HOW TO USE MILNOR® ELECTRICAL SCHEMATICS

Milnor® electrical schematic manuals contain a ***table of contents/component list*, a set of s*chematic drawings, and a signal routing table.*** These documents are cross referenced and must be used together.

The ***table of contents/components list shows,*** for every component on every schematic in the manual, the *component item number*(explained in detail below), statement of function, parent schematic number, part number, description and electric box location.

The ***schematic drawings*** use symbols for each electro-mechanical component, and indicate the function of each. Integrated circuits are not shown, but the function of each microprocessor input and output is stated. Certain electrical components not pertinent to circuit logic, such as wire connectors, are not represented on the schematic but are shown in the signal routing table. **Most machines (manuals) require several schematics to describe the complete control system *including all available options.* However, this means that there are usually some schematics that do not apply to a specific machine.** Each schematic is devoted to circuits with common functions (e.g., microprocessor inputs, motor contactors). Schematics appear in the manual in alphanumeric order.

The ***signal routing table*** assists in determining wire routing. It identifies each group of conductors in a control system connected with zero resistance. Groups are identified by a two or three character wire number. Each wire belonging to such a group of conductors has that group's wire number printed along the wire insulation. Although there are some exceptions, generally each group of conductors within the entire electrical system for a machine family has its own unique wire number. The signal routing table for the manual lists each wire alphanumerically by wire number and each component/pin number to which *the wire is attached,* including those not shown on the schematics (e.g., wire connectors). Milnor® document MSTS0202BE HOW TO USE THE SIGNAL ROUTING TABLE provides more information.

Component Prefix Classifications and Descriptions

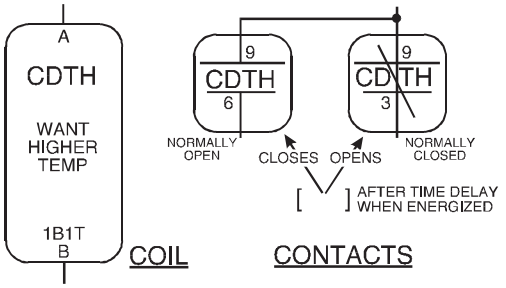
The ***component item numbers*** consist of up to six characters and appear as part of a component's symbol on the schematic. The first two characters indicate the general class of component and the remaining characters are a mnemonic for the function. For example, CD is the code for all time delay relays and SR stands for safety reset. Thus, CDSR is a time delay relay that serves as a safety reset.

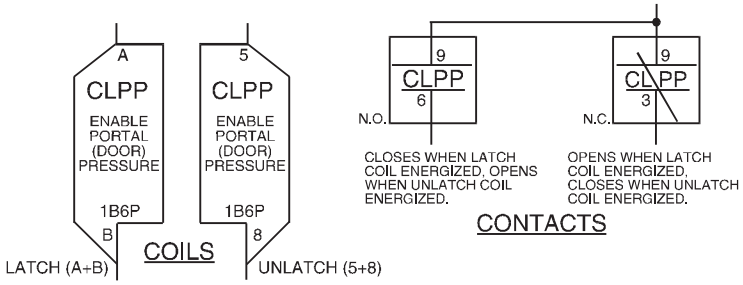
The following are descriptions of the electrical components used in Milnor® machines. Descriptions are in alphabetical order of the component class code (two character prefix).

BA=Printed Circuit Board Insulating substrate on which a thin pattern of copper conductors has been formed to connect discreet electronic components also mounted on the board.

CB=Circuit Breaker Automatic switch that opens an electric circuit in abnormal current conditions (e.g., an overload).

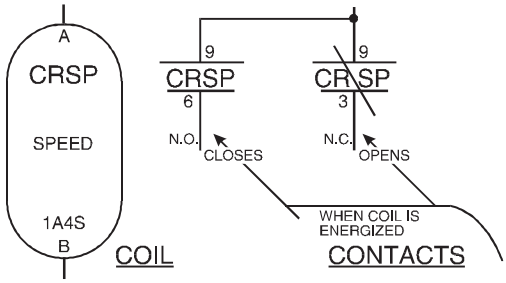
CD=Control, Time Delay Relay A relay whose contacts switch only after a fixed or adjustable delay, once voltage has been applied to its coil. The contacts switch back to normal (de-energized state) immediately when the voltage is removed.

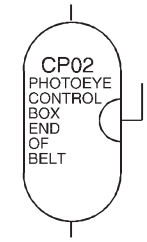




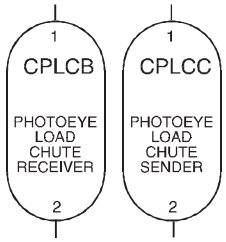
CL=Control, Latch Relay A relay which latches in an energized or set position when operated by one coil (the *latch/set coil*). The relay stays latched, even though coil voltage is removed. The relay releases or unlatches when voltage is applied to a second coil, (the *unlatch/reset coil*).

CR=Control, Relay A relay whose contacts switch immediately when voltage is applied to its coil and revert to normal when the voltage is removed.





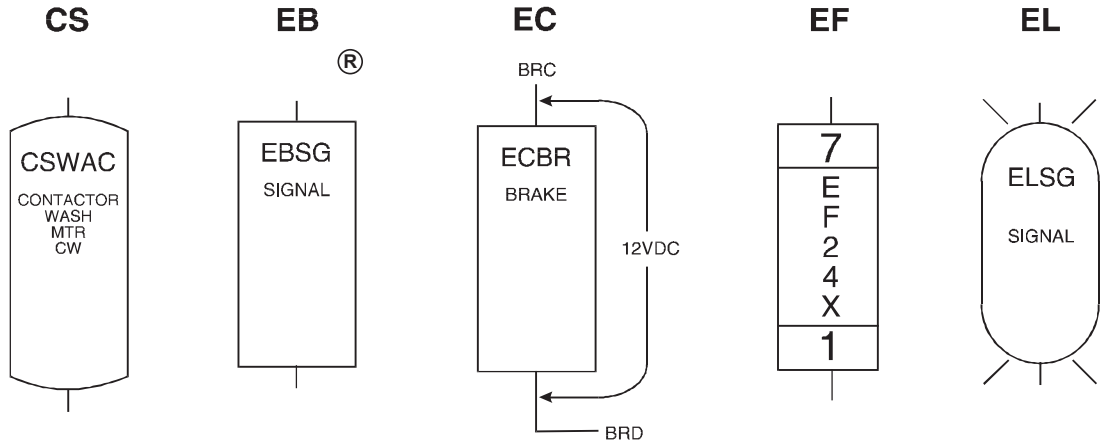
Example of One Assembly



Example of Two Separate Assemblies

CP=Control, Photo-Eyes Photo-eyes sense the presence of an object without direct physical contact. Photo-eyes consist of a *transmitter, receiver, and output module.* These components may be housed in one assembly with the transmitter bouncing light off of a reflector to the receiver, or these components can be housed in *two separate assemblies* with the transmitter pointed directly at the receiver.

The photo-eye can be set to turn on its output either when the light beam becomes blocked (dark operate) or when it becomes unblocked (light operate).



CS=Control, Contactor/Motor Starter A relay capable of handling heavier electrical loads, usually a motor.

EB=Electric Buzzer An audible signaling device.

EC=Electric Clutch A clutch consists of a coil and a rotor. The rotor has two separate rotating plates. These plates are free to rotate independent of each other until the coil is energized. Once energized the two plates turn as one.

ED=Electronic Display A visual presentation of data, such as an LCD (liquid crystal display), LED (light emitting diode) display, or VFD (vacuum florescent display).

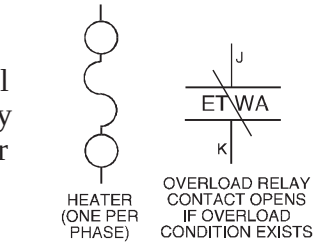
EF=Electric Fuse A fuse is an over-current safety device with a circuit opening fusible member which is heated and severed by the passage of over-current through it.

EL=Electric Light Indicator lights may be either incandescent or fluorescent.

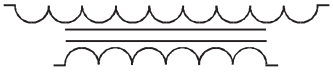
EM=Electro Magnet Solenoid A device consisting of a core surrounded by a wire coil through which an electric current is passed. While current is flowing, iron is attracted to the core (e.g., a pinch tube drain valve solenoid).

ES=Electronic Power Supply A device that converts AC (altemating current) to filtered and regulated DC (direct current). The input voltage to the power supply is usually 120 or 240 VAC . The output is +5, +12, and -12 VDC.

ET=Thermal Overload A safety device designed to protect a motor. A thermal overload consists of an overload block, heaters, and an auxiliary contact. The auxiliary contact is normally installed in a safety (three-wire) circuit that stops power to the motor contactor coil when a motor overload occurs.

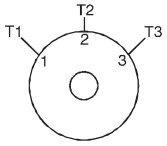


EX=Electrical Transformer A device that transfers electrical energy from one isolated circuit to another, often raising or lowering the voltage in the process.



KB=Keyboard Device similar to a typewriter for making entries to a computer.

MN=Electronic Monitor (CRT) A cathode ray tube used for visual presentation of data.



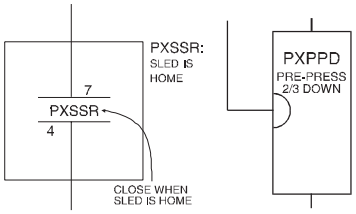
MR=Motors Electro-mechanical device that converts electrical energy into mechanical energy.

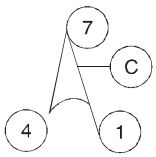
MV=Motor (Variable Speed) Inverter To vary the speed of an AC motor, the volts to frequency ratio must be kept constant. The motor will overheat if this ratio is not maintained.

The motor variable speed inverter converts three phase AC to DC. The inverter then uses this DC voltage to generate AC at the proper voltage and frequency for the commanded speed.

NOTE: Switch symbols used in the schematics and described below always depict the switch in its unactuated state.

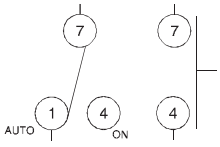
PX=Proximity Switch A device which reacts to the proximity of an target without physical contact or connection. The actuator or target causes a change in the inductance of the proximity switch which causes the switch to operate. Proximity switches can be two-wire (AC) or three-wire (DC) devices.

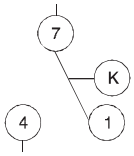




SC=Switch, Cam Operated A switch in which the electrical contacts are opened and/or closed by the mechanical action of a cam(s). Applications include 35-50 pound timer operated machines, autospot, timer reversing motor assembly, and some balancing systems.

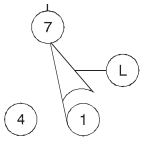
SH=Switch, Hand Operated A switch that is manually operated (e.g., *Start button, Master switch,* etc.).



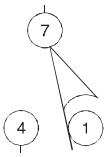


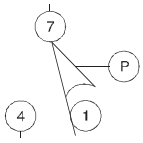
SK=Switch, Key Lock A switch that requires a key to operate . This prevents unauthorized personnel from gaining access to certain functions (e.g., the *Program Menu*).

SL=Switch, Level Operated A switch connected to a float that causes the switch to open and close as the level changes.



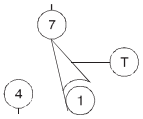
SM=Switch, Mechanically Operated A switch that is mechanically operated by a part of or the motion of the machine (e.g., door closed switch, tilt limit switches, etc.)





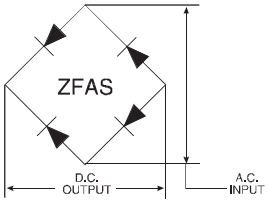
SP=Switch, Pressure Operated A switch consisting of a diaphragm that pushes against a switch actuator.

ST=Switch, Temperature Operated A switch that is actuated at a preset temperature (e.g., dryer safety probes) or has adjustable set points (e.g., Motometers or Combistats).



TB=Terminal Board A strip or block for attaching or terminating wires.

VE=Valve, Electric Operated A valve operated by an electric coil to control the flow of fluid. The fluid can be air, water or hydraulics.

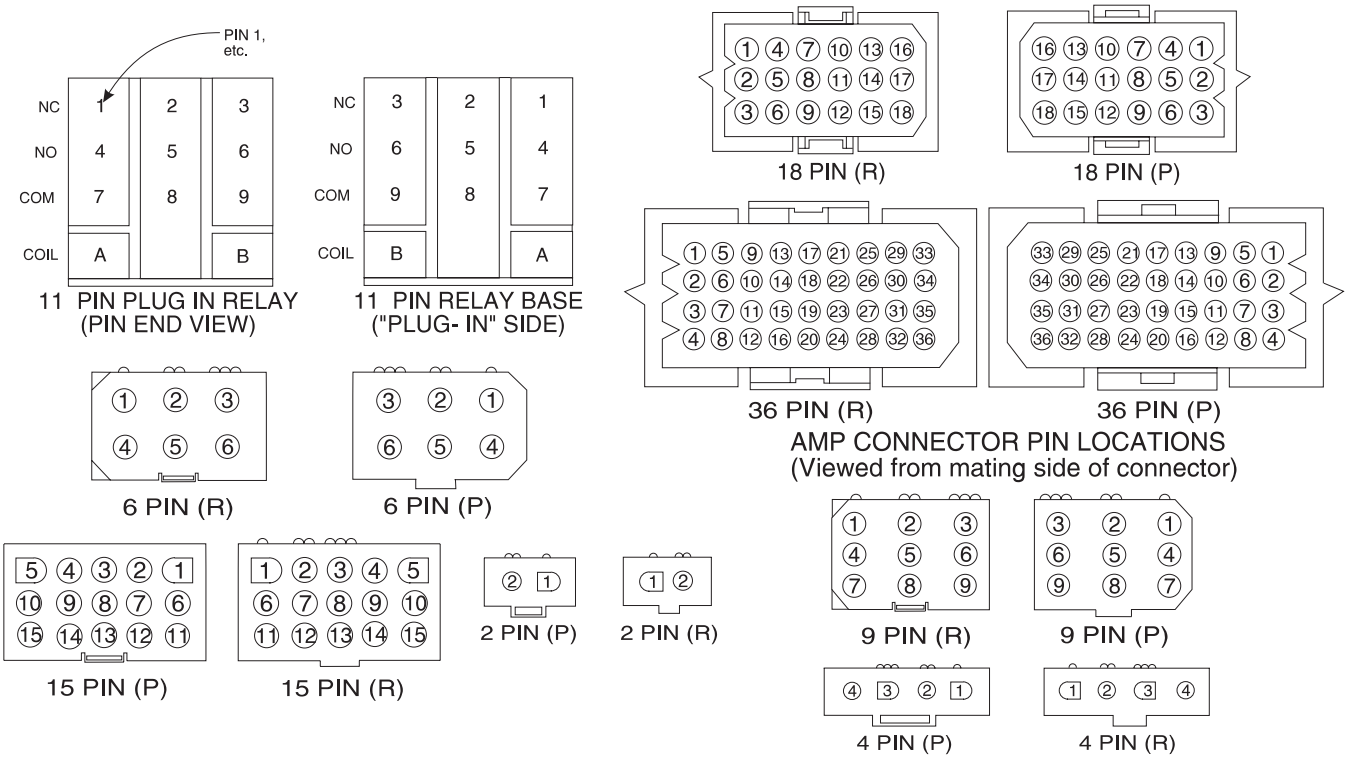


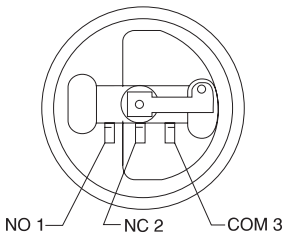
ZF=Rectifier A solid state device that converts alternating current to direct current.

WC=Wiring Connector A coupling device for joining two cables or connecting a cable to an electronic circuit or piece of equipment. Connectors are male or female, according to whether they plug into or receive the mating connector.

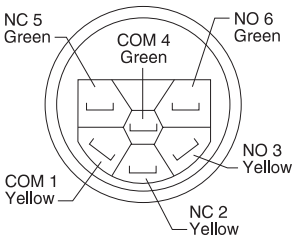
Component Terminal Numbering

NOTE: Numbers shown usually appear on the component.

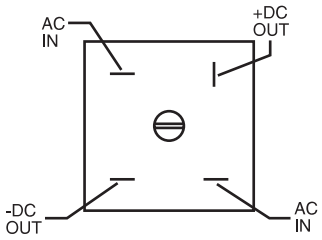




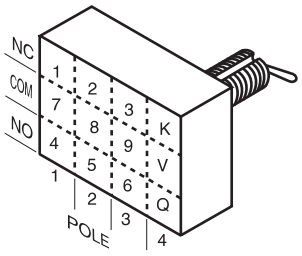
PRESSURE SWITCH



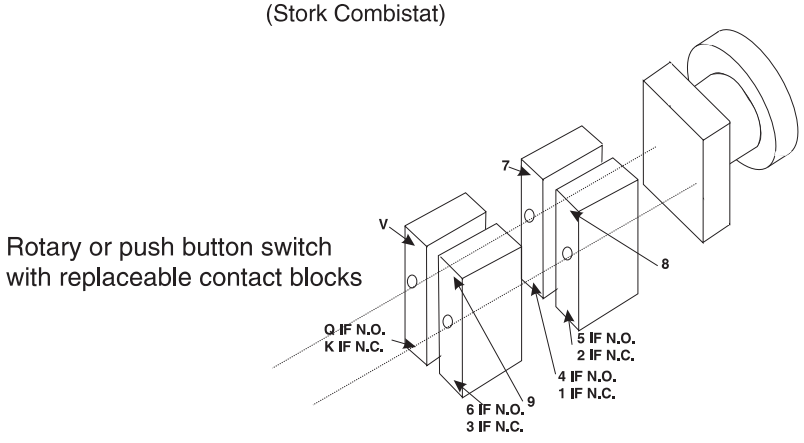
TEMPERATURE CONTROLLER (Stork Combistat)



BRIDGE RECTIFIER



TOGGLE SWITCH



Features of Milnor® Electrical Schematics

Document W6DRYGS+A shown on the next page, is part of an actual schematic for the Milnor Gas Dryer. For the purposes of this instruction, the schematic is shown gray and explanations of the items on the schematic are shown black.

The item numbers below correspond to the circled item numbers shown on the drawing.

① The first six characters of the *drawing number (W6DRYG)* indicate that this is a *wiring diagram (W)*, identify the *generation of controls (6)*, and identify the *type of machine (DRYG*=Gas Dryer). These characters appear in the drawing number of every schematic in the set.

The characters following the first six are unique to each drawing. The two characters identified as the *page number* are an abbreviation for the function performed by the depicted circuitry (S+=three-wire circuit) and establish the order in which the schematic occurs in the manual (schematics are arranged in alpha-numeric order in the manual).

Whenever circuitry changes are significant enough to warrant publishing a new schematic drawing, the new drawing number will be the same as the old except for the major revision letter (*A* in the example).

② Included in the drawing title are the class of control system, the title of this circuit, and the circuit voltage.

③ Line numbers are provided along the bottom edge of the drawing. These permit service personnel in the field and at the Milnor factory to quickly relate circuit locations when discussing troubleshooting over the phone. Page and line numbers are referenced on the drawing as explained in items five and six below.

④ General functions of the circuit or portions thereof are stated across the top edge of the drawing.

⑤ Relay contacts show the page and line number on which the relay coil may be found. This is the type of cross referencing most frequently used in troubleshooting.

⑥ Relay coils show the page and line number on which its associated contacts are located.

⑦ Relay contacts and relay coils show the physical location of the relay.

⑧ The designation *MTA* applies to electronic circuit board connections. Typically, a control system will contain several different types of circuit boards and one or more boards of each type. A numerical suffix identifies the board type and a numerical prefix identifies which one of several boards of a given type is being depicted. For example, the designation *1MTA5* identifies this as the first I/O board (8 output, 16 input board) in the control system. As shown on the drawing, a pin number follows the board number, separated by a dash. Thus, *1MTA5-9* is pin 9 on this board. The numerical designations for board types vary from one control system to another. Some of the board types commonly encountered on the Mark II washer-extractor control and their designations are as follows:

MTA1-MTA6 = 8 output, 16 input (8/16) boards.

MTA11-MTA16 = 16 output boards

MTA30-MTA40 = processor boards

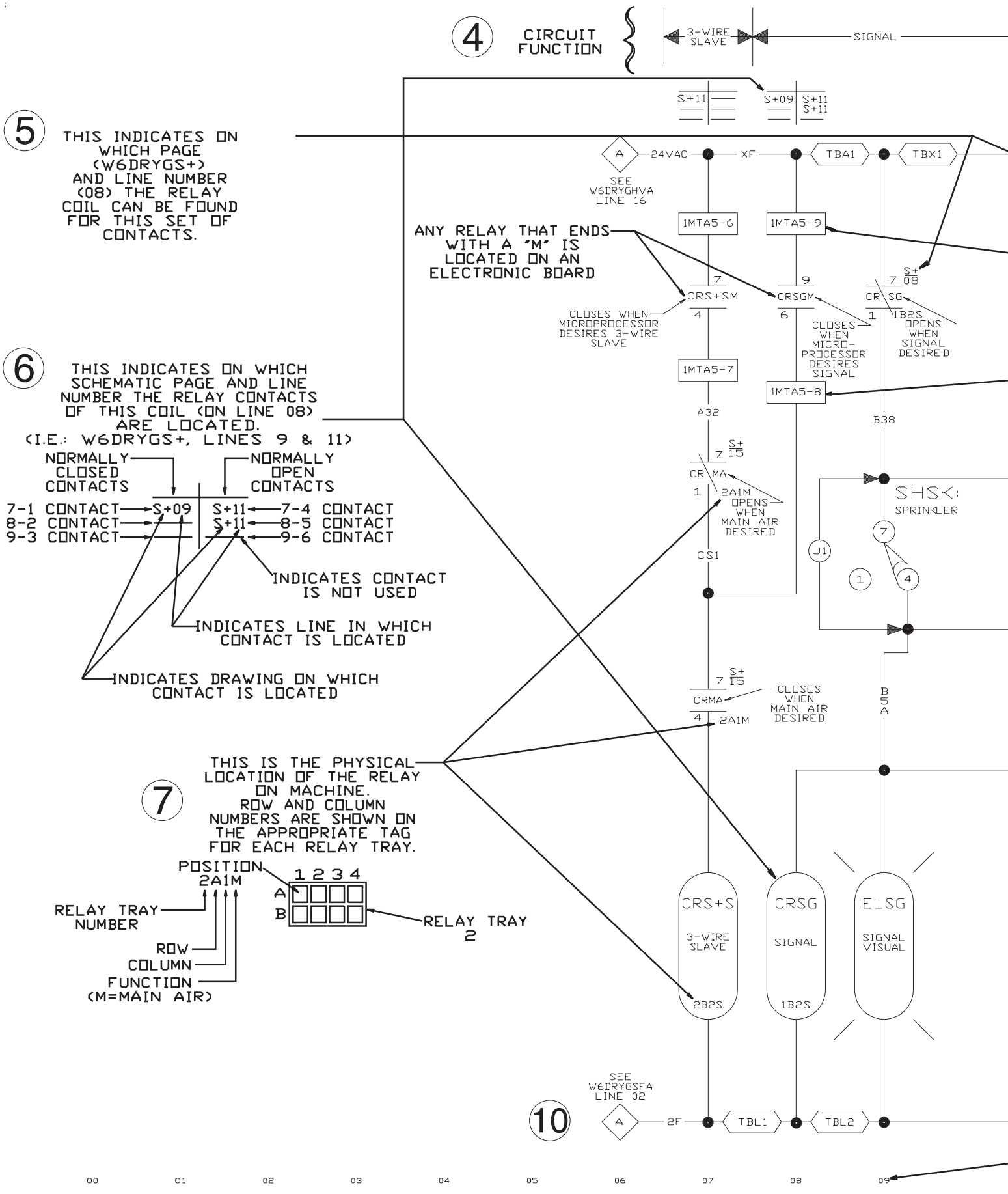
MTA41-MTA43 = digital to analog (D/A) boards

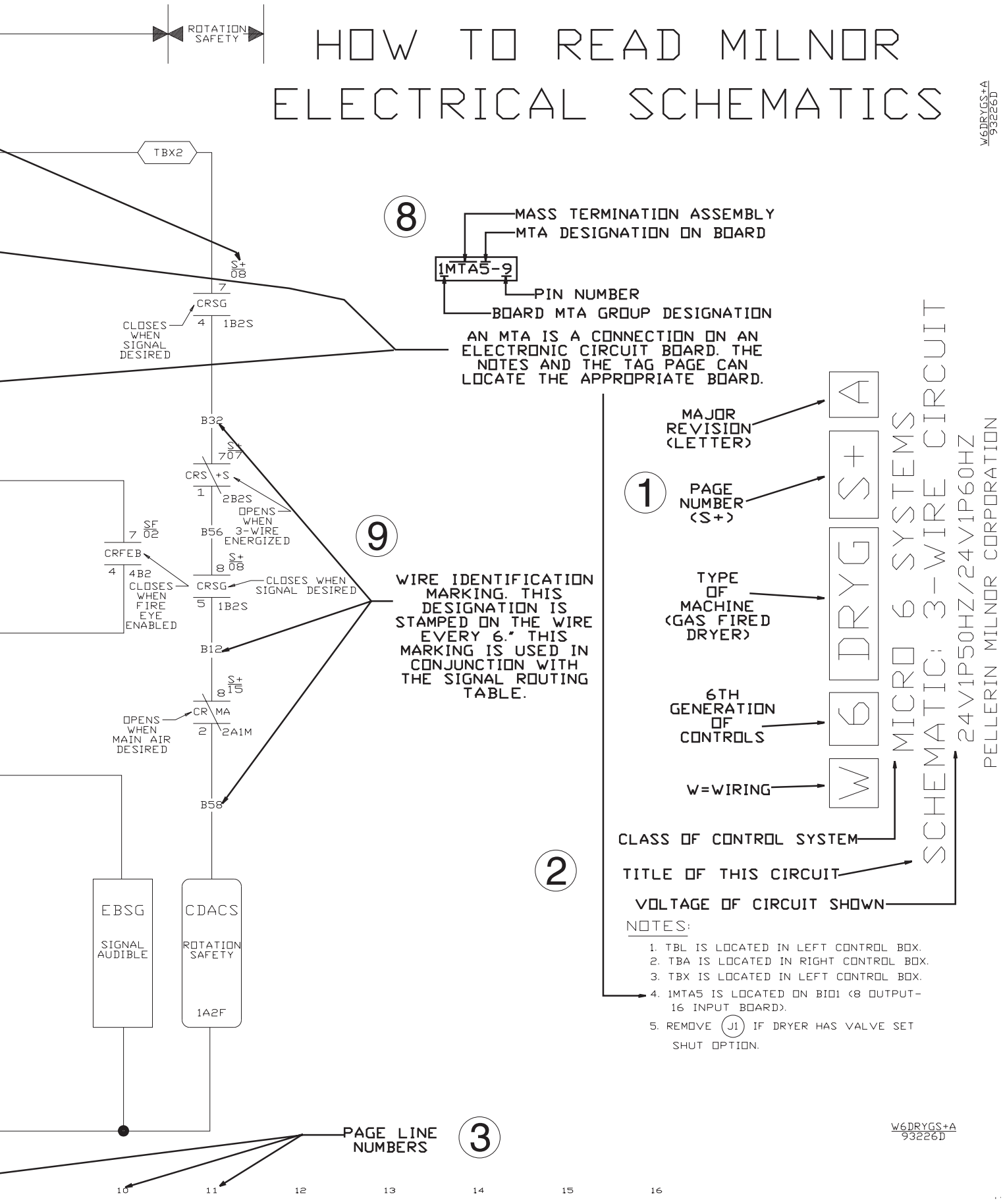
MTA51-MTA56 = analog to digital (A/D) boards

The complete listing of the boards utilized in a given control system can be found in the component list for that system.

⑨ The wire numbers, as described in the explanation of the signal routing table at the beginning of this section, are shown at appropriate locations on the schematic drawing.

⑩ Where diamond symbols appear at the end of a conductor, these are match points for continuing the schematic on another drawing. The page and line number that continues the circuit is printed adjacent to the diamond symbol. Where more than one match point appears on the referenced page, match diamonds containing corresponding letters.


4
CIRCUIT FUNCTION
3-WIRE SLAVE
SIGNAL
5
THIS INDICATES ON WHICH PAGE (W6DRYGS+) AND LINE NUMBER (08) THE RELAY COIL CAN BE FOUND FOR THIS SET OF CONTACTS.
S+11
S+09
S+11
S+11
A
24VAC
XF
TBA1
TBX1
SEE W6DRYGHVA LINE 16
1MTA5-6
1MTA5-9
ANY RELAY THAT ENDS WITH A "M" IS LOCATED ON AN ELECTRONIC BOARD
7
CRS+SM
4
CLOSES WHEN MICROPROCESSOR DESIRES 3-WIRE SLAVE
9
CRSGM
6
CLOSES WHEN MICRO-PROCESSOR DESIRES SIGNAL
7
S+08
CR SG
1
1B2S
OPENS WHEN SIGNAL DESIRED
1MTA5-7
1MTA5-8
6
THIS INDICATES ON WHICH SCHEMATIC PAGE AND LINE NUMBER THE RELAY CONTACTS OF THIS COIL (ON LINE 08) ARE LOCATED.
(I.E.: W6DRYGS+, LINES 9 & 11)
NORMALLY CLOSED CONTACTS
NORMALLY OPEN CONTACTS
7-1 CONTACT
8-2 CONTACT
9-3 CONTACT
S+09
S+11
S+11
7-4 CONTACT
8-5 CONTACT
9-6 CONTACT
INDICATES CONTACT IS NOT USED
INDICATES LINE IN WHICH CONTACT IS LOCATED
INDICATES DRAWING ON WHICH CONTACT IS LOCATED
A32
B38
7
S+15
CR MA
1
2A1M
OPENS WHEN MAIN AIR DESIRED
CS1
SHSK
SPRINKLER
J1
7
1
4
7
S+15
CRMA
4
2A1M
CLOSES WHEN MAIN AIR DESIRED
B5A
7
THIS IS THE PHYSICAL LOCATION OF THE RELAY ON MACHINE.
ROW AND COLUMN NUMBERS ARE SHOWN ON THE APPROPRIATE TAG FOR EACH RELAY TRAY.
POSITION 2A1M
1 2 3 4
A
B
RELAY TRAY NUMBER
RELAY TRAY 2
ROW
COLUMN
FUNCTION (M=MAIN AIR)
CRS+S
3-WIRE SLAVE
2B2S
CRSG
SIGNAL
1B2S
ELSG
SIGNAL VISUAL
SEE W6DRYGSFA LINE 02
10
A
2F
TBL1
TBL2
00
01
02
03
04
05
06
07
08
09


ROTATION SAFETY
HOW TO READ MILNOR ELECTRICAL SCHEMATICS
W6DRYGS+A 93226D
TBX2
8
MASS TERMINATION ASSEMBLY
MTA DESIGNATION ON BOARD
1MTA5-9
PIN NUMBER
BOARD MTA GROUP DESIGNATION
AN MTA IS A CONNECTION ON AN ELECTRONIC CIRCUIT BOARD. THE NOTES AND THE TAG PAGE CAN LOCATE THE APPROPRIATE BOARD.
S+ 08
7
CRSG
4
1B2S
CLOSES WHEN SIGNAL DESIRED
B32
S+ 07
CRS
+S
1
2B2S
OPENS WHEN 3-WIRE ENERGIZED
B56
SF 02
7
CRFEB
4
4B2
CLOSES WHEN FIRE EYE ENABLED
S+ 08
8
CRSG
5
1B2S
CLOSES WHEN SIGNAL DESIRED
9
WIRE IDENTIFICATION MARKING. THIS DESIGNATION IS STAMPED ON THE WIRE EVERY 6." THIS MARKING IS USED IN CONJUNCTION WITH THE SIGNAL ROUTING TABLE.
B12
S+ 15
8
CR
MA
2
2A1M
OPENS WHEN MAIN AIR DESIRED
B58
EBSG
SIGNAL AUDIBLE
CDACS
ROTATION SAFETY
1A2F
MAJOR REVISION (LETTER)
1
PAGE NUMBER (S+)
TYPE OF MACHINE (GAS FIRED DRYER)
6TH GENERATION OF CONTROLS
W=WIRING
W 6 DRYG S+ A
CLASS OF CONTROL SYSTEM
2
TITLE OF THIS CIRCUIT
VOLTAGE OF CIRCUIT SHOWN
MICRO 6 SYSTEMS SCHEMATIC: 3-WIRE CIRCUIT
24V1P50HZ/24V1P60HZ
PELLERIN MILNOR CORPORATION
NOTES:
1. TBL IS LOCATED IN LEFT CONTROL BOX.
2. TBA IS LOCATED IN RIGHT CONTROL BOX.
3. TBX IS LOCATED IN LEFT CONTROL BOX.
4. 1MTA5 IS LOCATED ON BIO1 (8 OUTPUT-16 INPUT BOARD).
5. REMOVE (J1) IF DRYER HAS VALVE SET SHUT OPTION.
PAGE LINE NUMBERS
3
W6DRYGS+A 93226D
10
11
12
13
14
15
16