtain a complete Manager's Control Panel Wiring Diagram.

Power Lifts

Due to the wide variety of power lifts on the market, no wiring diagrams for the ball return's power lift are supplied. Every power lift is activated by a 24-volt relay. The Carrousel Controllers' Wiring Diagrams indicate the wiring up to the 24-volt relay necessary to activate the power lifts, regardless of their make and model.

Foul Lights

The Mendes Foul Lights function with 12VAC which is supplied through the foul light's power box located below the ball return. The power box contains a transformer used to reduce the voltage it receives from the ball return's power box.

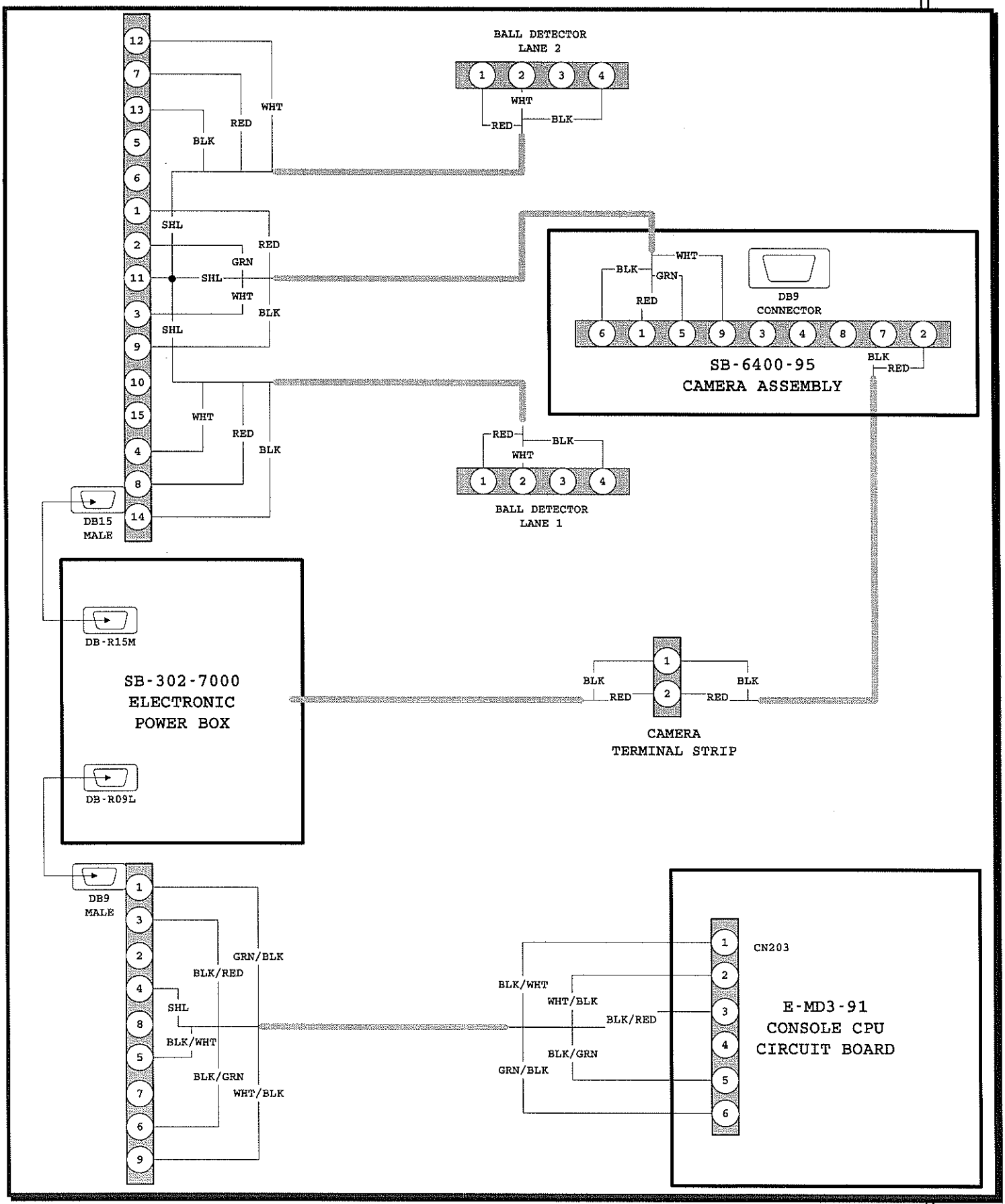


Camera

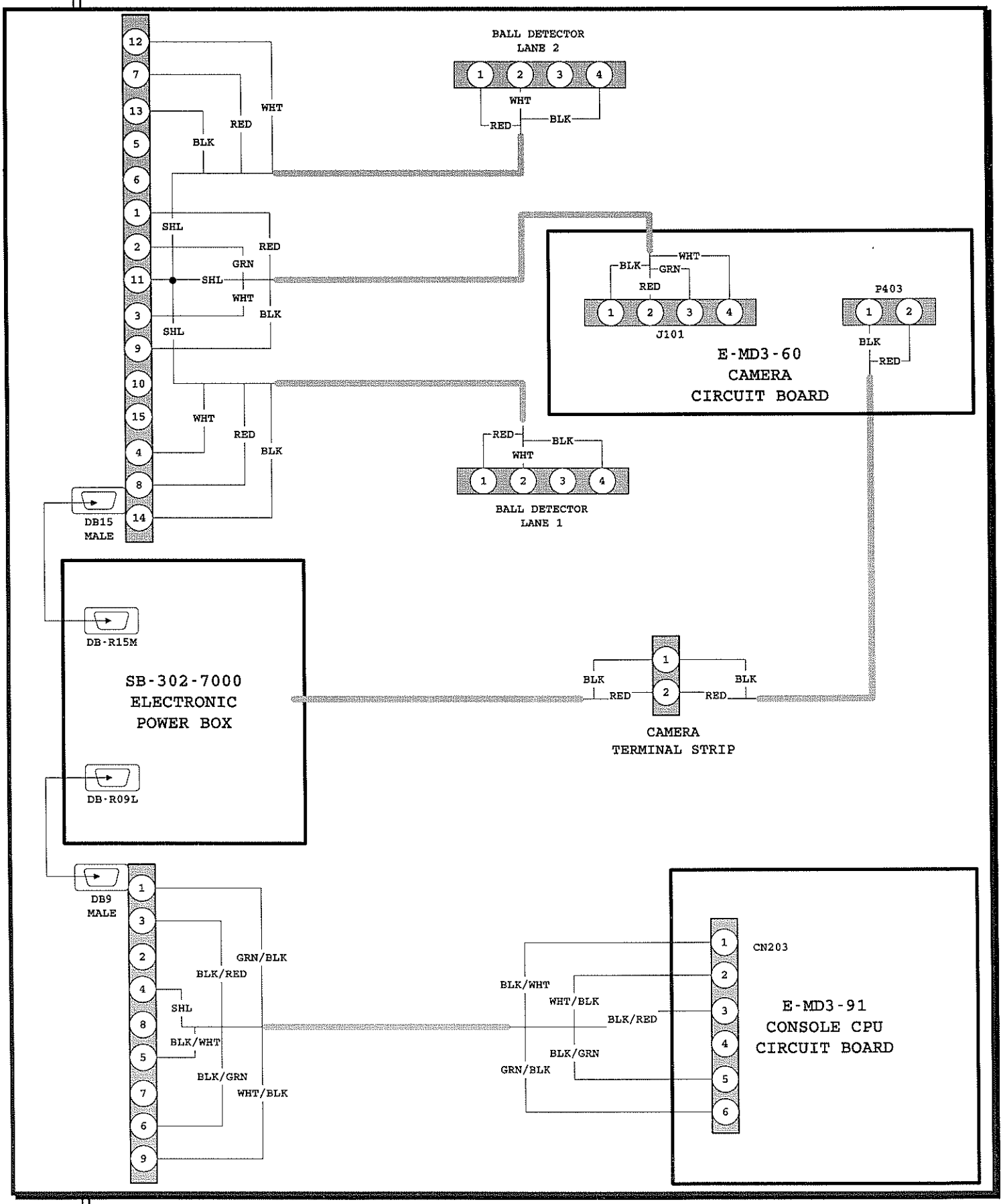
Depending on the model of camera you have (SB-6400 or SB-6400-95), the wiring will be slightly different. The Original Mendes Camera (SB-6400) uses two MTAs directly on its circuit board to connect it to the rest of the system, while the 1995 Mendes Camera (SB-6400-95) uses one DB-9 connector plugged into the assembly.

The diagrams on the following pages concentrate on the camera connections. Refer to the 24-Volt Output Circuit Board Wiring Diagram and the Main Circuit Board Wiring Diagram for the remaining wiring of the Camera Terminal Strip and the DB-9 connections on the Electronic Power Box.

Camera SB-6400-95



Camera SB-6400



Wiring Notes

Important Notes on Fluorescent Lights

Originally, all electronic power boxes were wired in exactly the same manner, regardless of the electrical phase in use. commencing with electronic power box serial number ***MPB-00084***, wiring modifications are made to all electronic power boxes destined to function on 240VAC, 50Hz.

The wiring modifications, which may be seen on page 156, concern the fluorescent lighting fixtures. This modification is due to the impossibility of purchasing replacement fluorescent tubes and fixtures on the international market.

The original power boxes may be modified by carrying out the following steps which are illustrated in the diagram on the opposite page.

Step 1. Remove the ***black*** wire located on Pinsetter 1's E-MD92-01 Terminal 102 and connect it to E-MD92-21 Terminal 153.

Step 2. Use a ***new wire*** to connect Pinsetter 1's E-MD92-01 Terminal 102 to E-MD92-21 Terminal 152.

Step 3. Remove the ***black*** wire located on Pinsetter 2's E-MD92-01 Terminal 102 and connect it to E-MD92-21 Terminal 160.

Step 4. Use a ***new wire*** to connect Pinsetter 2's E-MD92-01 Terminal 102 to E-MD92-21 Terminal 159.

Step 5. Remove the ***white*** wire from E-MD92-90 Terminal 101 and connect it to E-MD92-21 Terminal 117.

Step 6. Remove the ***black*** wire from E-MD92-90 Terminal 102 and connect it to E-MD92-21 Terminal 154.

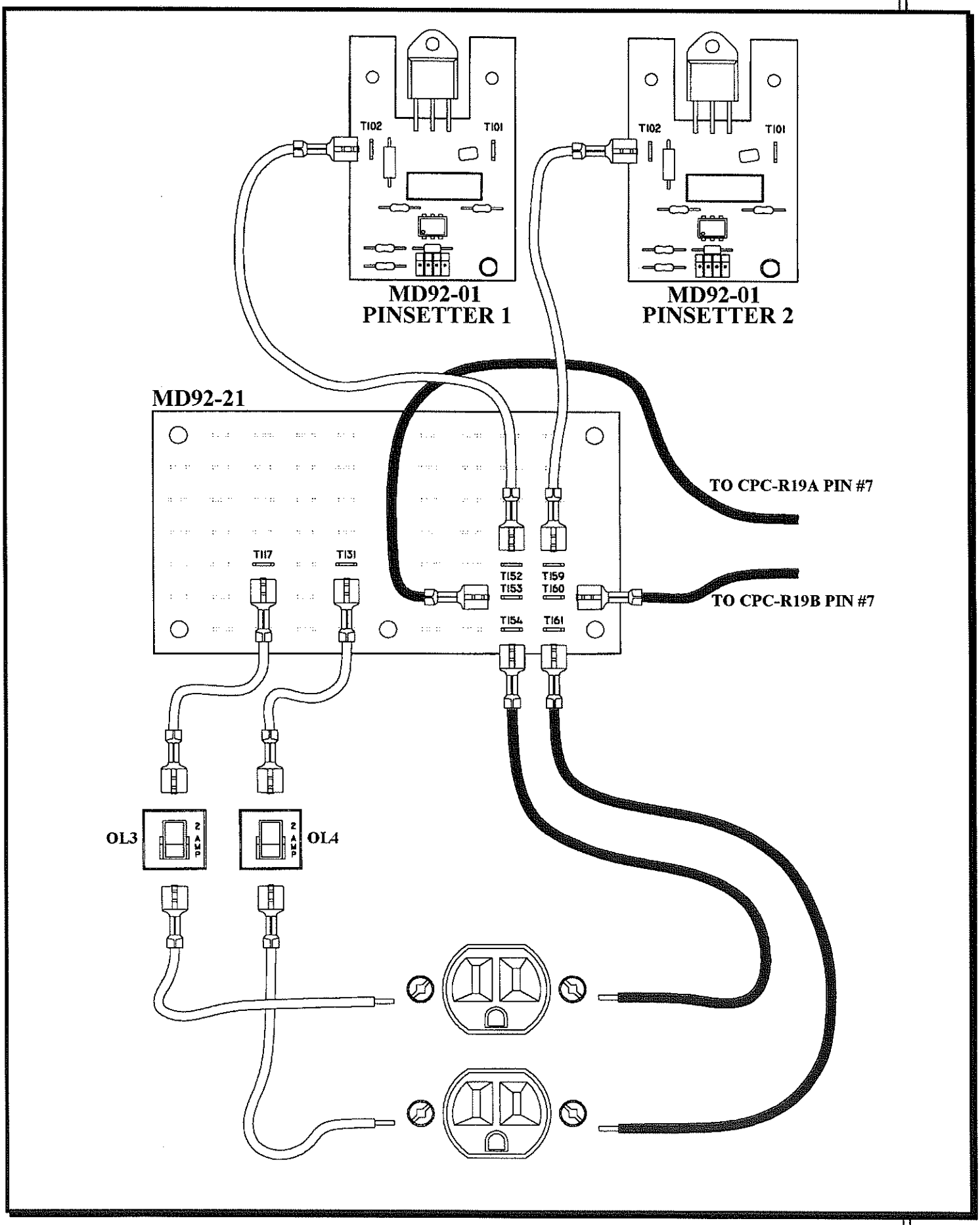
Step 7. Remove the ***white*** wire from E-MD92-90 Terminal 201 and connect it to E-MD92-21 Terminal 131.

Step 8. Remove the ***black*** wire from E-MD92-90 Terminal 202 and connect it to E-MD92-21 Terminal 161.

Step 9. Replace both 120VAC electric receptacles for 240VAC electrical receptacles.

Step 10. Compare the modified wiring in your electronic power box to the diagram on the opposite page, it should be identical.

Two 40-watt fluorescent lighting tubes must always be used regardless of your installation.


T102
T101
MD92-01
PINSETTER 1
T102
T101
MD92-01
PINSETTER 2
MD92-21
T117
T131
T152
T153
T154
T159
T160
T161
TO CPC-R19A PIN #7
TO CPC-R19B PIN #7
OL3
2 AMP
2 AMP
OL4