316, 318 AND 420 ELECTRICAL SCHEMATIC—SINGLE PTO

A1—TDC Module
A2—Ignition Module
(S.N. 420001—)
B1—Engine Oil Pressure Switch
C1—Condenser
(S.N. 420001—)
E1—Spark Plug
E2—Spark Plug
E3—Ignition (Breaker) Points
(S.N. —420000)
E4—Left Headlight
E5—Middle Headlight
E6—Right Headlight
E7—Left Tail Light
E8—Right Tail Light
F1—20-Amp Fuse
F2—2-Amp Fuse:
316 (S.N. —475000)
318 (S.N. —475000)
420 (S.N. —595880)
3-Amp Fuse:
316 (S.N. 475001—)
318 (S.N. 475001—)
420 (S.N. 595881—)
F3—25-Amp Circuit Breaker
G1—Battery
G2—Stator Alternator
K1—Starter Solenoid:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
M1—Starter Motor:
316 (S.N. 362984—)
318 (S.N. 364138—)
420 (S.N. 360010—)
M2—Starter Motor:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
N1—Voltage Regulator/Rectifier
P1—Front PTO Indicator
P3—Hour Meter
P4—Battery Discharge Indicator
P5—Engine Oil Pressure Indicator
S1—Key Switch
S2—Front PTO Switch
S4—Brake Switch:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
S5—Transmission Neutral Switch
S6—Seat Switch
S7—Headlight Switch
T1—Ignition Coil
W1—Engine Ground
(S.N. 475001—)
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X4—Front PTO Switch 3-Pin Connector
X5—Rear PTO Harness 3-Pin Connector
X6—Rear PTO Switch 2-Pin Connector
X7—Rear PTO Switch 3-Pin Connector
X8—Brake Switch 2-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
X9—Transmission Neutral Switch 1-Pin Connector
X10—Transmission Neutral Switch 1-Pin Connector
X11—Seat Switch 2-Pin Connector
X12—Engine Harness 3-Pin Connector
X13—Voltage Regulator/Rectifier 1-Pin Connector (VDC Output)
X14—Voltage Regulator/Rectifier 1-Pin Connector (Stator)
X15—Voltage Regulator/Rectifier 1-Pin Connector (Stator)
X16—Headlight Switch 2-Pin Connector
X17—Headlight Harness Connector
1-Pin (S.N. —475000)
2-Pin (S.N. 475001—)
X18—Tail Light Harness Connector
1-Pin (S.N. —475000)
2-Pin (S.N. 475001—)
X19—Engine Oil Pressure Switch 1-Pin Connector
X20—Hour Meter 1-Pin Connector
X21—Hour Meter 1-Pin Connector (Ground)
X22—TDC Module 2-Pin Connector
X23—TDC Module 8-Pin Connector
X24—Rear PTO Clutch 1-Pin Connector (Ground)
X25—Rear PTO Lamp 1-Pin Connector (Ground)
X26—Front PTO Clutch 2-Pin Connector
X27—Single Point Ground 1-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
Y1—Front PTO Clutch

Legend For Electrical Schematic

NOTE:

Wire colors are the same for all machines. Wire numbers indicated on schematic are for machines (S.N. 475001—).

1. For 316 (S.N. —596120), 318 (S.N. —600304) and 420 (S.N. —595880) machines, brake switch (S4) is not used. Purple wire "710" connects transmission neutral switch directly to terminal "S2" of key switch.

2. For machines (S.N. —475000), a light green wire is used instead of the red "210" wire used on later machines. The green wire connects to terminal "B" of key switch (S1), not to circuit breaker (F3) as does the red "210" wire.

NOTE:

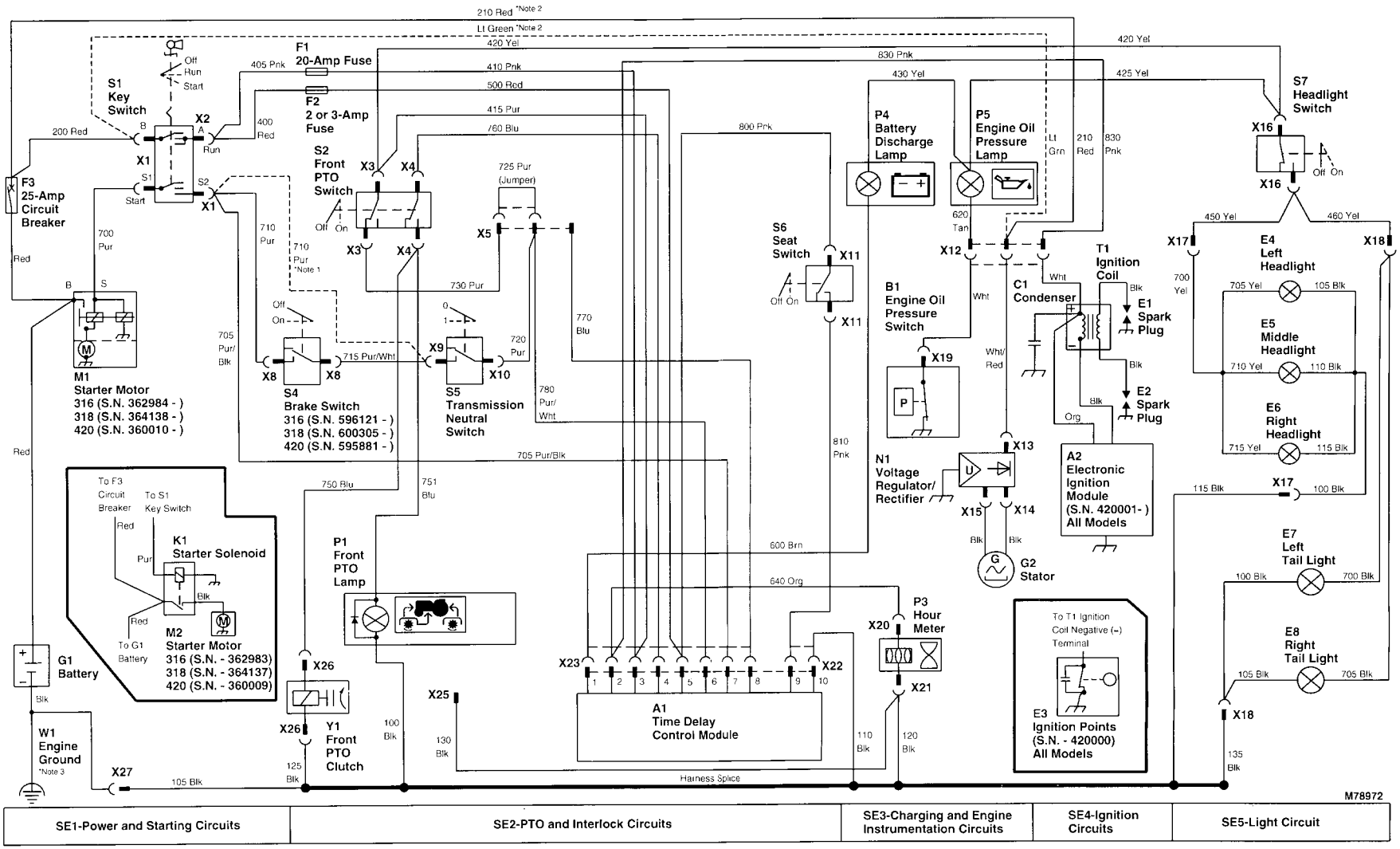
3. The electrical schematic shows ground circuits for machines (S.N. 475001—). For these machines, all component grounds terminate (spliced) inside the main harness with one wire connecting to a single ground point at the engine.

For machines (S.N. —475000), the (blk) ground wires for the PTO lamps, hour meter, and TDC module (2-pin connector) terminate at the right pedestal panel. Exterior components, such as the PTO clutches and head and tail lights use the tractor frame for ground.

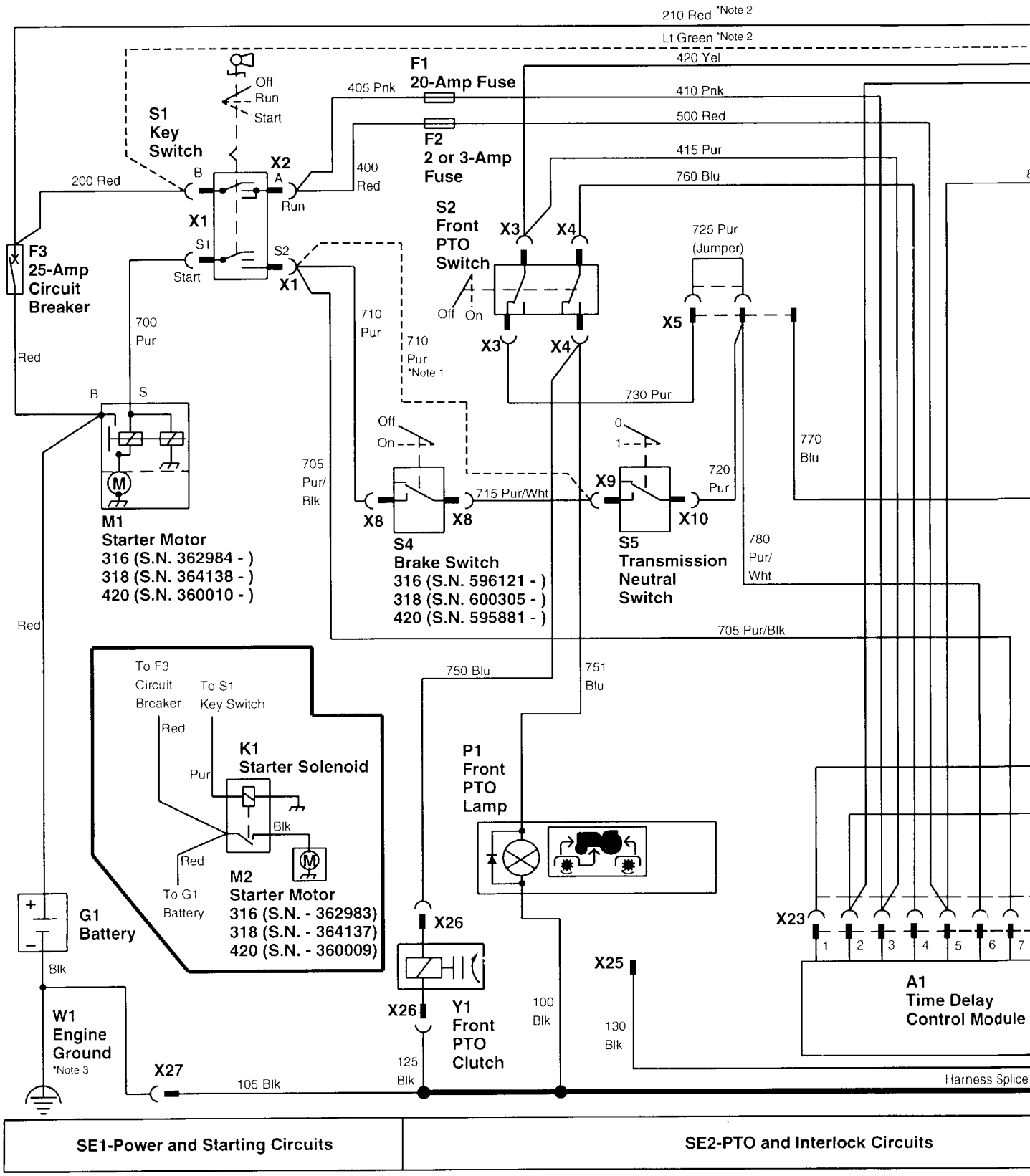
240
10
2

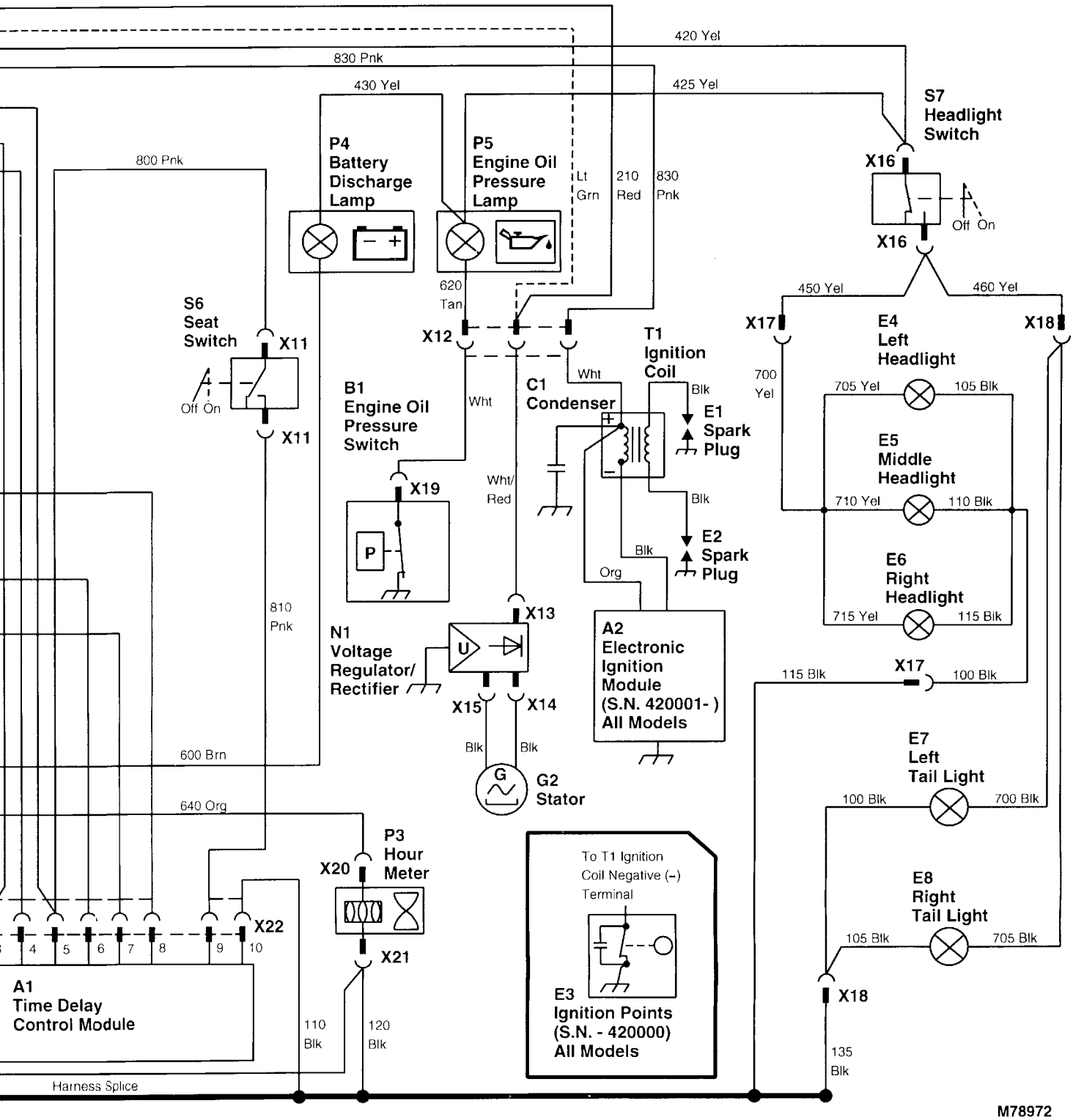
MX,159024015,1 -19-16MAY95

316, 318, AND 420 ELECTRICAL SCHEMATIC — SINGLE PTO



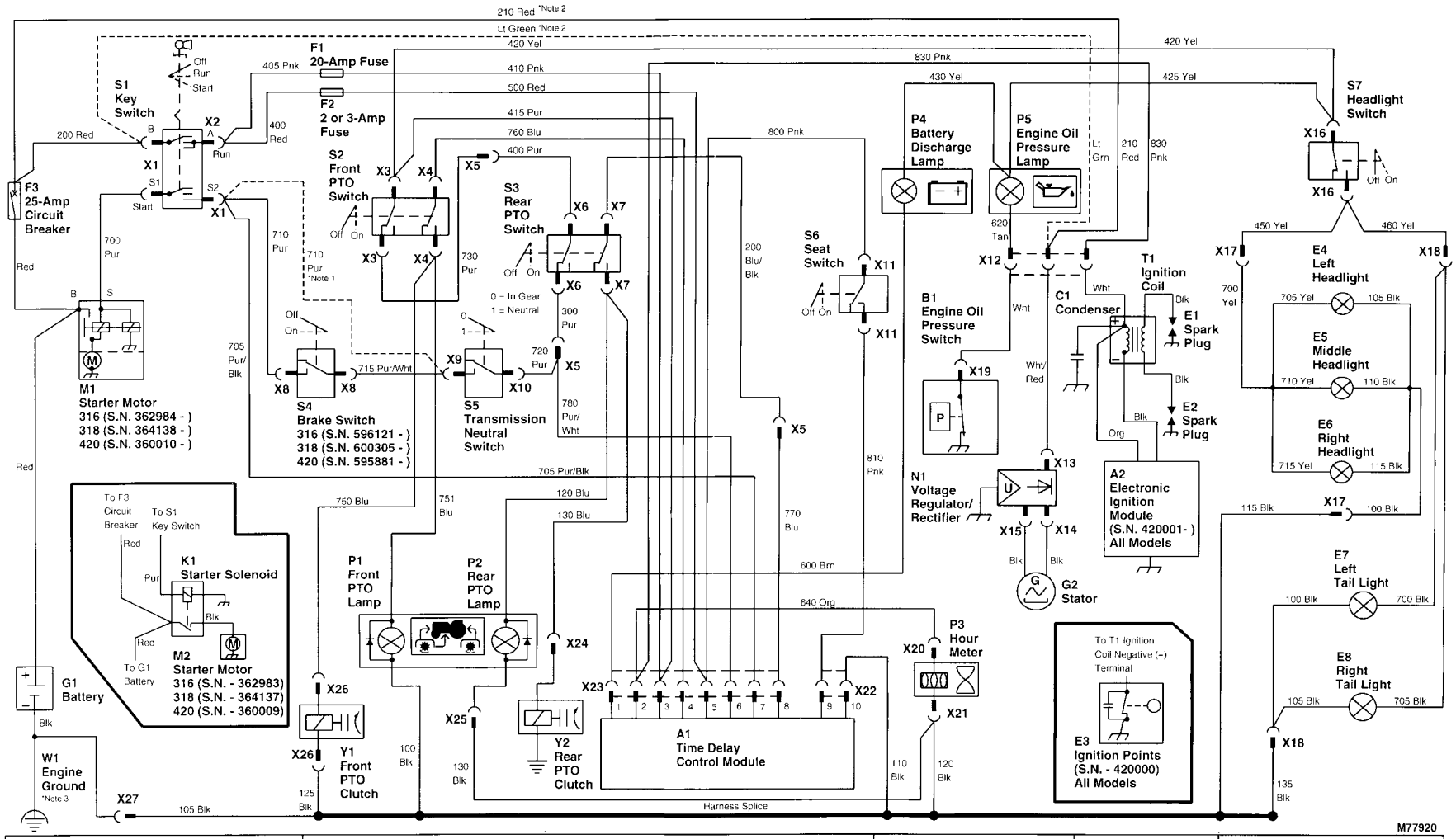
316, 318, AND 420 ELECTRICAL SCHEMATIC — SINGLE PTO



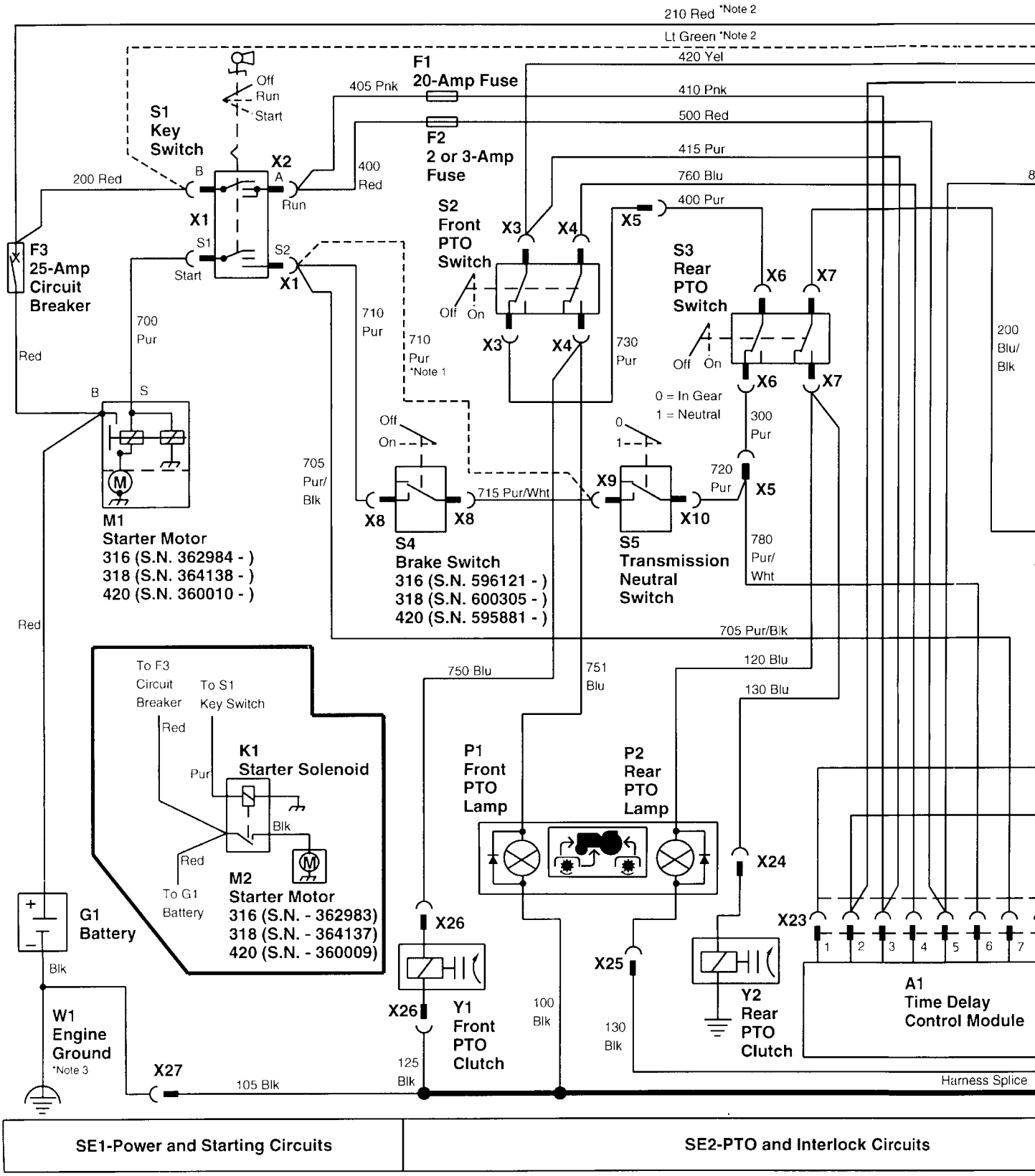

420 Yel
830 Pnk
430 Yel
425 Yel
S7
Headlight
Switch
X16
Off On
X16
P4
Battery
Discharge
Lamp
P5
Engine Oil
Pressure
Lamp
Lt
Grn
210
Red
830
Pnk
800 Pnk
620
Tan
450 Yel
460 Yel
X17
X18
E4
Left
Headlight
700
Yel
705 Yel
105 Blk
E5
Middle
Headlight
710 Yel
110 Blk
E6
Right
Headlight
715 Yel
115 Blk
S6
Seat
Switch
X11
Off On
X11
X12
T1
Ignition
Coil
Wht
Blk
B1
Engine Oil
Pressure
Switch
Wht
C1
Condenser
E1
Spark
Plug
X19
Wht/
Red
Blk
E2
Spark
Plug
Blk
Org
P
810
Pnk
X13
N1
Voltage
Regulator/
Rectifier
U
A2
Electronic
Ignition
Module
(S.N. 420001-)
All Models
115 Blk
X17
100 Blk
X15
X14
Blk
Blk
G
G2
Stator
600 Brn
E7
Left
Tail Light
100 Blk
700 Blk
640 Org
P3
Hour
Meter
X20
To T1 Ignition
Coil Negative (-)
Terminal
E8
Right
Tail Light
105 Blk
705 Blk
X22
3
4
5
6
7
8
9
10
X21
X18
A1
Time Delay
Control Module
110
Blk
120
Blk
E3
Ignition Points
(S.N. - 420000)
All Models
135
Blk
Harness Splice

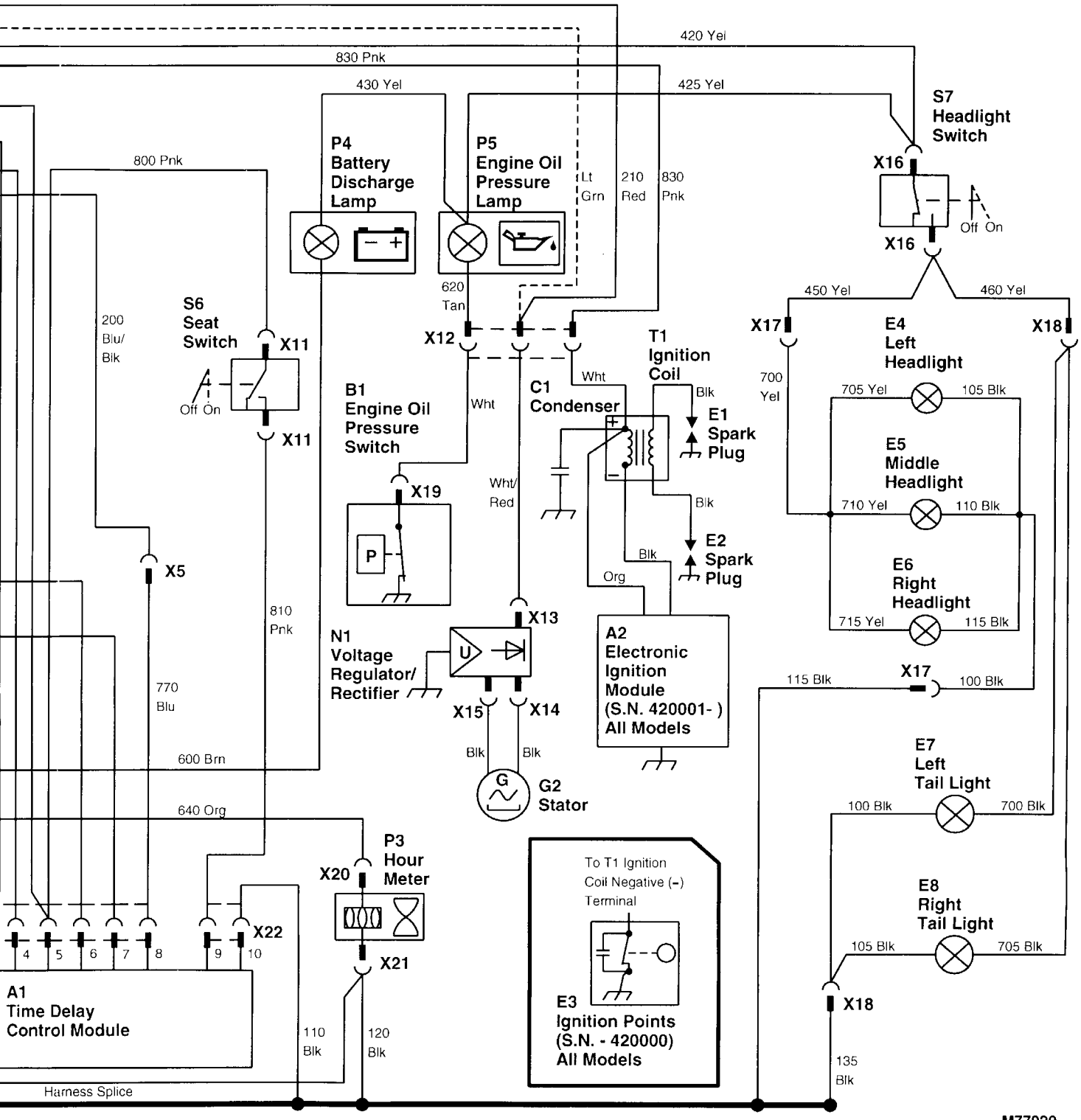
M78972

316, 318, AND 420 ELECTRICAL SCHEMATIC — DUAL PTO



316, 318, AND 420 ELECTRICAL SCHEMATIC — DUAL PTO





cuits	SE3-Charging and Engine Instrumentation Circuits	SE4-Ignition Circuits	SE5-Light Circuit

316, 318 AND 420 ELECTRICAL SCHEMATIC—DUAL PTO

A1—TDC Module
A2—Ignition Module
(S.N. 420001—)
B1—Engine Oil Pressure Switch
C1—Condenser
(S.N. 420001—)
E1—Spark Plug
E2—Spark Plug
E3—Ignition (Breaker) Points
(S.N. —420000)
E4—Left Headlight
E5—Middle Headlight
E6—Right Headlight
E7—Left Tail Light
E8—Right Tail Light
F1—20-Amp Fuse
F2—2-Amp Fuse:
316 (S.N. —475000)
318 (S.N. —475000)
420 (S.N. —595880)
3-Amp Fuse:
316 (S.N. 475001—)
318 (S.N. 475001—)
420 (S.N. 595881—)
F3—25-Amp Circuit Breaker
G1—Battery
G2—Stator Alternator
K1—Starter Solenoid:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
M1—Starter Motor:
316 (S.N. 362984—)
318 (S.N. 364138—)
420 (S.N. 360010—)
M2—Starter Motor:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
N1—Voltage Regulator/Rectifier
P1—Front PTO Indicator
P2—Rear PTO Indicator (Optional)
P3—Hour Meter
P4—Battery Discharge Indicator
P5—Engine Oil Pressure Indicator
S1—Key Switch
S2—Front PTO Switch
S3—Rear PTO Switch (Optional)
S4—Brake Switch:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
S5—Transmission Neutral Switch
S6—Seat Switch
S7—Headlight Switch
T1—Ignition Coil
W1—Engine Ground
(S.N. 475001—)
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X4—Front PTO Switch 3-Pin Connector
X5—Rear PTO Harness 3-Pin Connector
X6—Rear PTO Switch 2-Pin Connector
X7—Rear PTO Switch 3-Pin Connector
X8—Brake Switch 2-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
X9—Transmission Neutral Switch 1-Pin Connector
X10—Transmission Neutral Switch 1-Pin Connector
X11—Seat Switch 2-Pin Connector
X12—Engine Harness 3-Pin Connector
X13—Voltage Regulator/Rectifier 1-Pin Connector (VDC Output)
X14—Voltage Regulator/Rectifier 1-Pin Connector (Stator)
X15—Voltage Regulator/Rectifier 1-Pin Connector (Stator)
X16—Headlight Switch 2-Pin Connector
X17—Headlight Harness Connector
1-Pin (S.N. —475000)
2-Pin (S.N. 475001—)
X18—Tail Light Harness Connector
1-Pin (S.N. —475000)
2-Pin (S.N. 475001—)
X19—Engine Oil Pressure Switch 1-Pin Connector
X20—Hour Meter 1-Pin Connector
X21—Hour Meter 1-Pin Connector (Ground)
X22—TDC Module 2-Pin Connector
X23—TDC Module 8-Pin Connector
X24—Rear PTO Clutch 1-Pin Connector (Ground)
X25—Rear PTO Lamp 1-Pin Connector (Ground)
X26—Front PTO Clutch 2-Pin Connector
X27—Single Point Ground 1-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
Y1—Front PTO Clutch
Y2—Rear PTO Clutch (Optional)

Legend For Electrical Schematic

NOTE:

Wire colors are the same for all machines. Wire numbers indicated on schematic are for machines (S.N. 475001—).

1. For 316 (S.N. —596120), 318 (S.N. —600304) and 420 (S.N. —595880) machines, brake switch (S4) is not used. Purple wire "710" connects transmission neutral switch directly to terminal "S2" of key switch.

2. For machines (S.N. —475000), a light green wire is used instead of the red "210" wire used on later machines. The green wire connects to terminal "B" of key switch (S1), not to circuit breaker (F3) as does the red "210" wire.

NOTE:

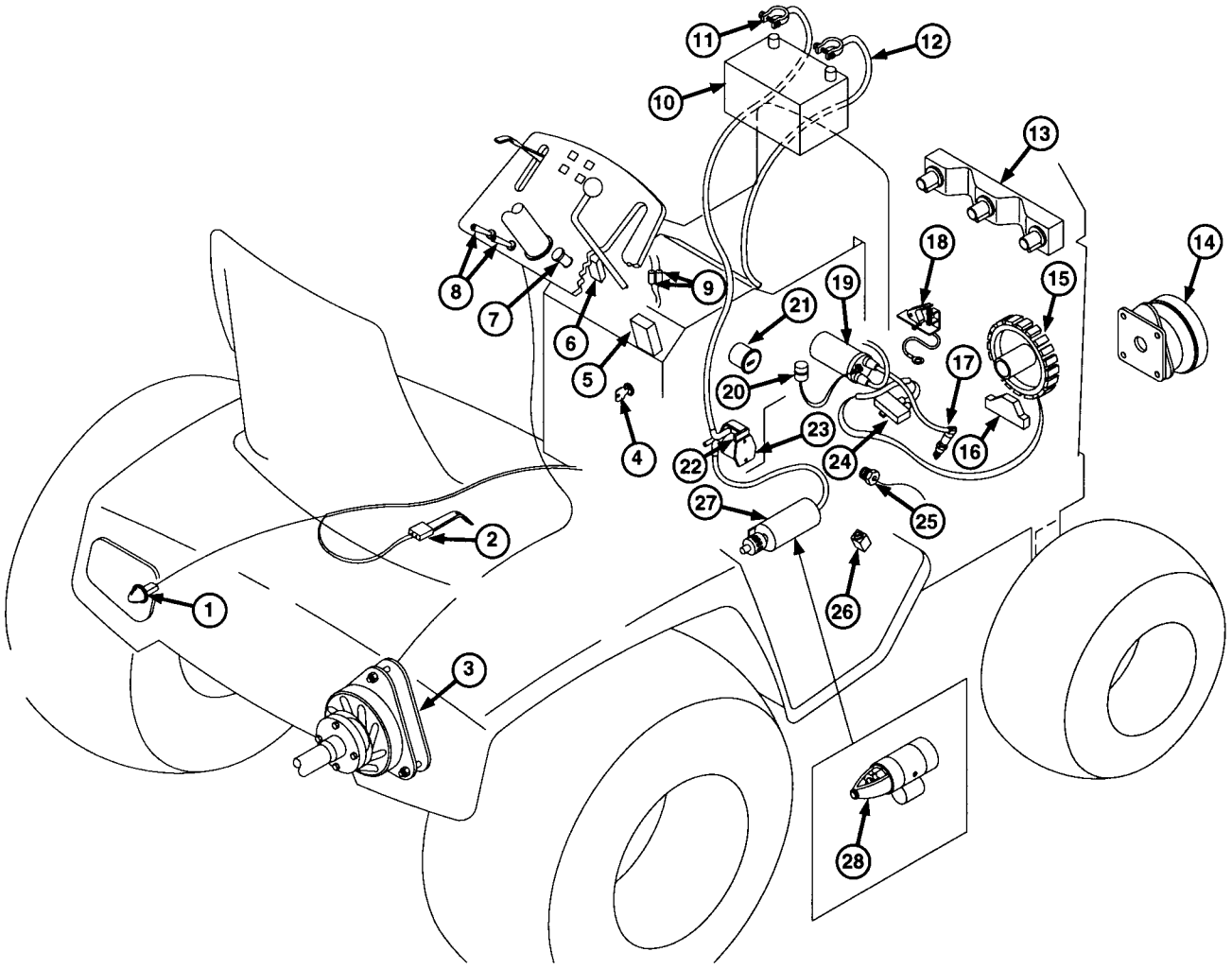
3. The electrical schematic shows ground circuits for machines (S.N. 475001—). For these machines, all component grounds terminate (spliced) inside the main harness with one wire connecting to a single ground point at the engine.

For machines (S.N. —475000), the (blk) ground wires for the PTO lamps, hour meter, and TDC module (2-pin connector) terminate at the right pedestal panel. Exterior components, such as the PTO clutches and head and tail lights use the tractor frame for ground.

240
10
5

MX,159024015,4 -19-16MAY95

ELECTRICAL COMPONENT LOCATION



1—Tail Light (2 used)
2—Seat Switch
3—Rear Electric PTO Clutch (Optional)
4—Key Switch
5—TDC Module
6—Transmission Neutral Start Switch
7—Light Switch
8—PTO Switches
9—2-Amp and 20-Amp Fuse: (See Note)
316 (S.N. —475000)
318 (S.N. —475000)
420 (S.N. —595880)
10—Battery
11—Positive (+) Battery Cable
12—Negative (—) Battery Cable
13—Headlights
14—Front Electric PTO Clutch
15—Stator Alternator
16—Igntion Module (S.N. 420001—)
17—Spark Plug (2 used)
18—Ignition (Breaker) Points (S.N. —420000)
19—Ignition Coil
20—Condenser
21—Hour Meter
22—Circuit Breaker
23—Starter Solenoid:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
24—Regulator/Rectifier
25—Engine Oil Pressure Switch
26—Brake Switch:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
27—Starter Motor:
316 (S.N. —362983)
318 (S.N. —364137)
420 (S.N. —360009)
28—Starter Motor:
316 (S.N. 362984—)
318 (S.N. 364138—)
420 (S.N. 360010—)

NOTE: For machines 316, 318 (S.N. 475001—) and 420 (S.N. 595881—), 3-amp and 20-amp blade type fuses replace the 2-amp and 20-amp tubular type fuses shown. The blade type fuses are located in the same area as early version.

240
15
1

MX,159024010,1 -19-16MAY95

STARTING CIRCUIT OPERATION

The function of the starting circuit is to crank the engine by energizing starter motor (M1). PTO switches (S2 and S3), transmission neutral switch (S5), and brake switch (S4) are used as interlock safety switches within the starter circuit. For the starter motor to energize, the following conditions must be met:

- Front and rear PTO switches in OFF position.
- Hydrostatic Control Lever in N/STOP position.
- Brake pedal depressed.
- Key Switch in "START" position.

NOTE: Depressing the brake pedal required only on later models:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)

For all other machines, depressing the brake pedal is not necessary for starter operation.

PTO switches (S2 and S3) are used in the starting circuit to prevent the engine from cranking while the PTO is engaged. Each PTO switch contains two sets of contacts; one for the PTO circuit (lower contact) and the other (upper contact) as a safety interlock for the starting circuit. When the PTO switch is in the ON position (PTO engaged), the PTO switch interlock contacts are open. When the PTO switch is in the OFF position (PTO disengaged), the PTO interlock contacts are closed, allowing current to flow to transmission neutral switch (S5).

The transmission neutral switch is used in the starting circuit to prevent the engine from cranking when the transmission is in gear. When the hydrostatic control lever is in the forward or reverse position, the transmission neutral switch contacts are open. Moving the hydrostatic control lever to the N/STOP position closes the contacts, allowing current to flow to brake switch (S4).

NOTE: Brake switch equipped on machines: 316 (S.N. 596121—), 318 (S.N. 600305—), and 420 (S.N. 595881—) only. For all other machines, current flows from the transmission switch, directly to terminal "S2" on key switch (S1).

The brake switch will prevent the engine from cranking unless the brake pedal is depressed or park brake is engaged. Depressing the brake pedal closes the brake switch contacts, allowing current to flow to terminal "S2" on key switch (S1).

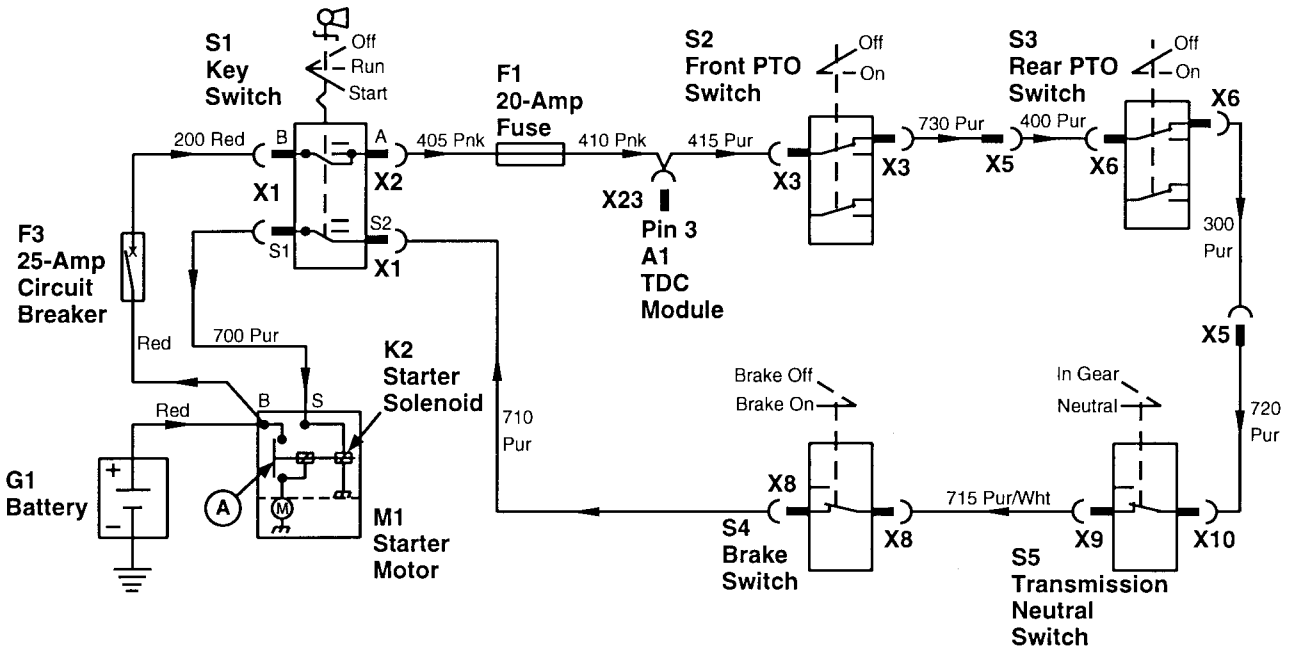
The key switch initiates current flow through the starting circuit with the use of two sets of contacts. Both contacts are open when the switch is in the OFF position. When the key switch is turned to the START position, both contacts close. If all the interlock switch contacts in the start circuit are closed, current from the battery positive terminal flows through the 25 amp circuit breaker (F3) to terminal "B" on the key switch. Current flows across the closed contacts, out terminal "A" to the 20 amp fuse (F1). From fuse (F1), current flows through the PTO, transmission, and brake (if equipped) switches and flows back to terminal "S2" of the key switch. The current flows across the key switch contacts, then out terminal "S1" to starter solenoid (K2), energizing the solenoid.

NOTE: For machines 316 (S.N. —362983), 318 (S.N. —364137) and 420 (S.N. —360009), a bendix drive starter motor is used. These starter motors use a remote mounted starter solenoid relay.

Starter solenoid (K2) contains two coil windings called the pull-in and hold-in windings. Current flowing through these coils produce a strong magnetic field which pulls a plunger inward and closes solenoid main contacts (A). Because the starter is a shift type (solenoid mounted on starter), the plunger also moves the starter drive gear outward to mesh with the flywheel ring gear.

When the solenoid contacts close, high current from the battery flows across the solenoid contacts to starter motor (M1), causing it to turn. Because the pull-in windings are grounded through the starter, current will flow through the pull-in windings only as long as the solenoid main contacts are open. When the solenoid contacts close, both ends of the pull-in windings have the same voltage. This causes the current to stop flowing through the pull-in windings. Because the hold-in windings are grounded directly to the chassis, current continues to flow through the hold-in windings. This keeps the solenoid energized (main contacts closed; starter drive engaged) until the key switch is turned to the RUN or OFF position.

MX,159024020,1 -19-16MAY95



A—Starter Solenoid Main Contact
F1—20 Amp Fuse
F3—25 Amp Circuit Breaker
G1—Battery
K2—Starter Solenoid
M1—Starter Motor
S1—Key Switch
S2—Front PTO Switch
S3—Rear PTO Switch (Optional)
S4—Brake Switch:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
S5—Transmission Neutral Switch
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X5—Rear PTO Harness 3-Pin Connector
X6—Rear PTO Switch 2-Pin Connector
X8—Brake Switch 2-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
X9—Transmission Neutral Switch 1-Pin Connector
X10—Transmission Neutral Switch 1-Pin Connector
X23—TDC Module 8-Pin Connector

Starting Circuit Operation

MX,159024020,2 -19-16MAY95

240
15
3

IGNITION CIRCUIT OPERATION

The function of the ignition circuit is to produce spark across the gap of spark plugs (E1 and E2). The circuit is a battery ignition type that fires both spark plugs simultaniously, thus eliminating the need for a distributor. The ignition circuit automatically stops the engine anytime the operator rises off the seat for more than one second when tractor is in gear or if PTO is engaged.

OPERATOR ON SEAT—MACHINE IN GEAR AND/OR PTO ENGAGED:
When the key switch (S1) is turned to the RUN or START position, current flows from the positive terminal of battery (G1), through circuit breaker (F3), across key switch contacts at terminals “B” and “A”, to fuses (F1 and F2). From fuse (F2), current flows across the contacts of seat switch (S6), through time delay IC (E), to switch transistor (D) located inside the TDC module. As long as current from the IC flows to the transistor, the transistor is “switched on”. In this state, the transistor completes the path to ground for TDC ignition relay coil (B). The ground path allows current to flow from fuse (F1), through the relay coil to ground. This energizes the relay coil which closes relay contacts (A).

Current from fuse (F1) then flows across ignition relay contacts (A), out the TDC module to ignition coil (T1). The current flows through the coil primary windings, then through ignition module (A2) to ground.

Current flowing through the primary windings produces a magnetic field around the primary and secondary windings.

NOTE: For machines (S.N. —420000), ignition points (E3) are used. The ignition points are actuated by a pushrod that rides on a camshaft lobe.

The ignition module receives a signal from a trigger ring containing permanent magnets (the ring rotates with the engine crankshaft). This signal causes the ignition module to “break” the circuit, momentarily stopping current flow through the primary windings, and cause the magnetic field to collapse across the secondary windings. The collapsing magnetic field induces high voltage in the secondary windings of the ignition coil. The induced voltage flows from one end of the secondary windings, through the two spark plugs (jumping the plug gaps), then back to the opposite end of the secondary windings. The engine block completes the circuit between the two spark plugs.

When the operator rises from the seat, the seat switch contacts open, causing current to stop flowing to the time delay IC. If the operator does not return to the seat within approximately one second, the time delay IC stops current flow to transistor (D). The transistor will “switch off”, causing current through relay coil (B) to stop flowing and de-energize the coil. With the coil no longer energized, relay contacts (A) will open. Current stops flowing to the ignition coil, thus stopping the engine.

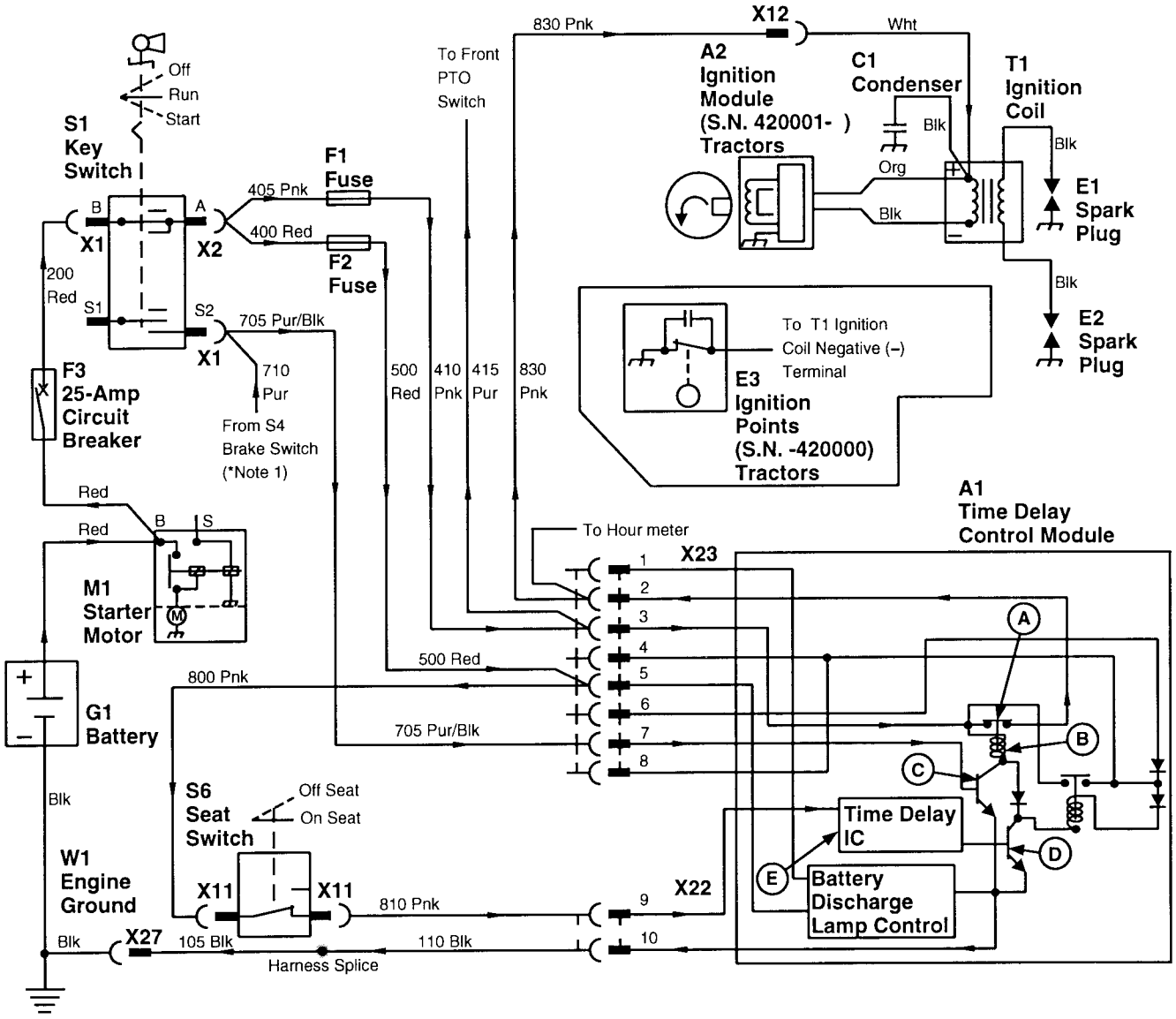
NOTE: Driving the machine over rough terrain can cause the seat switch contacts to momentarily open and close. When this happens, the time delay IC allows the engine to operate without interruption.

If the operator returns to the seat within approximately one second, current flow is re-established to the time delay IC before it has a chance to “time out” and stop current flow to the transistor. Current flow is NOT interrupted to the ignition coil and the engine is allowed to continue operating.

OPERATOR OFF SEAT—MACHINE IN NEUTRAL AND PTO DISENGAGED:
When operator is off the seat, current to the ignition coil can still be maintained through the neutral start (interlock) circuit. For current to flow through the interlock circuit, the key switch must be turned to the RUN or START position, the hydrostatic control lever in the STOP position, the PTO switch(es) in the OFF position (PTO disengaged), and park brake engaged (later models only).

With these conditions met, current flows from terminal “A” of the key switch to fuse (F1). From fuse (F1), current flows through the interlock contacts of the PTO switch(es), transmission neutral switch, and brake switch to terminal “S1” on the key switch. From terminal “S1”, current flows to transistor (C) located in the TDC module. As long as current from the interlock circuit flows to transistor (C), the transistor is “switched on”. In this state, the transistor provides an alternate path to ground for relay coil (B). The energized relay closes the relay contacts, allowing current to flow to the igniton coil.

MX,159024020,3 -19-16MAY95



A—TDC Ignition Relay Contacts
B—TDC Ignition Relay Coil
C—Switch Transistor
D—Time Delay Switch Transistor
E—Time Delay IC (Internal Circuit)
A1—Time Delay Control (TDC) Module
A2—Ignition Module (S.N. 420001—)
C1—Condenser (S.N. 420001—)
E1—Spark Plug
E2—Spark Plug
E3—Ignition Points (S.N. —420000)
F1—20 Amp Fuse
F2—2 Amp Fuse (Early Machines)
3 Amp Fuse (Later Machines)
F3—25 Amp Circuit Breaker
G1—Battery
M1—Starter Motor
S1—Key Switch
S6—Seat Switch
T1—Ignition Coil
W1—Engine Ground
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X11—Seat Switch 2-Pin Connector
X12—Engine Harness 3-Pin Connector
X22—TDC Module 2-Pin Connector
X23—TDC Module 8-Pin Connector
X27—Single Point Ground 1-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)

NOTE: 1. For machines 316 (S.N. —596120), 318 (S.N. —600304) and 420 (S.N. —595880), brake switch (S4) is not used. Interlock current flow to transistor (C) comes from transmission neutral start switch (S5).

NOTE: 2. The illustration shows ground circuit for machines (S.N. 475001—). For machines (S.N. —475000), the blk wire from the TDC module 2-pin connector terminates (grounds) at the right pedestal panel.

MX,159024020,4 -19-16MAY95

PTO CIRCUIT OPERATION

The function of the PTO circuit is to energize the PTO clutch(es) and turn on the PTO lamp(s). Also, the PTO circuit automatically disengages the PTO clutch(es) anytime the operator rises off the seat for more than one second.

To engage the PTO clutch(es), the following conditions must be met:
- Operator on seat.
- Key Switch at RUN position.
- PTO switches initially at OFF position, then moved to ON position.

When the operator is on the seat and key switch (S1) is turned to the RUN or START position, current flows from the positive terminal of battery (G1), through circuit breaker (F3), to key switch terminal "B". The current flows across the switch contacts to key switch terminal "A". From terminal "A", current flows to fuses (F1 and F2). From fuse (F2), current flows across the closed contacts of seat switch (S6) to pin "9" of TDC module connector (X22).

Inside the TDC module, current flows to time delay IC (A), then to switch transistor (B). As long as current from the IC flows to the transistor, the transistor is "switched on". In this state, the transistor completes the path to ground for PTO relay coil (G).

NOTE: Front PTO switch (S2) and optional rear PTO switch (S3) have two sets of contacts each. One set is used to actuate the clutches and the other set is used in the interlock circuit (see Starting Circuit Theory of Operation in this group).

If machine is not equipped with rear PTO, a jumper wire at 3-pin connector (X5) is used in place of the rear PTO switch.

With the PTO switch(es) in the OFF position, current will flow from fuse (F1) to connector (X3) on the front PTO switch. Current flows across the switch contacts, then to 3-pin connector (X5). If equipped with optional rear PTO, current will flow from connector (X5) to connector (X6) on the rear PTO switch. Current flows across the switch contacts and back out to connector (X5). From connector (X5), current flows to the TDC module, through pin "6" of connector (X23). Inside the TDC module, current flows through diodes (E and F), then through the PTO relay coil and transistor (B) to ground. The interlock circuit current energizes the PTO relay coil, which closes relay contacts (D). Once the contacts are closed, current flows directly from fuse (F1), across the relay contacts to the relay coil. This current keeps the relay energized (latched) as long as transistor (B) provides a path to ground. Once the coil is latched, current from the interlock circuit is no longer needed to keep the relay energized.

When the front PTO switch is moved to the ON position, current flowing across the relay contacts will also flow to connector (X4) on the front PTO switch, through pin "4" of connector (X23). Current flows across the switch contacts to front PTO clutch (Y1), engaging the clutch. Current also flows to front PTO lamp (P1), turning the lamp on.

NOTE: Operation of optional rear PTO is same as front PTO, except power for rear PTO comes from TDC module through pin "8" of connector (X23).

When the operator rises from the seat, the seat switch contacts open, causing current to stop flowing to the time delay IC. If the operator does not return to the seat within approximately one second, the time delay IC stops current flow to transistor (B). The transistor will "switch off", causing current through the PTO relay coil to stop flowing and de-energize the coil. At this point the PTO relay contacts will open, stopping current flow to the PTO clutch(es) and lamp(s), thus disengaging the PTO clutch(es) and turning the lamp(s) off.

NOTE: Driving the machine over rough terrain can cause the seat switch contacts to momentarily open and close. If this happens, the time delay IC allows the PTO(s) to operate without interruption.

If the operator returns to the seat within approximately one second, current flow is re-established to the time delay IC before it has a chance to "time out" and stop current flow to the transistor. Current flow is NOT interrupted, allowing the PTO(s) to continue operating.

NOTE: Illustration shows component ground for machines (S.N. 475001—). For machines (S.N. —475000), the component ground point is located at right side of pedestal panel.

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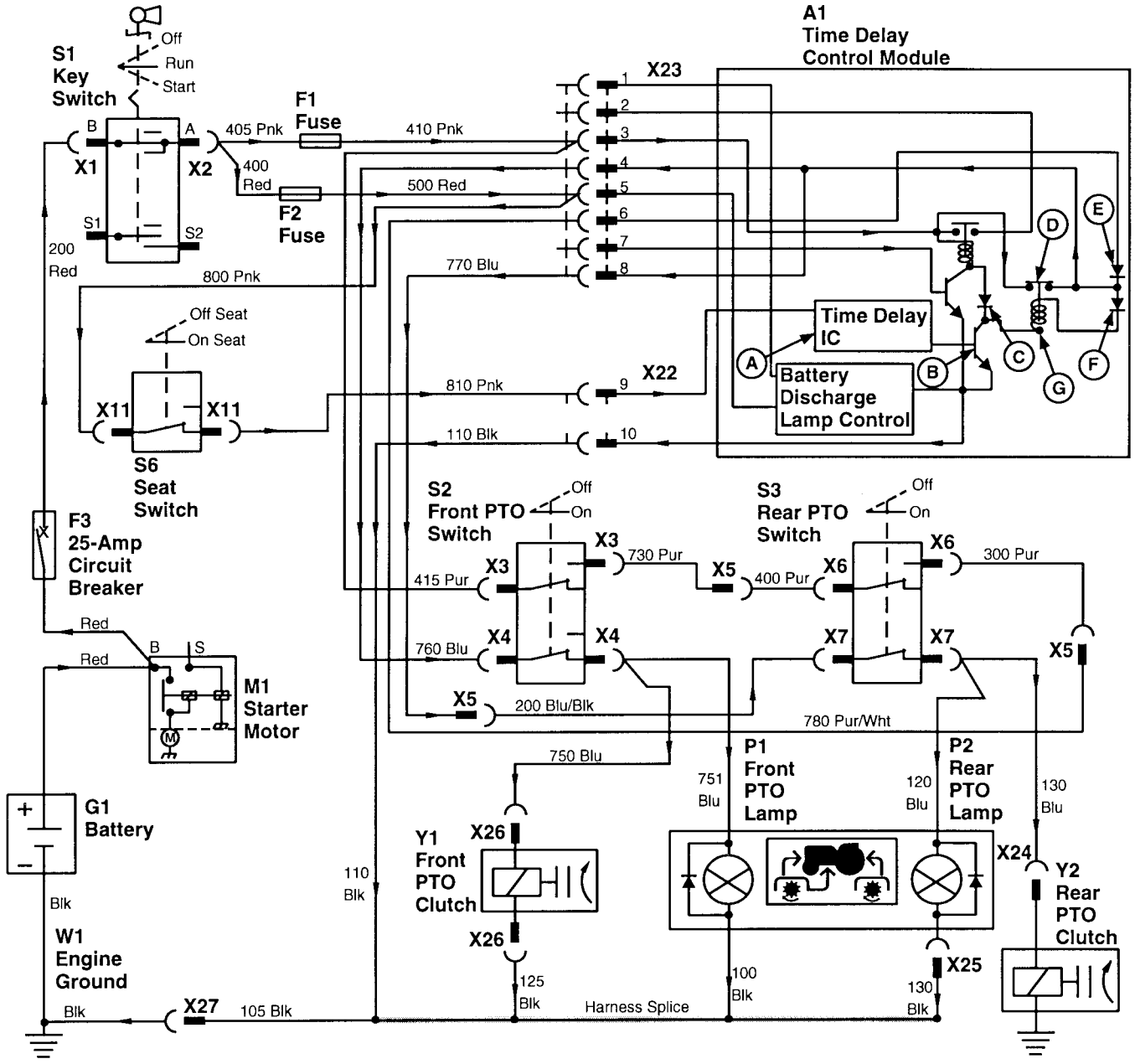

A—Time Delay IC (Internal Circuit)
B—Time Delay Switch Transistor
C—Isolation Diode
D—TDC PTO Relay Contacts
E—Isolation Diode
F—Isolation Diode
G—TDC PTO Relay Coil
A1—Time Delay Control (TDC) Module
F1—20 Amp Fuse
F2—2 Amp Fuse (Early Machines)
3 Amp Fuse (Later Machines)
F3—25 Amp Circuit Breaker
G1—Battery
M1—Starter Motor
P1—Front PTO Lamp
P2—Rear PTO Lamp (Optional)
S1—Key Switch
S2—Front PTO Switch
S3—Rear PTO Switch (Optional)
S6—Seat Switch
W1—Engine Ground
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X4—Front PTO Switch 3-Pin Connector
X5—Rear PTO Harness 3-Pin Connector
X6—Rear PTO Switch 2-Pin Connector
X7—Rear PTO Switch 3-Pin Connector
X11—Seat Switch 2-Pin Connector
X22—TDC Module 2-Pin Connector
X23—TDC Module 8-Pin Connector
X24—Rear PTO Clutch 1-Pin Connector (Ground)
X25—Rear PTO Lamp 1-Pin Connector (Ground)
X26—Front PTO Clutch 2-Pin Connector
X27—Single Point Ground 1-Pin Connector:
316 (S.N. 596121—)
318 (S.N. 600305—)
420 (S.N. 595881—)
Y1—Front PTO Clutch
Y2—Rear PTO Clutch (Optional)

MX,159024020,6 -19-16MAY95

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CHARGING CIRUIT OPERATION

The function of the charging circuit is to keep the battery properly charged by supplying approximately 13.6—14.7 VDC to the battery while the engine is operating.

The charging system is a permanent magnet and stator type. The magnets are located in the flywheel, which rotates around the stationary stator (G2) windings. Current output is controlled by voltage regulator/rectifier (N1), mounted separately from the stator. Battery discharge lamp (P4) warns the operator when battery discharge lamp control (A) senses low battery voltage. The battery discharge lamp and lamp control DO NOT monitor current output from the stator.

As the flywheel turns, the permanent magnets induce alternating current (AC) in the stator windings. The alternating current flows to the voltage regulator/rectifier. The rectifier portion of the voltage regulator/rectifier converts the alternating current to direct current (DC). The regulator portion stabilizes the direct current and increases or decreases current flow as required by the battery.

Battery discharge lamp control (A) senses battery voltage present at fuse (F2). If the lamp control senses low voltage (less than 12.3 volts), it will provide a path to ground for battery discharge lamp (P4). Since battery voltage is always available at the discharge lamp when the key switch is in the RUN or START position, the ground path provided by the lamp control will allow battery current from fuse (F1) to flow through the battery discharge lamp to ground, lighting the discharge lamp. The lamp will stay on until battery voltage increases to 12.7 volts. At this point, the battery discharge lamp control will break the path to ground, turning the battery discharge lamp off.

Fuses (F1 and F2) protect the battery discharge lamp and lamp control circuit from excessive current.

NOTE: (*) For machines (S.N. —475000), a light green wire is used instead of the 210 red wire used on later machines. The green wire connects to terminal "B" of key switch (S1), instead of connecting to circuit breaker (F3).

NOTE: 1. The illustration shows ground circuit for machines (S.N. 475001—).

For machines (S.N. —475000), the blk wire from the TDC module 2-pin connector terminates (grounds) at the right side of the pedestal panel.

MX,159024020,7 -19-16MAY95

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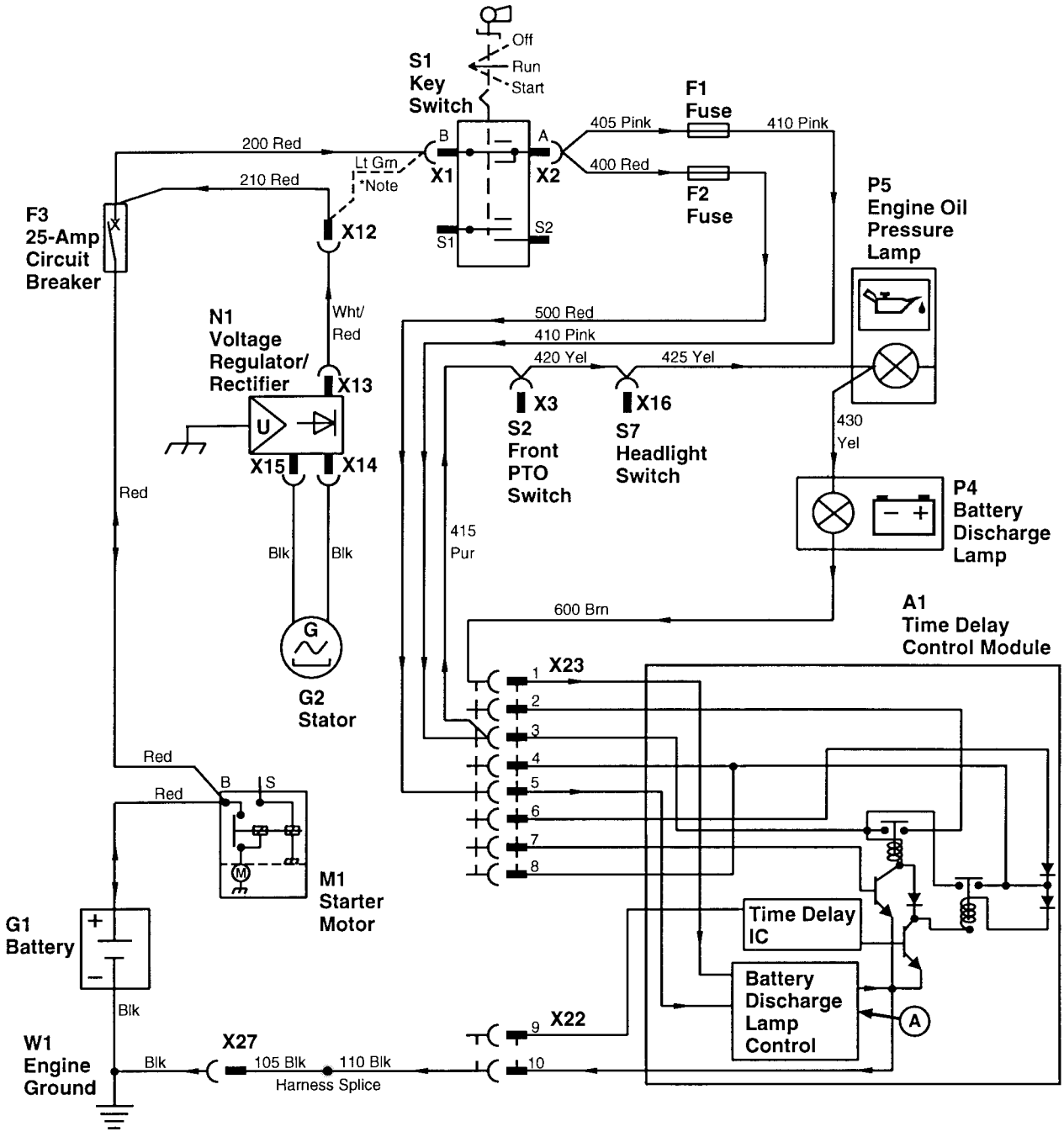

M77924 -19-04MAR95

A—Battery Discharge Lamp Control
A1—Time Delay Control (TDC) Module
F1—20 Amp Fuse
F2—2 Amp Fuse (Early Machines)
3 Amp Fuse (Later Machines)
F3—25 Amp Circuit Breaker
G1—Battery
G2—Stator
M1—Starter Motor
N1—Voltage Regulator/Rectifier
P4—Battery Discharge Lamp
P5—Engine Oil Pressure Lamp
S1—Key Switch
W1—Engine Ground (See Note)
X1—Key Switch 5-Pin Connector
X2— Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X16—Headlight Switch Connector
X22—TDC Module 2-Pin Connector
X23—TDC Module 8-Pin Connector

Charging Circuit Operation

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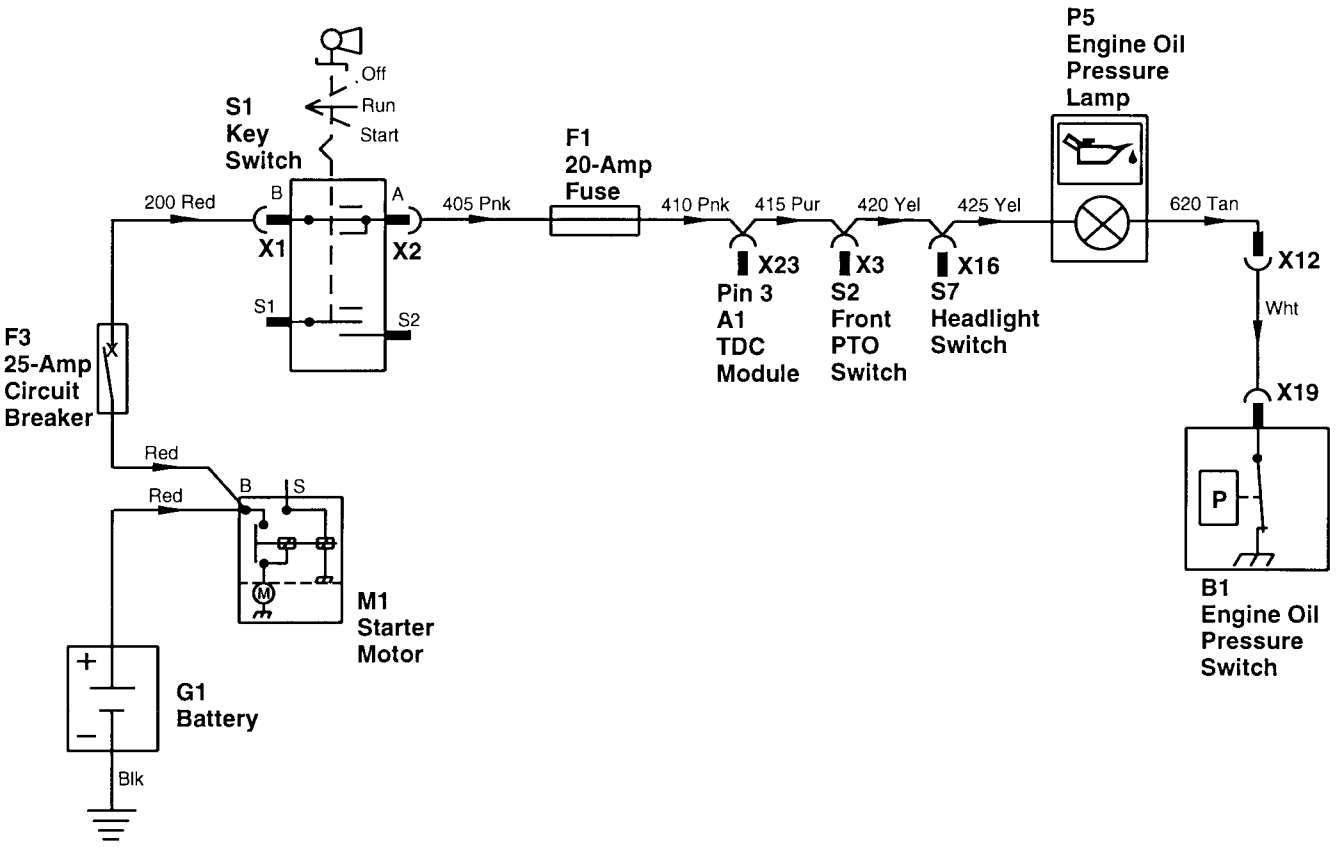
OIL PRESSURE LAMP CIRCUIT OPERATION



B1—Engine Oil Pressure Switch
F1—20 Amp Fuse
F3—25 Amp Circuit Breaker
G1—Battery
M1—Starter Motor
P5—Engine Oil Pressure Lamp
S1—Key Switch
X1—Key Switch 5-Pin Connector
X2—Key Switch 1-Pin Connector
X3—Front PTO Switch 2-Pin Connector
X16—Headlight Switch 2-Pin Connector
X23—TDC Module 8-Pin Connector

The purpose of the oil pressure lamp circuit is to warn the operator when engine oil pressure is too low for safe operation of the engine.

Oil pressure switch (B1) is a normally-closed switch. When there is no oil pressure, such as when the engine is not operating, the switch contacts are closed. The closed contacts of the oil pressure switch provide a path to ground for oil pressure lamp (P5).

When the key switch is turned to the RUN or START position, current from the battery flows through circuit breaker (F3), key switch (S1), and 20 amp fuse (F1). From the fuse, current flows through oil pressure lamp (P5), oil pressure switch (B1), then to ground, lighting the oil pressure lamp. The lamp will stay lit until either the key switch is turned to the OFF position or engine oil pressure increases to the point where the pressure switch contacts open, such as during normal engine operation.

Fuse (F1) protects the oil pressure lamp circuit from excessive current.

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