Ignition Systems
for
Russian Motorcycles
(Part II: PM-05 Breaker/Distributor)

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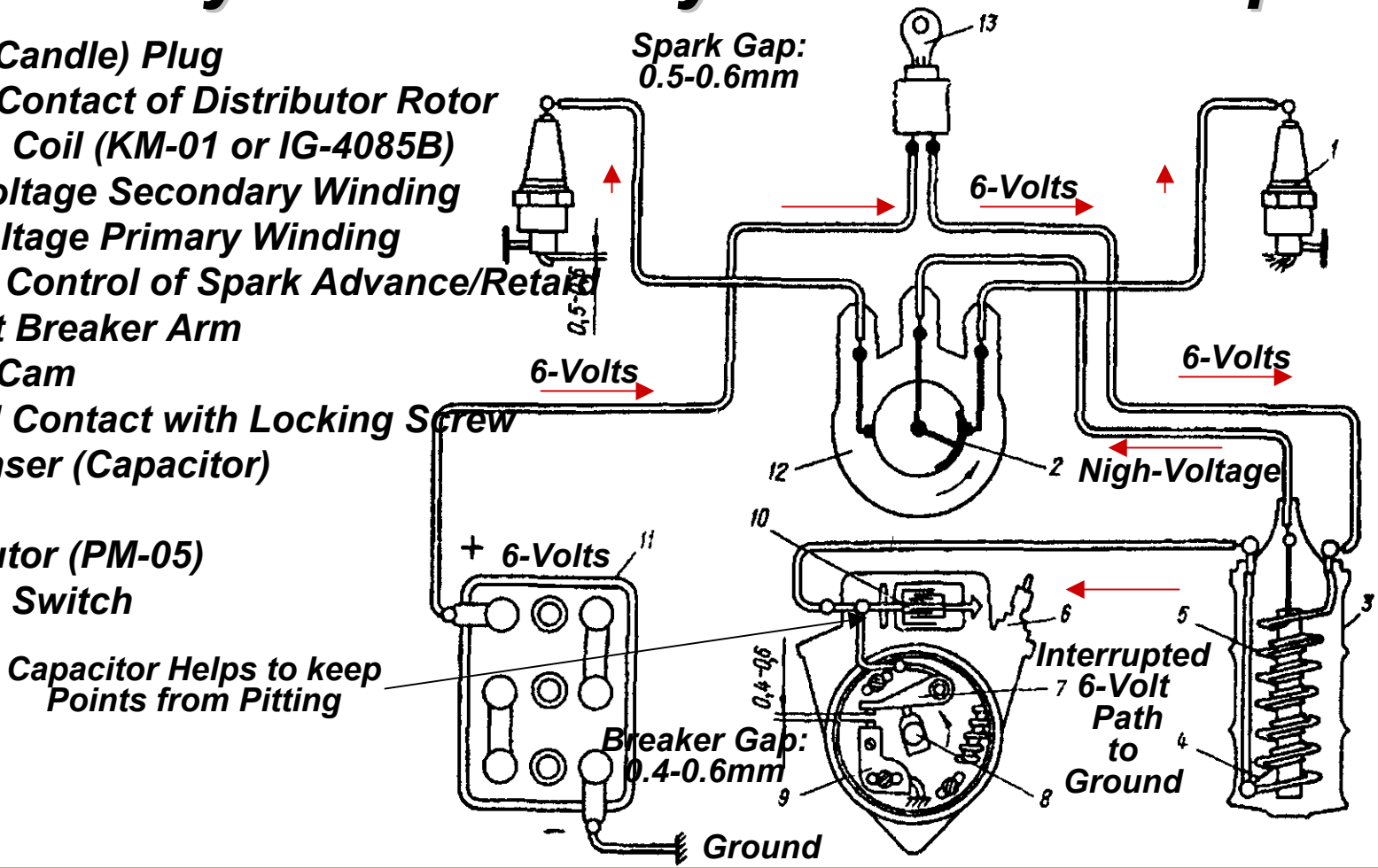
(01/2011)

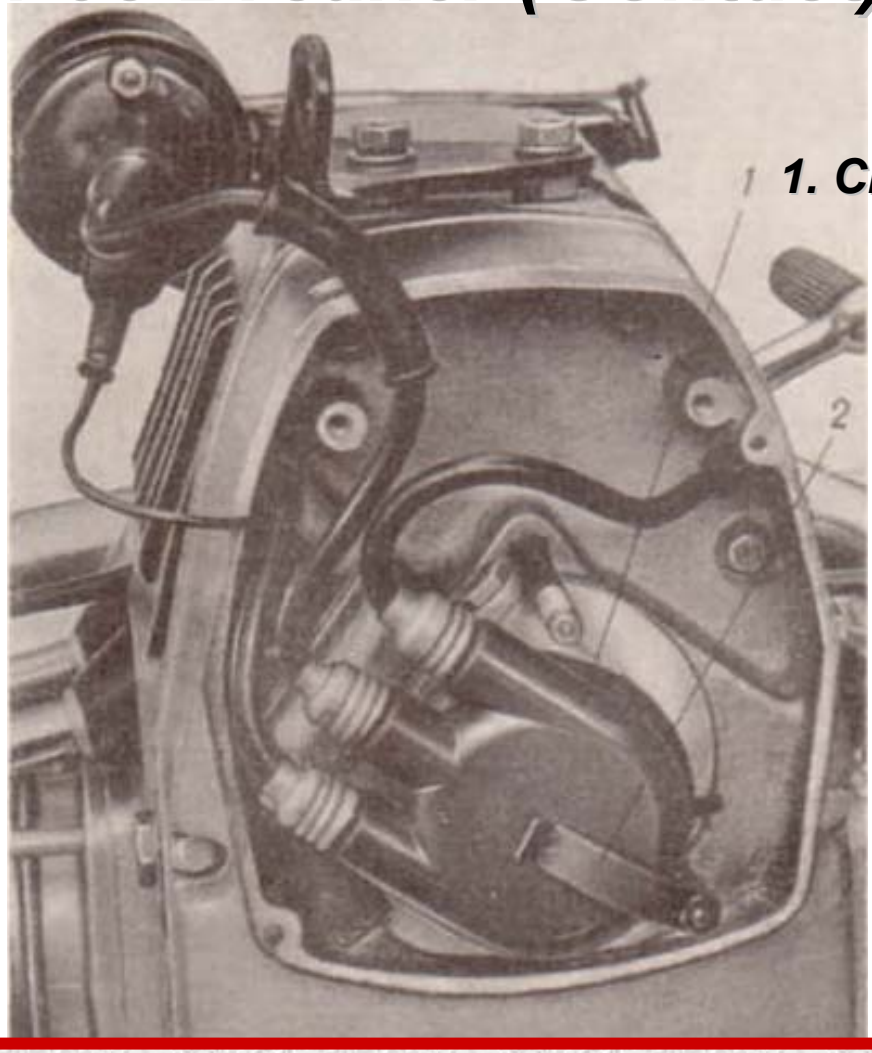
Ignition System of Early Urals and Dneprs

1. Spark (Candle) Plug
2. Center Contact of Distributor Rotor
3. Ignition Coil (KM-01 or IG-4085B)
4. High-Voltage Secondary Winding
5. Low-Voltage Primary Winding
6. Manual Control of Spark Advance/Retard
7. Contact Breaker Arm
8. Rotary Cam
9. Ground Contact with Locking Screw
10. Condenser (Capacitor)
11. Battery
12. Distributor (PM-05)
13. Ignition Switch



The basic ignition system is simple. The breaker points are normally closed, allowing the magnetic field to build in the ignition coil. When the cam shaft rises, opening the breaker points, the collapsing magnetic field induces a high-voltage in the secondary winding of the coil.

PM-05 Breaker (Contact) / Distributor

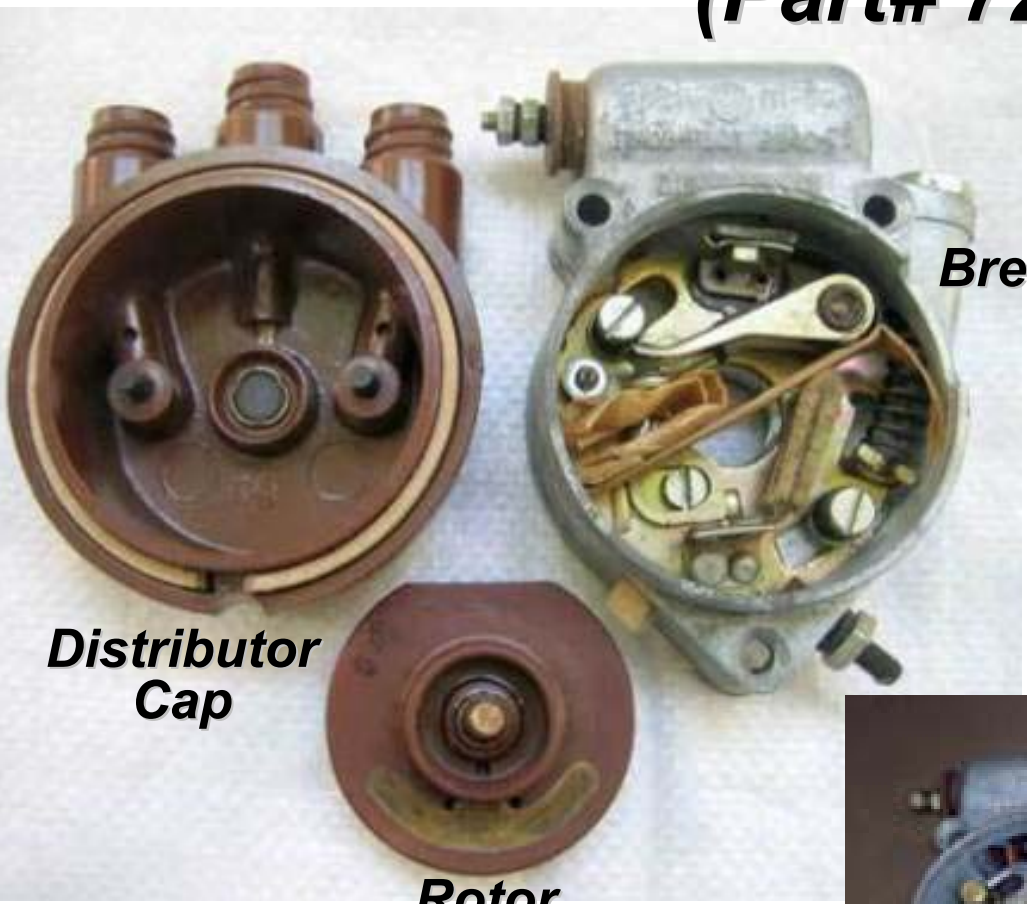


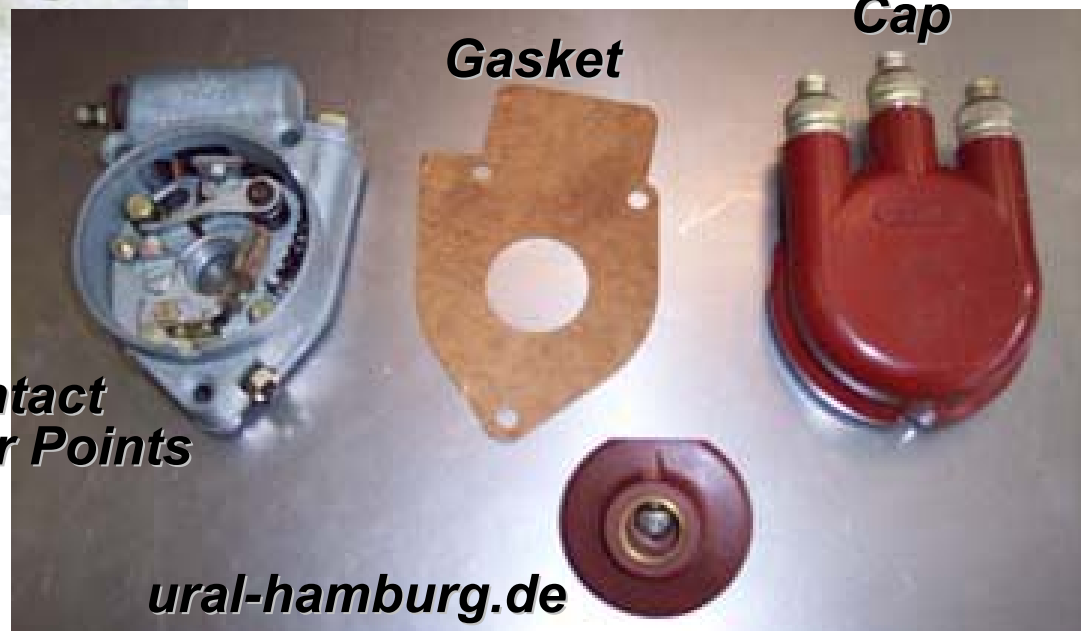
1. Circuit Breaker/Distributor

2. Attachment Spring

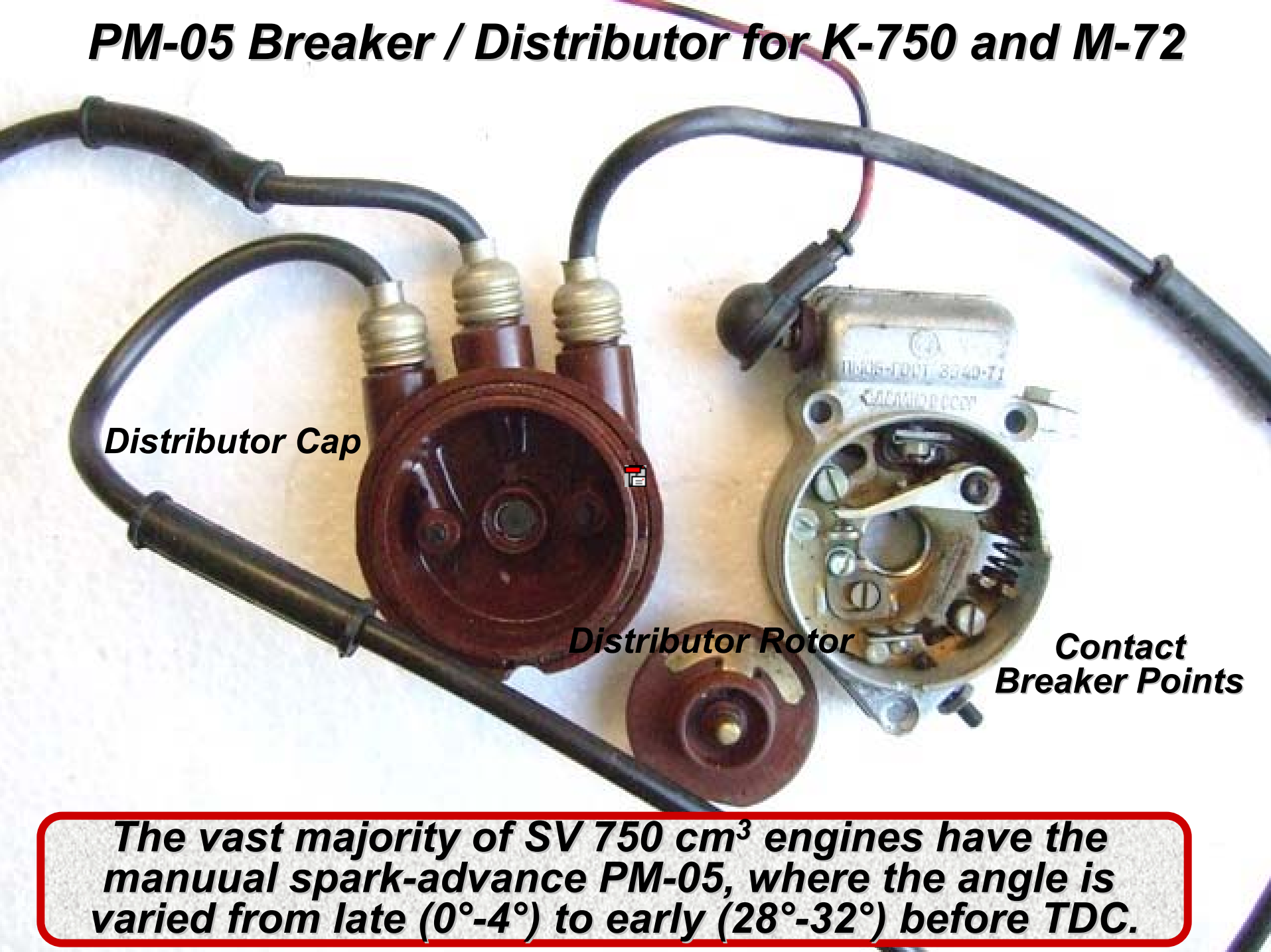
The PM-05 breaker/distributor was introduced to heavy Russian bike on Ural's M-72. The distributor cap was fastened by a special spring. High-voltage travels from the middle contact to the spark plugs (candles).

Ignition Distributor PM-05 (6-Volt) for K-750, M-72 (Part# 72172)



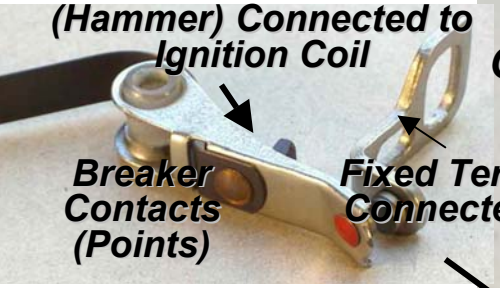


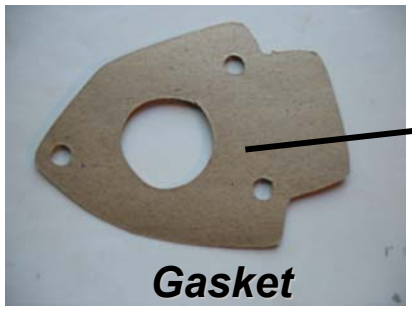
PM-05 Breaker / Distributor for K-750 and M-72

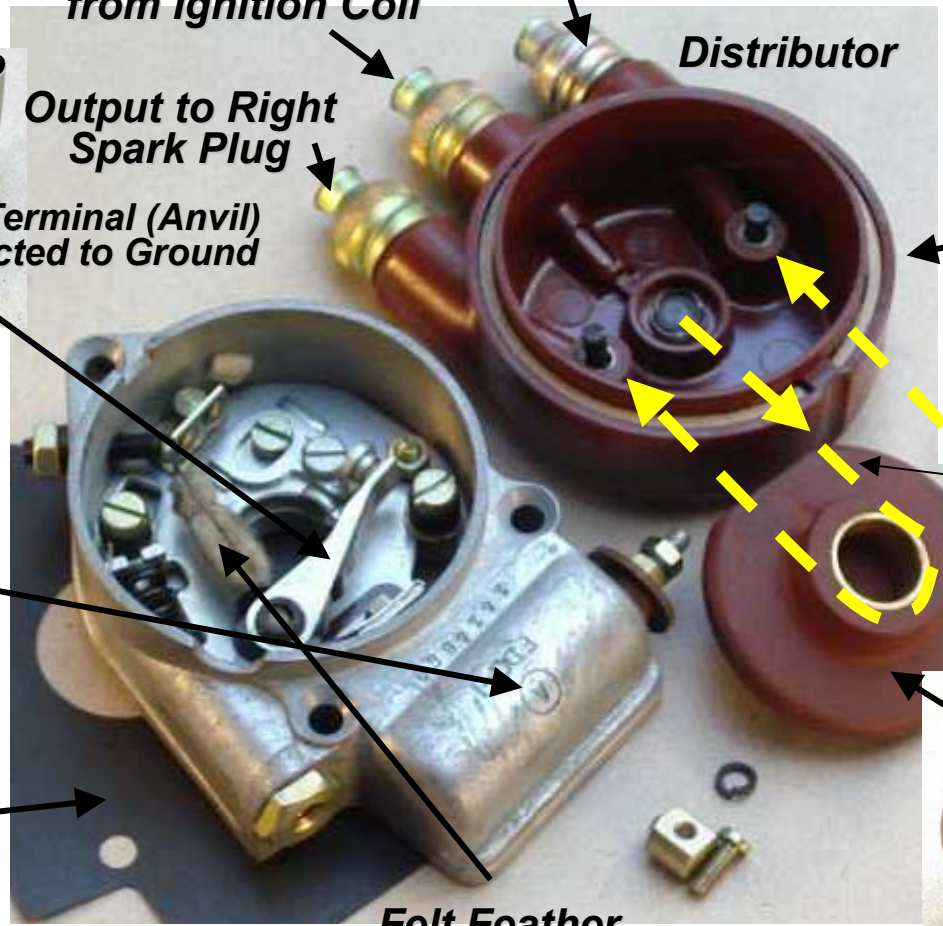


The vast majority of SV 750 cm^3 engines have the manuual spark-advance PM-05, where the angle is varied from late (0°-4°) to early (28°-32°) before TDC.

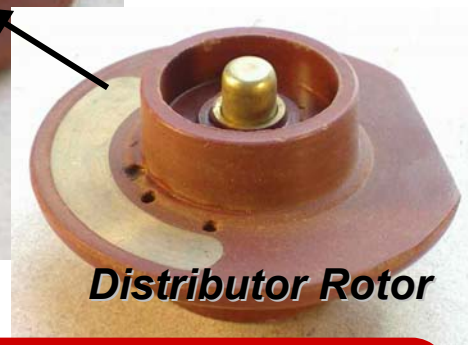
Breaker/Distributor PM-05 Breakdown







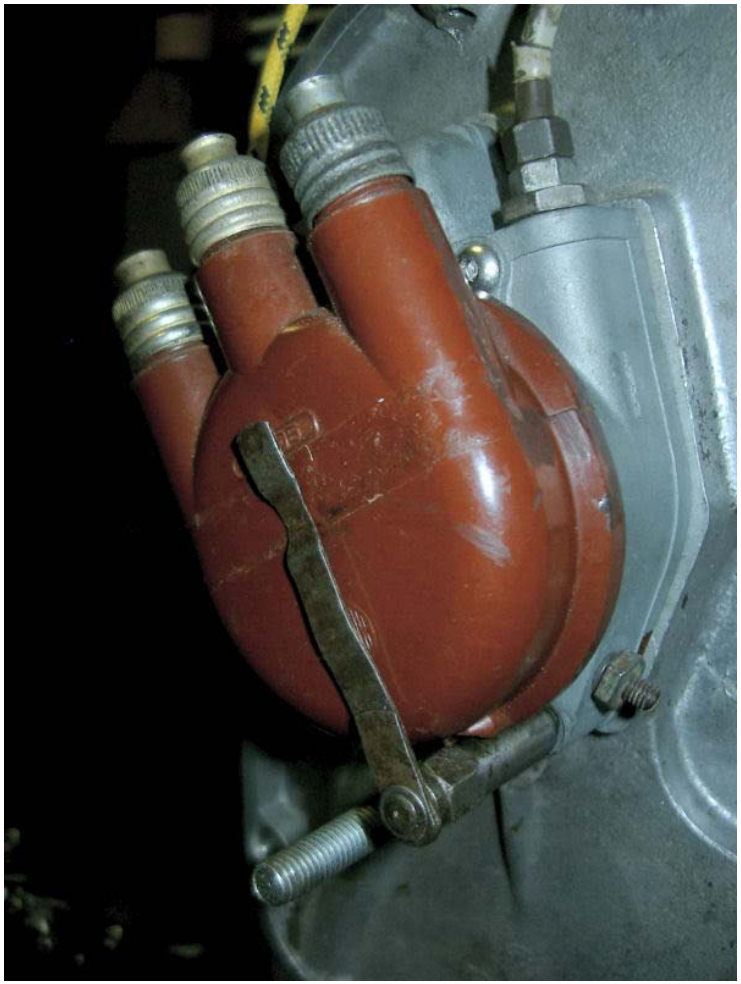
High-Voltage Path thru Center Contact, then Rotor, and Out thru Side Contacts



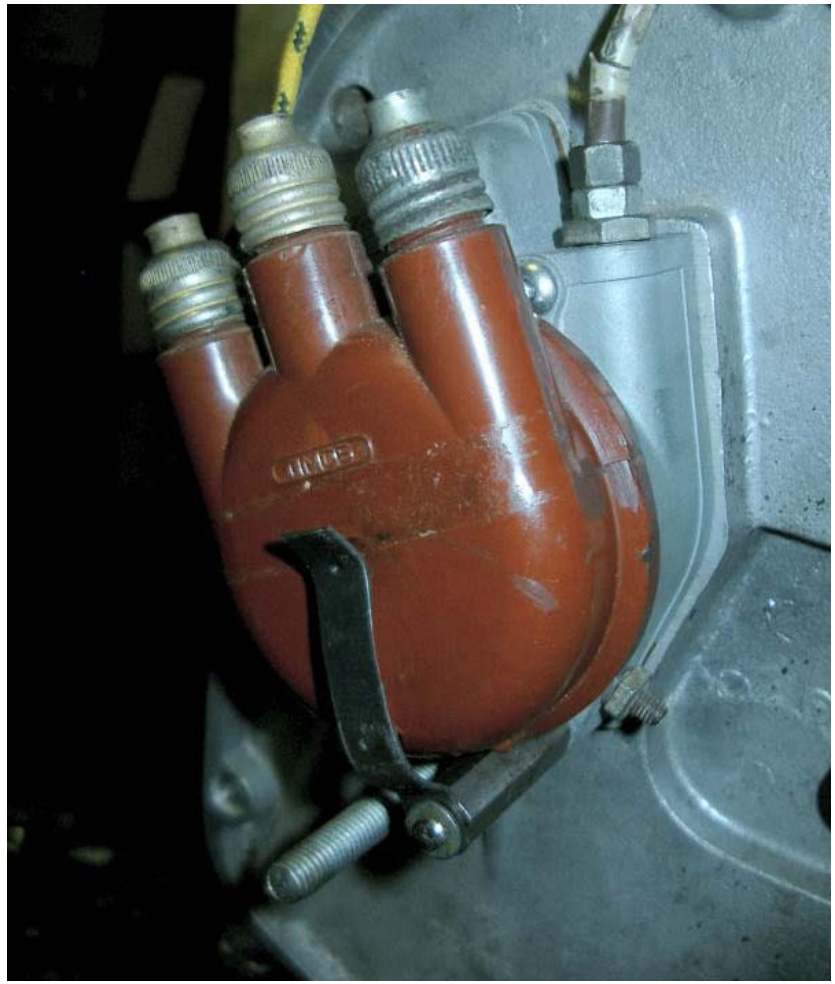
PM05 Breaker/Distributor was used on early versions of Dnepr's K-650, K-750, MT-12, MB-750 and M-72.

PM-05 Distributor Cover (Cap) and Rotor

PM-05 Distributor Cap Springs (Catweazle)



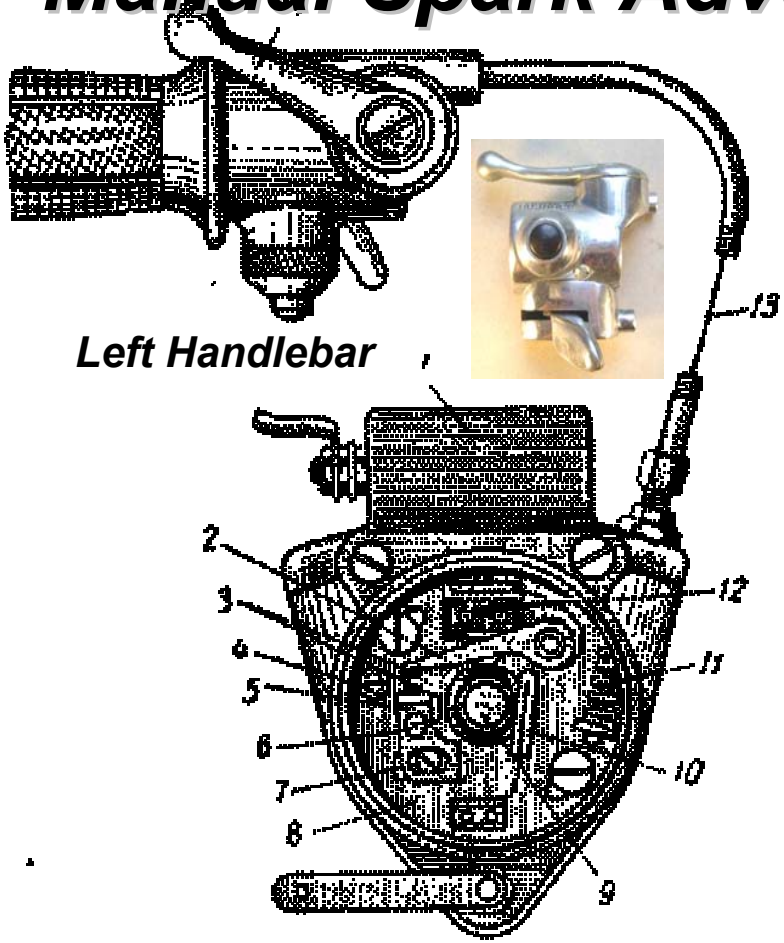
Older Type Cap



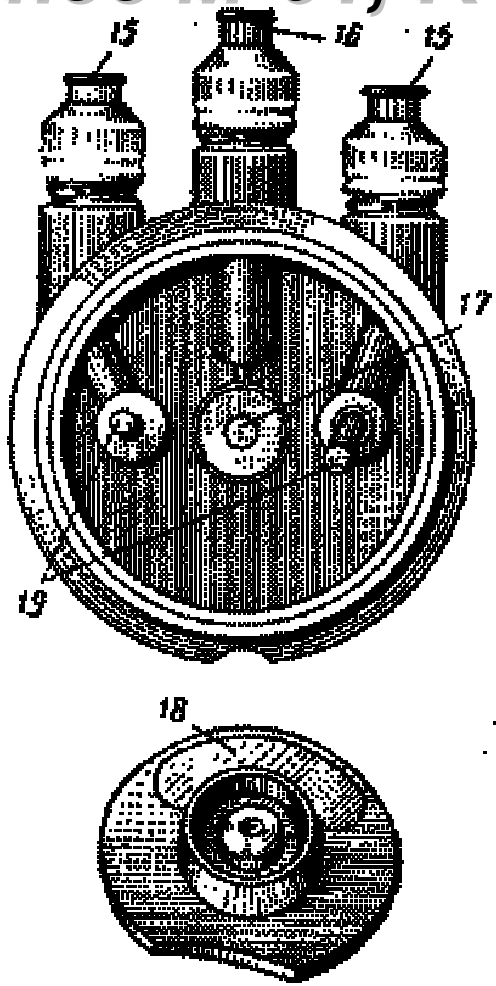
Newer Type Cap

The clamping spring may be of a different length, depending on the year of the bike.

Manual Spark Advance M-61, K-750 and M-72



Left Handlebar

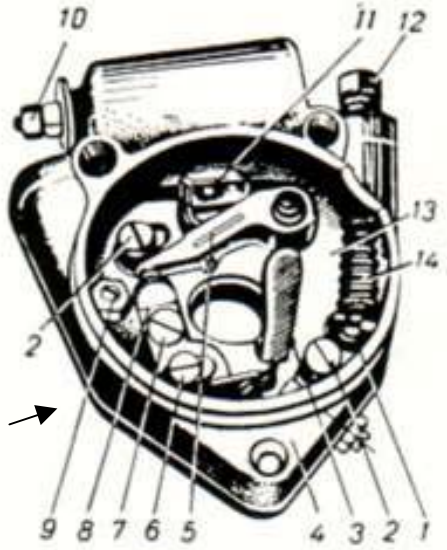


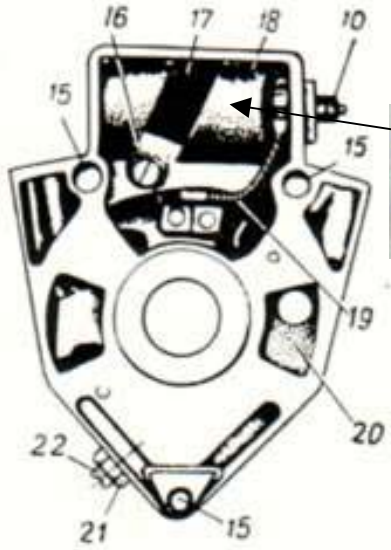
1. Capacitor
2. Movable Contact
3. Breaker Gap
4. Fixed Contact to Ground
5. Ground Contact
6. Locking Screw
7. Gap Adjustment Screw
8. Rotating Plate
9. Cam Shaft
10. Cam Roller
11. Spring
12. Anvil
13. Advance Control Cable
14. Advance Lever Control
15. Output to Spark Plugs
16. Input from Ignition Coil
17. Central Contact
18. Contact Plate
19. Carbon Contacts to Spark Plugs

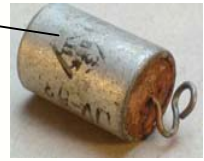
The PM-05 breaker/ distributor, with manual ignition advance, consists of a body with a cap, breaker points riding on a cam, and two screws to allow rotation around an angle, which can be set for timing. The movable contact can be moved to regulate the gap, with the help of the eccentric adjusting screw.

PM-05 Manual Advance/Retard Distributor

Rotary Disk

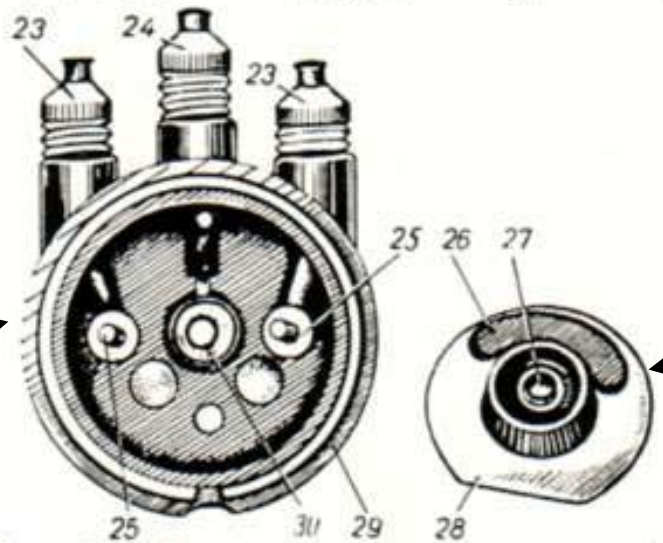






Capacitor

Distributor Cap

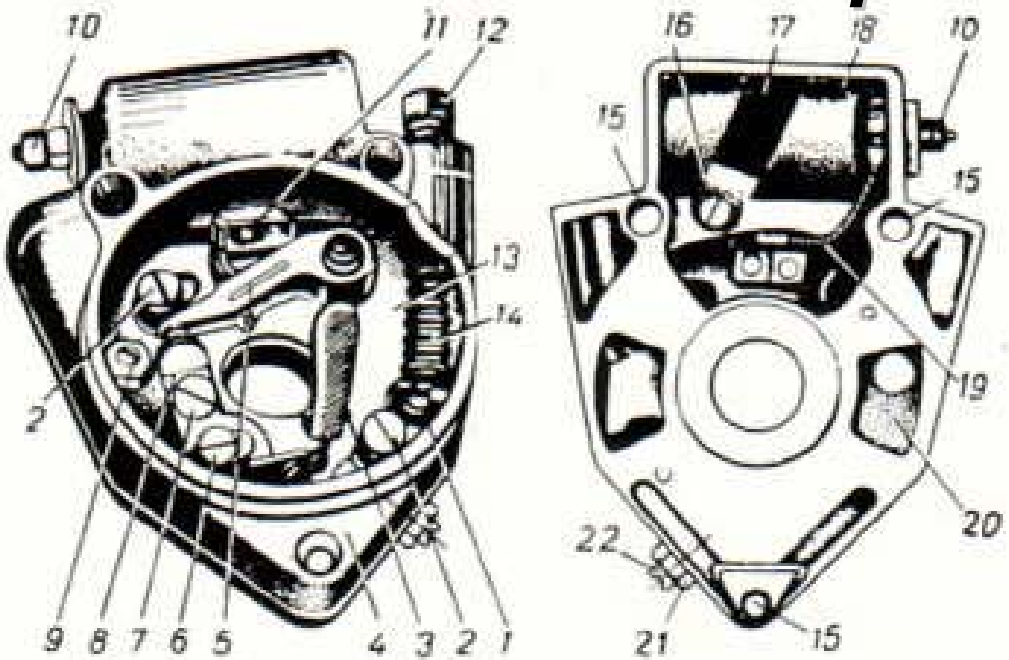


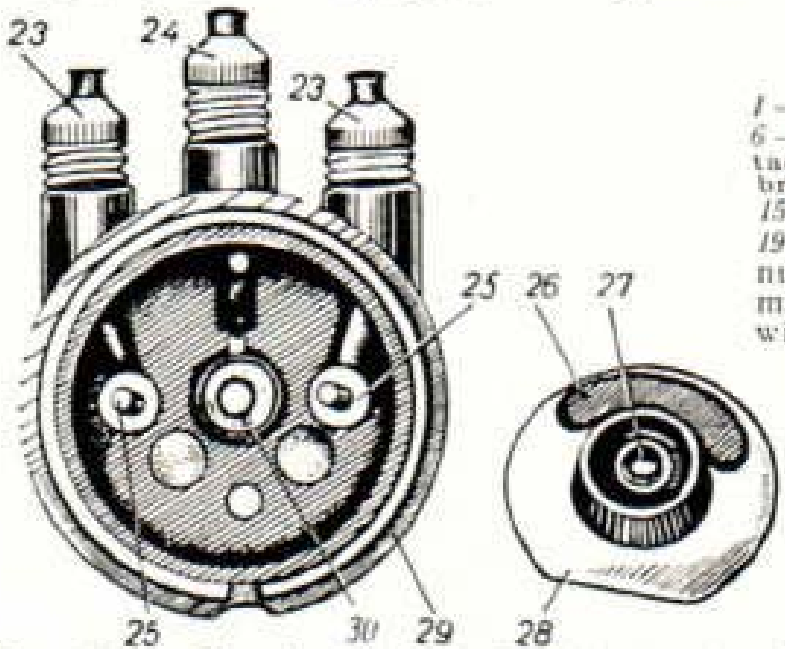
Rotor

1. Stop
2. Screw
3. Oil Felt Pad
4. Body
5. Lever
6. Screw
7. Locking Screw
8. Interrupter Plate Contact
9. Eccentric
10. Insulated Terminal
11. Contact Bracket
12. Adjusting Stop
13. Rotary Disk
14. Spring
15. Screw Hole
16. Screw
17. Plate
18. Capacitor (Condenser)
19. Capacitor Wire
20. Cut-out in Body
21. Adjusting Screw Lock-Nut
22. Adjusting Screw
23./24. Wire Conduits
25. Carbon Contact
26. Contact Plate
27. Cap with Spring
28. Rotor
29. Cover with Contacts
30. Central Contact

The PM05 is controlled by the ignition lever on the left handlebar, while the later PM-302 centrifugal regulator, provided an automatic change of ignition timing depending on engine speed.

PM-05 Interrupter-Distributor





1 — stop; *2* — screw; *3* — oil felt pad; *4* — body; *5* — lever; *6* — screw; *7* — locking screw; *8* — interrupter plate contact; *9* — eccentric; *10* — insulated terminal; *11* — contact bracket; *12* — adjusting stop; *13* — rotary disk; *14* — spring; *15* — screw hole; *16* — screw; *17* — plate; *18* — capacitor; *19* — wire; *20* — cutout in body; *21* — adjusting screw lock nut; *22* — adjusting screw; *23* and *24* — wire conduits (terminals); *25* — carbon contact; *26* — contact plate; *27* — cap with spring; *28* — rotor; *29* — cover with contacts; *30* — central contact

Why Advance/Retard Ignition Timing?

- *"Timing Advance" refers to the number of degrees Before Top Dead Center (BTDC) that the spark will ignite the air-fuel mixture in the combustion chamber during the compression stroke.*
- *Retarded timing can be defined as changing the timing so that fuel ignition happens later than the manufacturer's specified time.*
- *Timing advance is required because it takes time to burn the air-fuel mixture. Igniting the mixture before the piston reaches Top Dead Center (TDC) will allow the mixture to fully burn soon after the piston reaches TDC.*
- *As the engine speed increases, the time available to burn the mixture decreases, but the burning itself proceeds at the same speed. It needs to be started increasingly earlier to complete (advanced) in time.*
- *In a classic ignition system with breaker points, the basic timing can be set statically using a test light or dynamically using a timing light.*

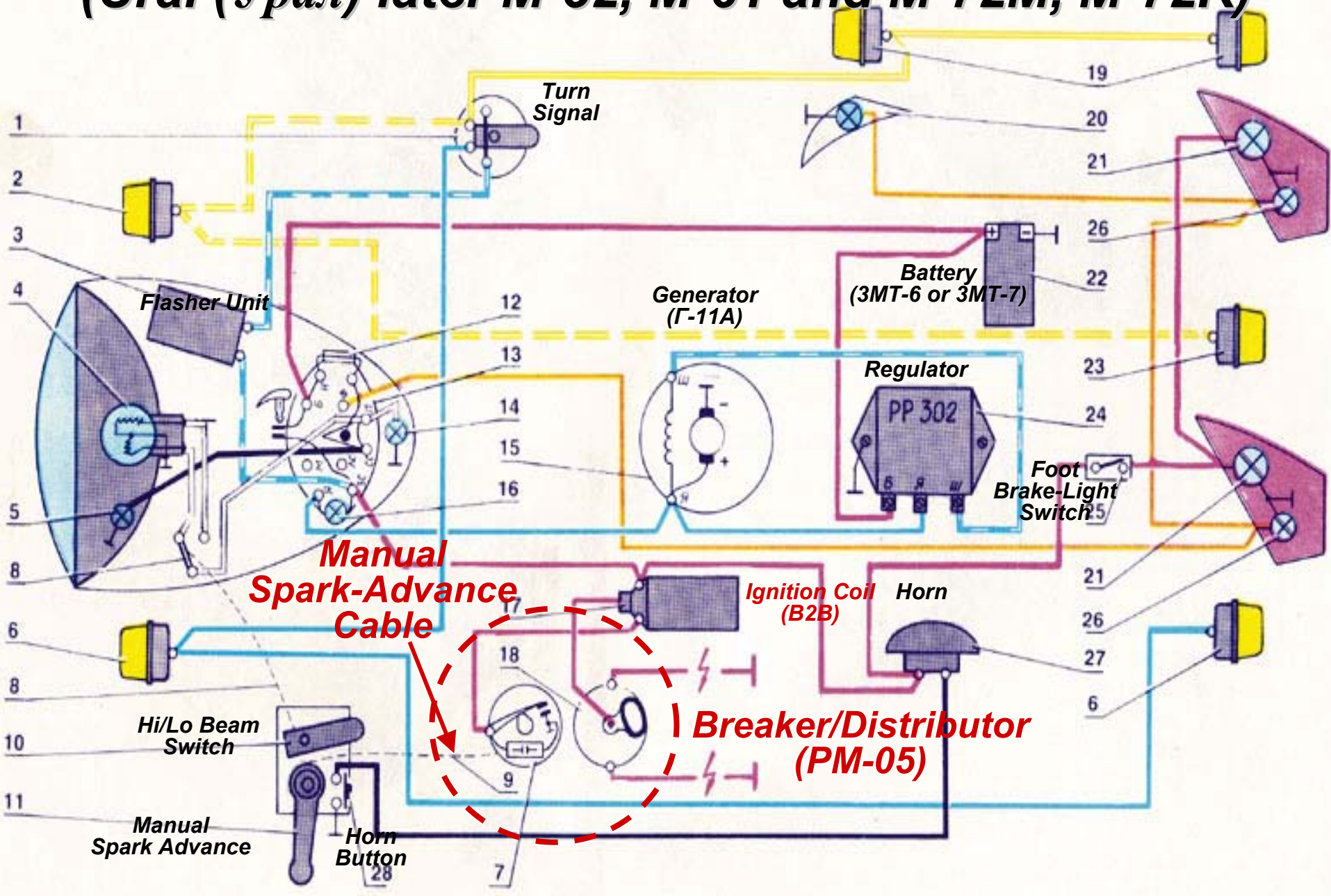
Ignition timing is the process of setting the time when a spark will occur during the compression stroke relative to piston position and crankshaft angular velocity.

Use of Handlebar Timing Lever (CossackPower (b-Cozz))

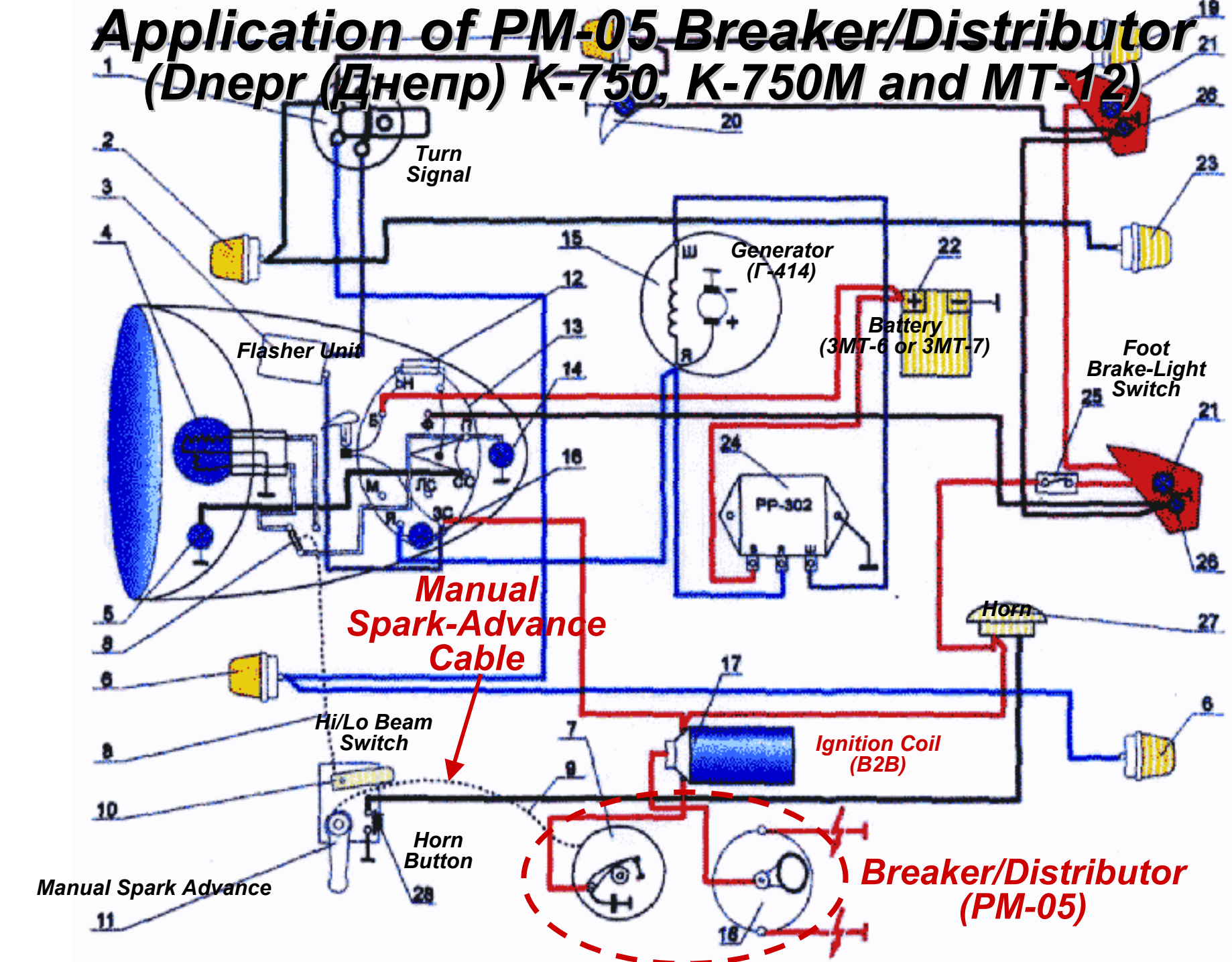
- *On the Open Road: Full Advance*
- *Going Up a Steep Hill: Retard a Bit*
- *Show-Off (slow thumpy idle when stopped): Full or Almost Retard*
- *If Bike Stalls (like a kill switch) when Pulled to Full Retard:*
  - *Probably Due to Cable Stretch*
  - *Retarding Too Far*
- *Never Ride on Full Retard*
- *When Spark Advance Is Increased (point when the ignition spark occurs, BTDC of the compression stroke) we Get More Power, but Also More Heat*
- *There is a point after which we get lots more heat and very little extra power. (STOP before we get to this point!)*
- *With Engine at Normal Operating Temperature and Idling, Advance Timing Slowly (Engine Will Speed Up)*
- *Move Timing Back and Forth, Advancing and Retarding to Get Highest Engine Idling Speed*
- *Back It Off (retard) a Bit*
  - *Engine Speed Slows Down Just a Little (Still idling, don't touch the throttle)*
- *Take Short Ride to Make Sure Engine Does Not "Ping" under Load*
- *Check Color of Spark Plugs to Make Sure Not Running Too Hot*

The manual control of spark advance is controlled by a handlebar lever connected to a PM-05 breaker/distributor.

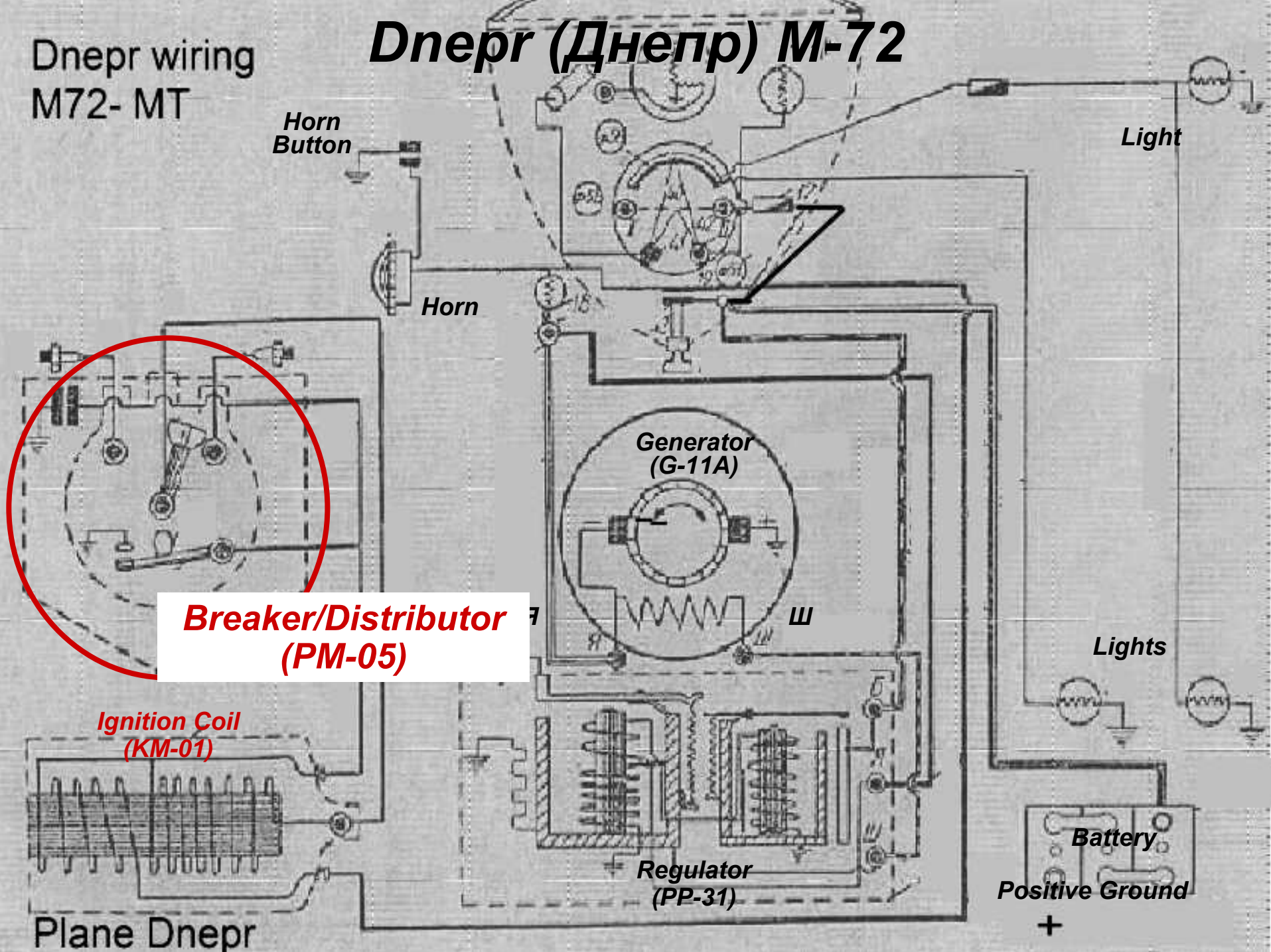
Application of PM-05 Breaker/Distributor
(Ural (Урал) later M-52, M-61 and M-72M, M-72K)



Application of PM-05 Breaker/Distributor (Dnepr (Днепр) K-750, K-750M and MT-12)

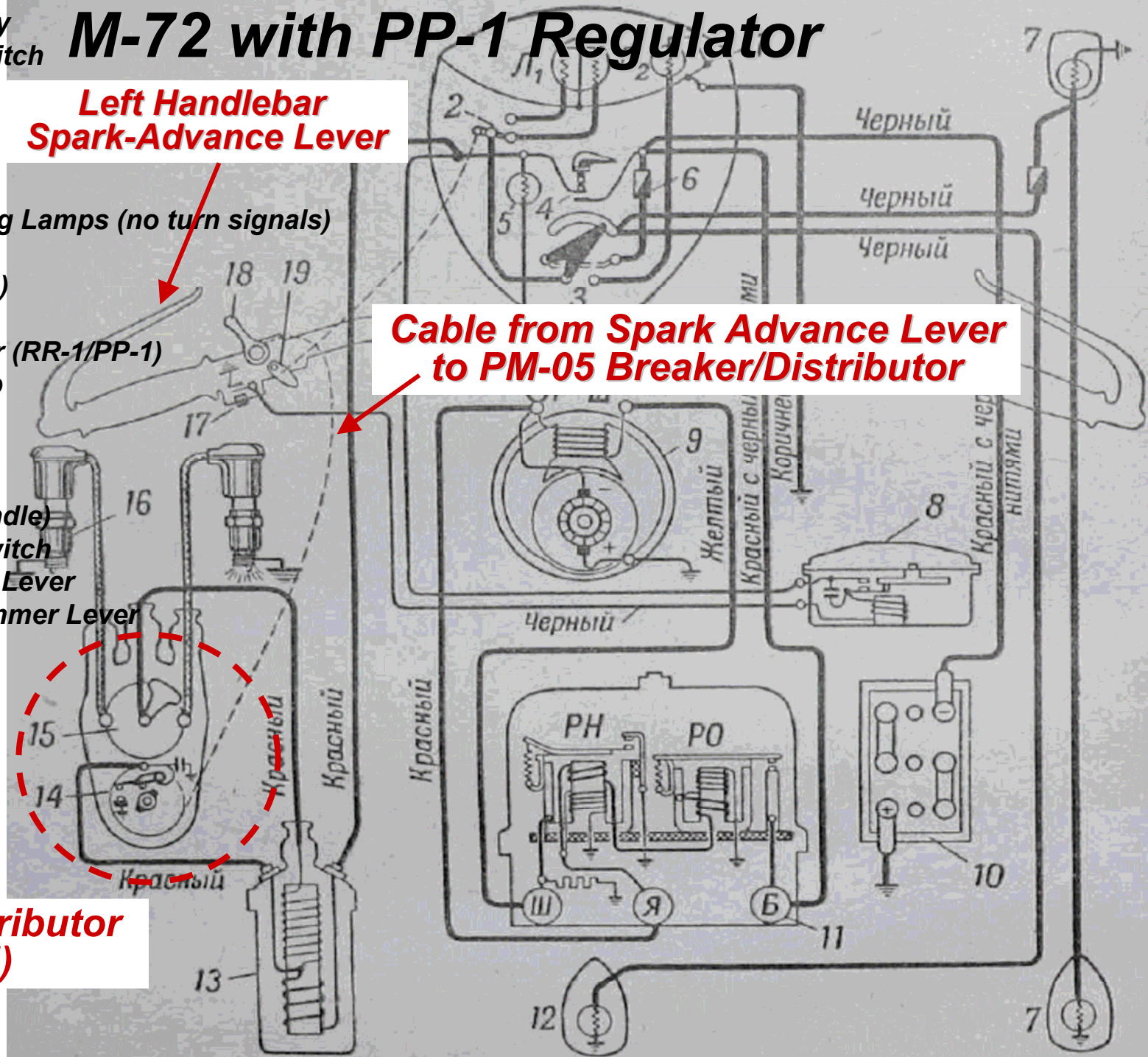


Dnepr (Днепр) M-72



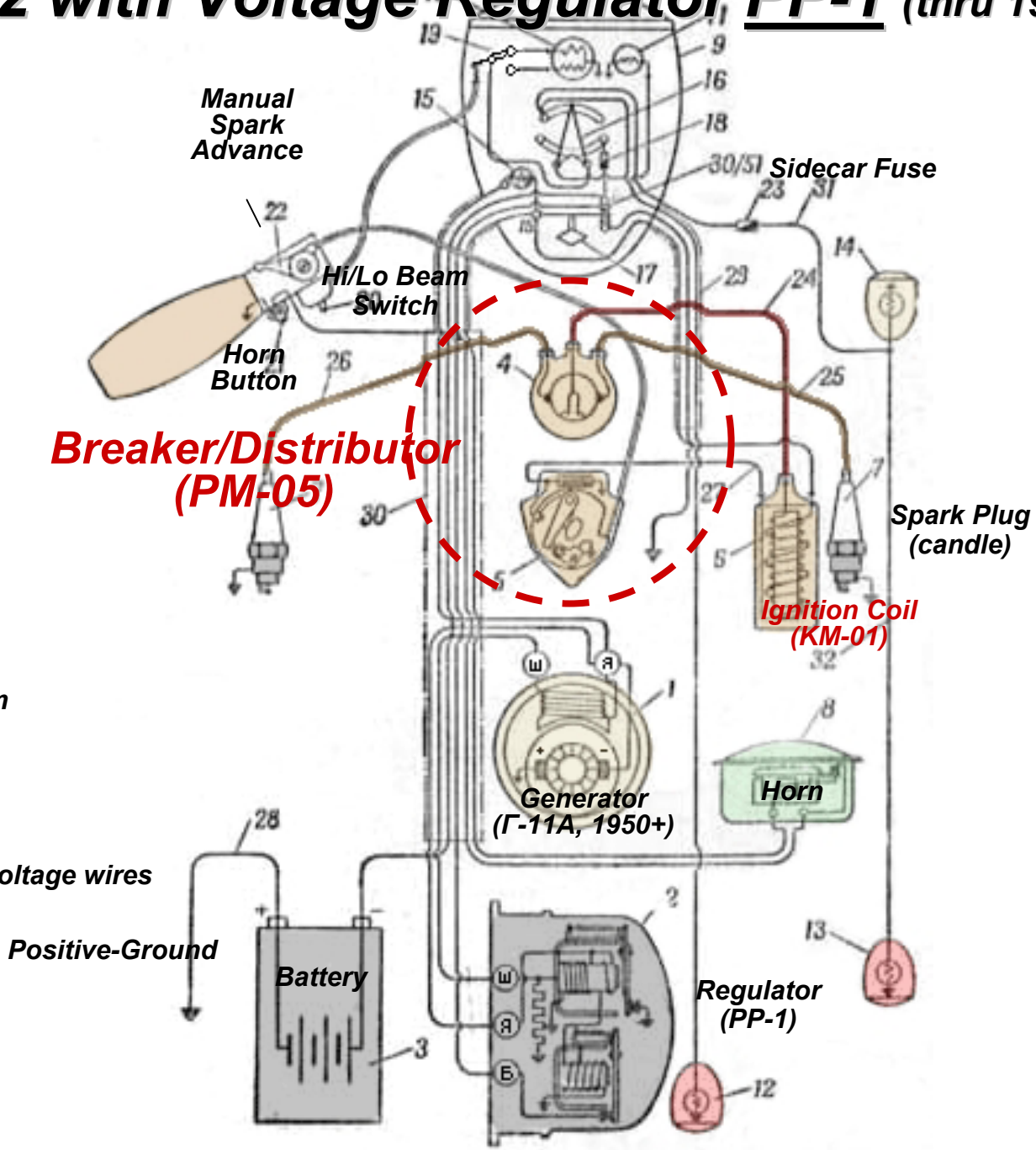
M-72 with PP-1 Regulator

1. Headlight Cavity
2. Hi/Lo-Beam Switch
3. Central Switch
4. Ignition Switch
5. Charge Light
6. Safety Fuse
7. Sidecar Running Lamps (no turn signals)
8. Signal Horn
9. Generator (Г-11)
10. Battery
11. Relay Regulator (RR-1/PP-1)
12. Rear Bike Lamp
13. Ignition Coil
14. Breaker Points
15. Distributor
16. Spark Plug (candle)
17. Horn Button Switch
18. Spark Advance Lever
19. Hi/Lo-Beam Dimmer Lever



Ural (Урал) M-72 with Voltage Regulator PP-1 (thru 1949)

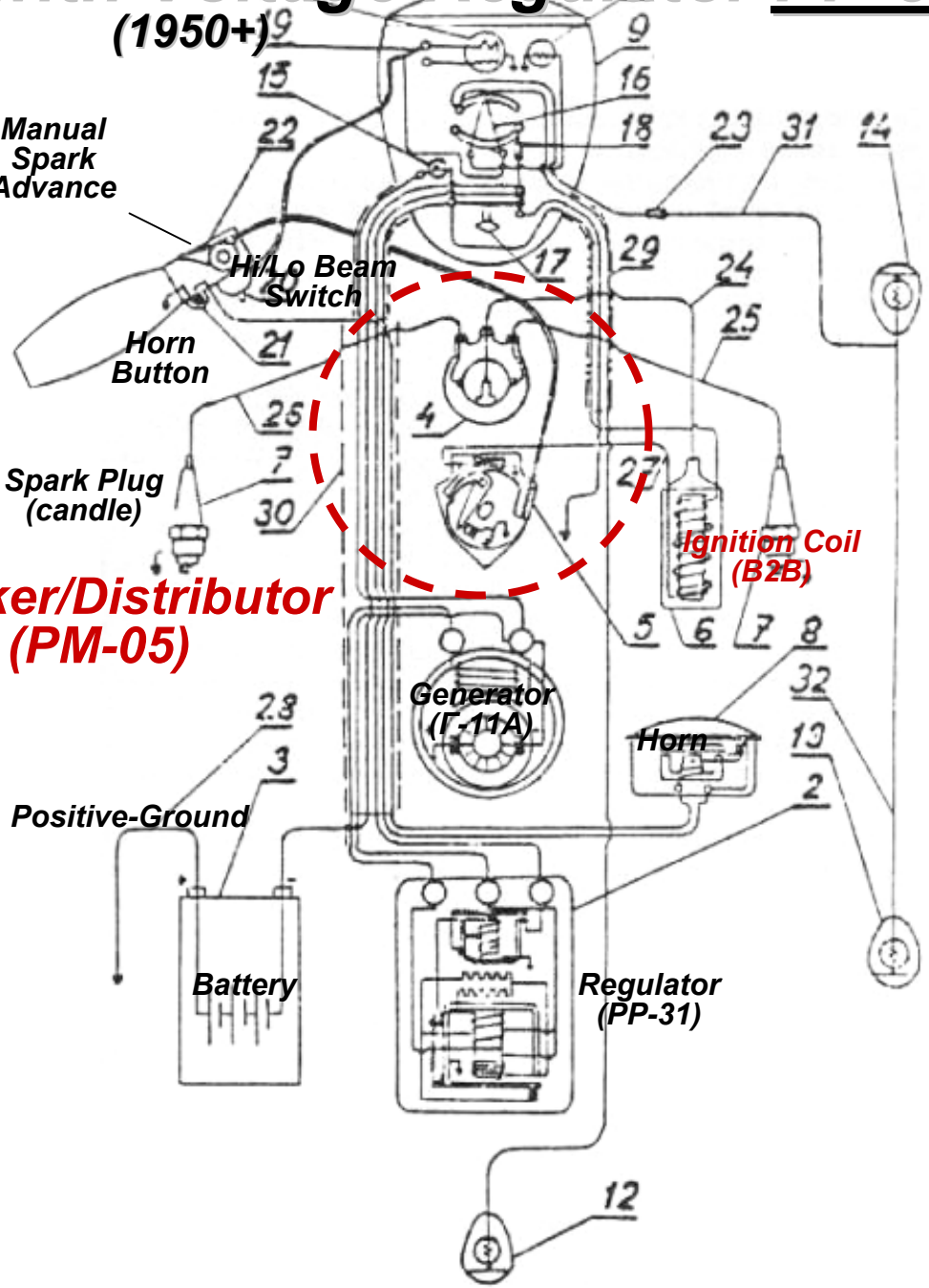
1 - generator: Г-11
2 - relay-regulator: PP-1
3 - rechargeable battery
4 - valve
5 - breaker/distributor: PM-05
6 - ignition coil: KM-01
7 - spark plugs (candles)
8 - signal
9 - lamp
10 - driving lamp and low light
11 - the parking light bulb
12 - tail light
13 - tail light sidecar
14 - front light sidecar
15 - control lamp
16 - ignition switch
17 - key
18 - fuse
19 - switch beam and dipped beam
20 - lever switch near and far light
21 - horn button signal
22 - Ignition control stick
23 - fuse lamps
24, 25 and 26 - high voltage wires
27, 28, 29 and 30 - bundle of low voltage wires
31 and 32 wire lanterns sidecar



Ural (Урал) M-72 with Voltage Regulator PP-31

(1950+)

1 – generator: Г-11А)
2 - relay-regulator: PP-31
3 - rechargeable battery
4 – valve
5 – breaker: PM-05
6 - ignition coil: B2B
7 – spark plugs (candles)
8 – signal
9 – lamp
10 - driving lamp and low light
11 - the parking light bulb
12 - tail light
13 - tail light sidecar
14 - front light sidecar
15 - control lamp
16 - a central switch
17 – key
18 – safety
19 - switch beam and dipped beam
20 - lever switch near and far light
21 - button signal
22 - Ignition control stick
23 - fuse lamps
24, 25 and 26 - high voltage wires
27, 28, 29 and 30 - bundle of low voltage wires
31 and 32 wire lanterns stroller



941 M-72, M-52, M-61, K750, K-750M, MT-12

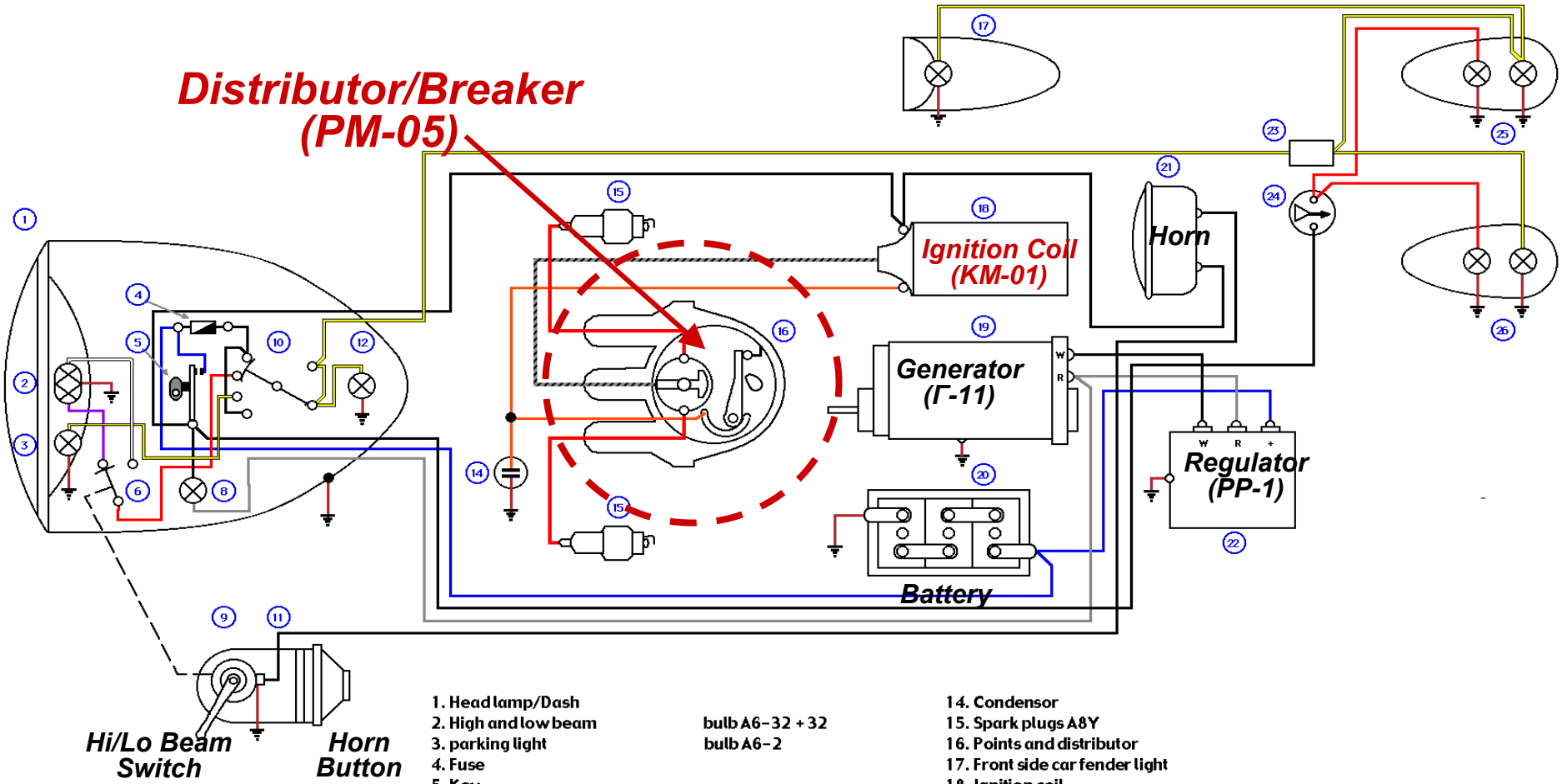
23 November 2006

Carl Allison

Note: Wire colors are not likely correct nor consistent with factory wiring. Schematic may have errors as well.

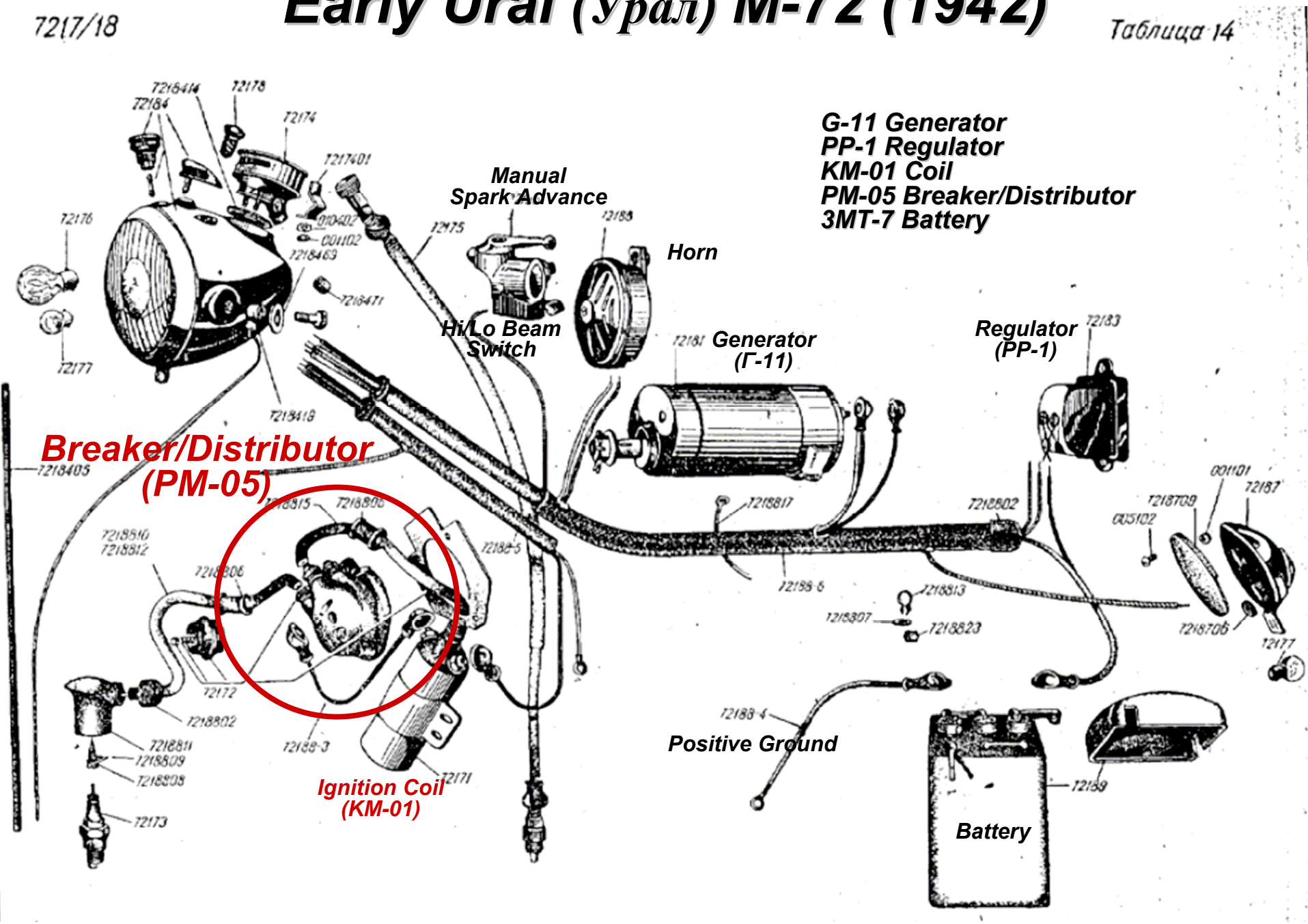
1941 Dnepr (Днепр) M-72, K-750, K-750M and MT-12

with PM-05 Distributor/Breaker Points



1. Head lamp/Dash
2. High and low beam — bulb A6-32 + 32
3. parking light — bulb A6-2
4. Fuse
5. Key
6. dimmer switch
7.
8. Generator charge indicator — lamp A6-0.25
9. Mechanical dimmer switch lever
10. Primary switch
11. horn button
12. speedometer bulb
13.
14. Condensor
15. Spark plugs A8Y
16. Points and distributor
17. Front side car fender light
18. Ignition coil
19. DC Generator
20. Battery — 3-MT-12
21. Horn — C37A
22. Regulator
23. Connector
24. Stop light switch — BK854
25. Rear side car fender light
26. Rear light

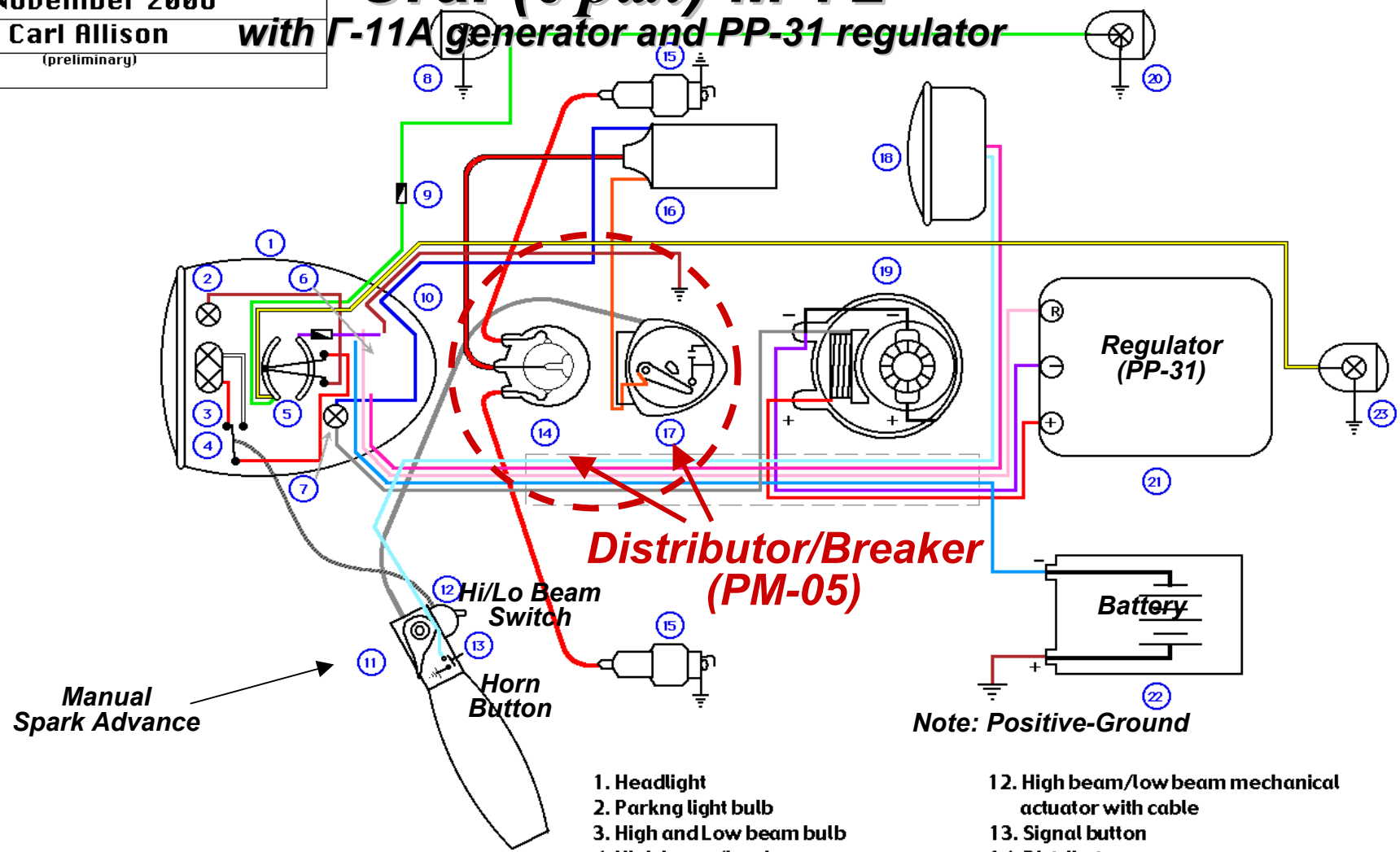
Early Ural (Урал) M-72 (1942)



Ural M72
7 November 2006
Carl Allison
(preliminary)

Ural (Урал) M-72

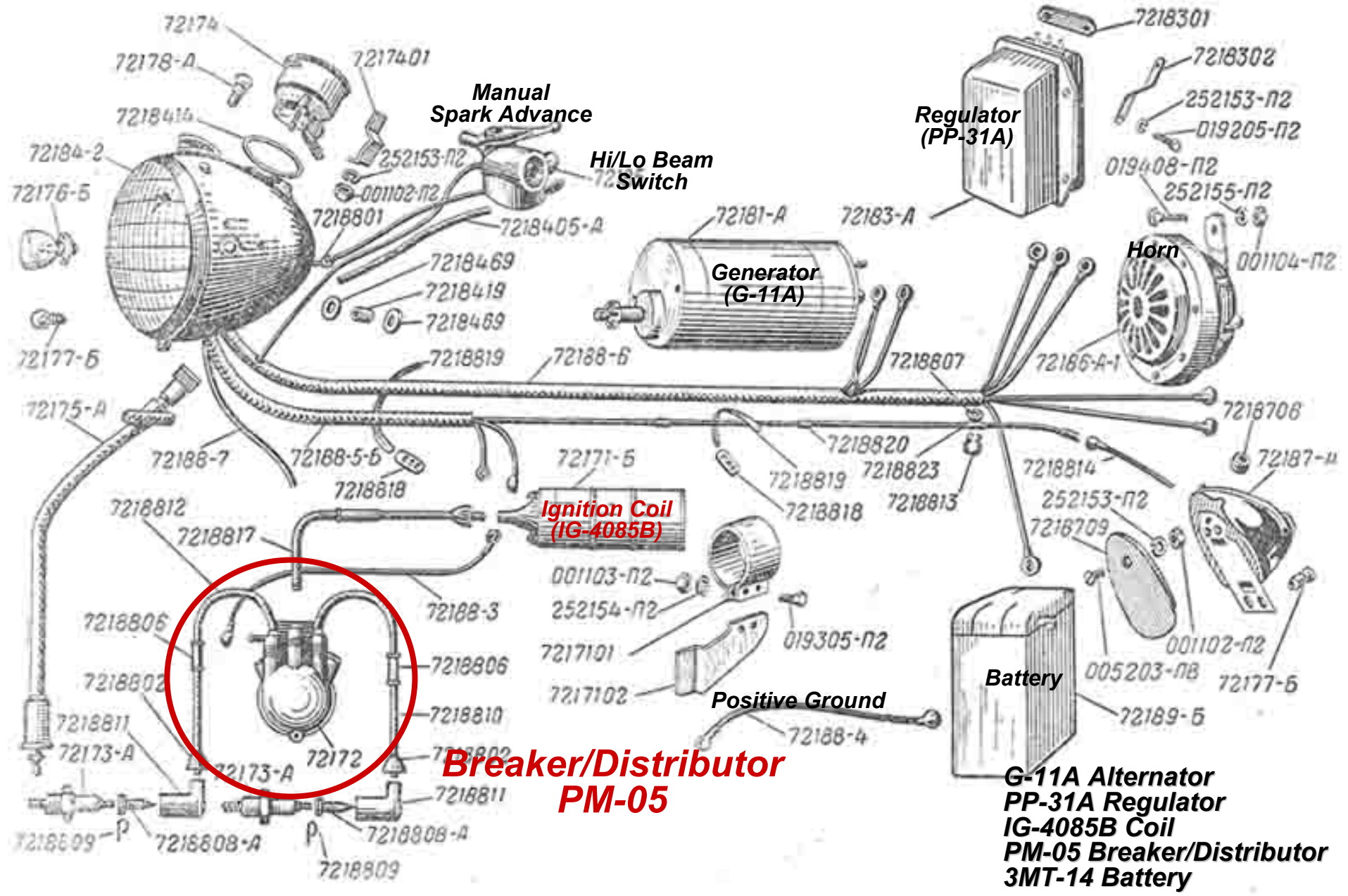
with Г-11А generator and PP-31 regulator



1. Headlight
2. Parkng light bulb
3. High and Low beam bulb
4. High beam/low beam electrical switch
5. Central switch
6. Fuse
7. Indicator light
8. front light of the sidecar
9. Sidecar lights fuse
10. Ignition key
11. Ignition setting lever with actuatorcable
12. High beam/low beam mechanical actuator with cable
13. Signal button
14. Distributor
15. Spark plugs
16. Ignition coil
17. Points
18. Horn
19. Generator
20. Sidecar taillight
21. Relay automatic controller RR-1
22. Battery
23. Taillight

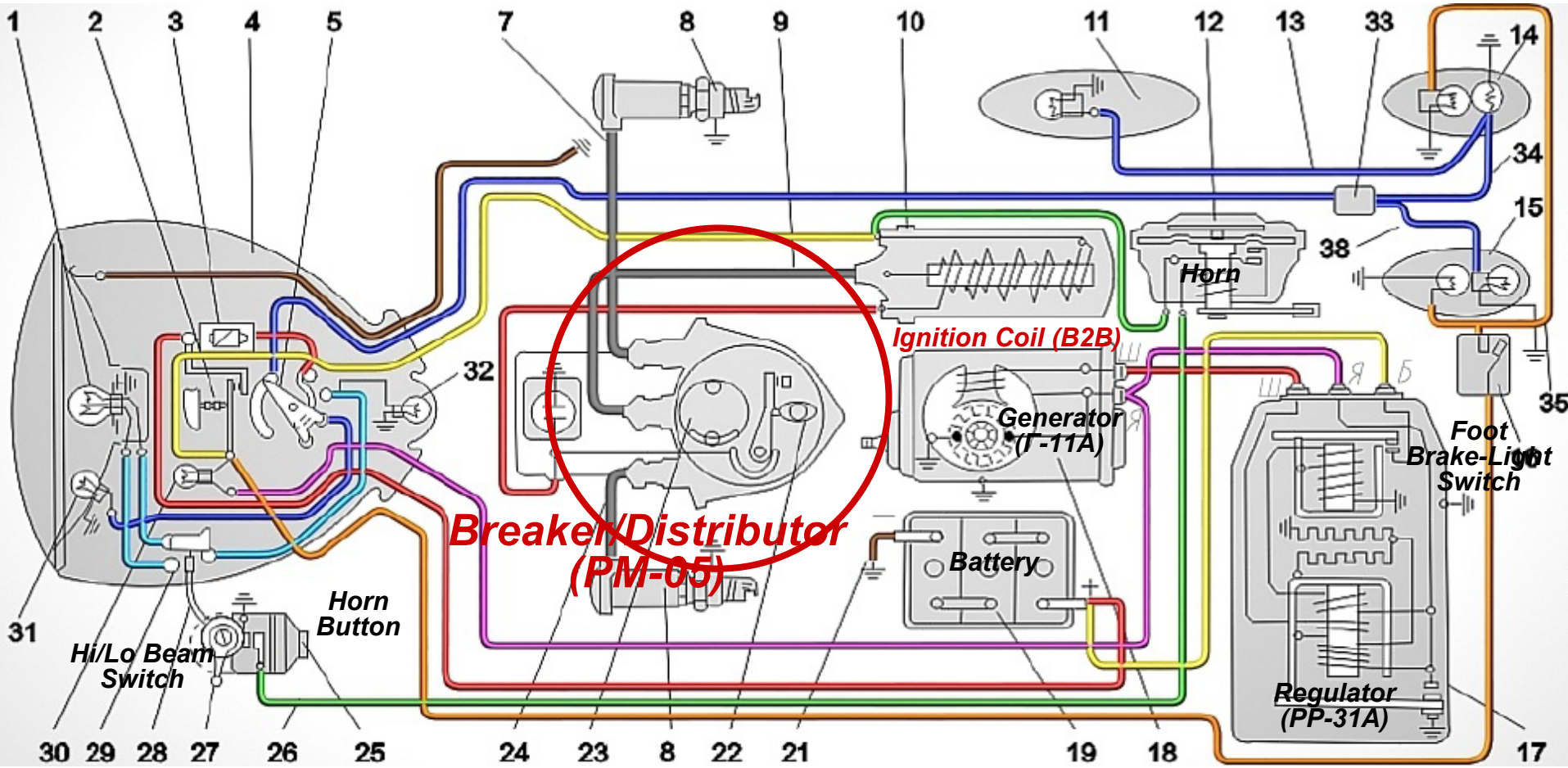
Dnepr (Днепр) Later M-72 (1955)

with Г-11А generator and PP-31 regulator



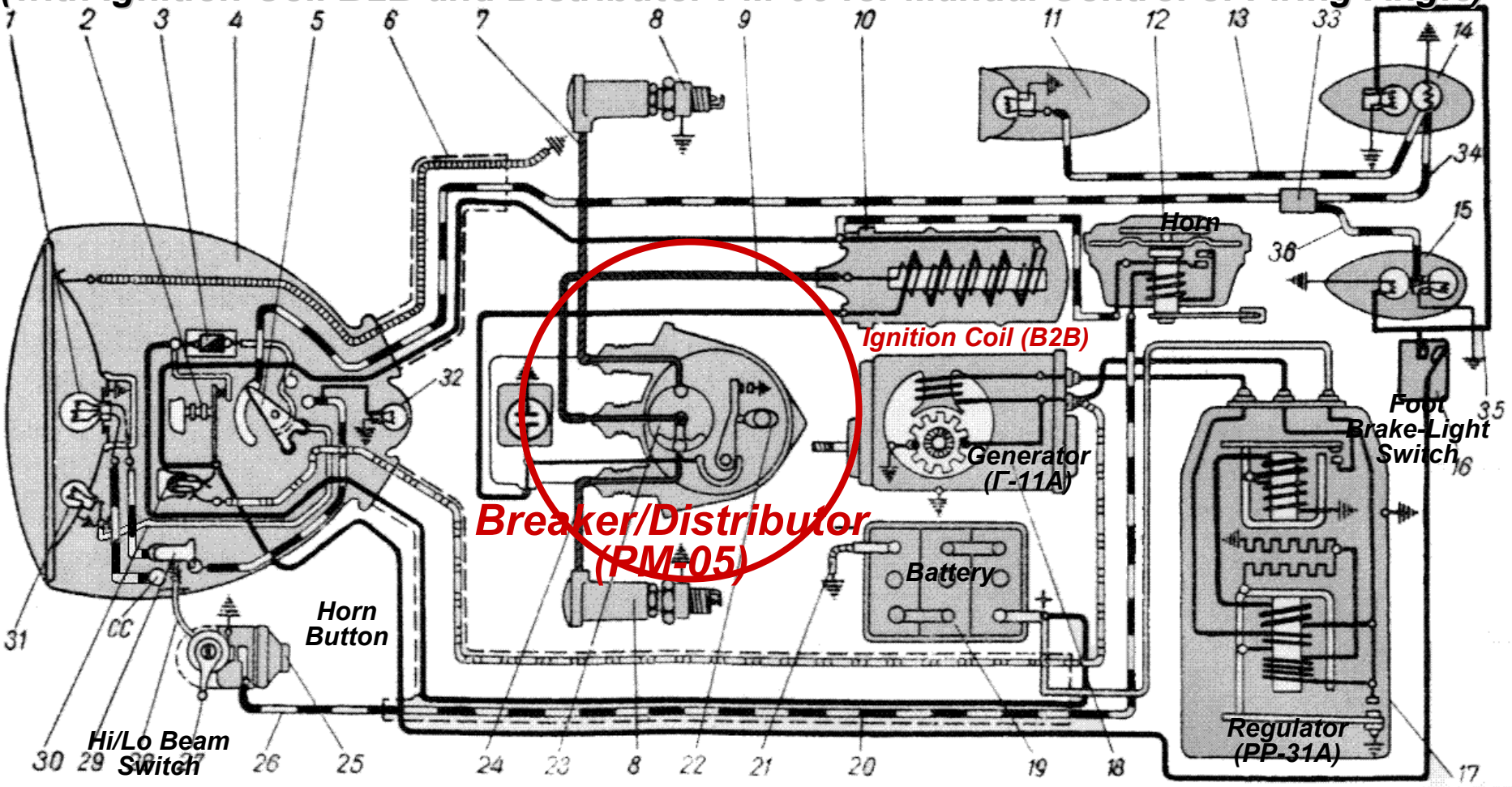
G-11A Alternator
PP-31A Regulator
IG-4085B Coil
PM-05 Breaker/Distributor
3MT-14 Battery

Dnepr (Днепр) Early K-750



Dnepr (Днепр) Early K-750 and K-750M

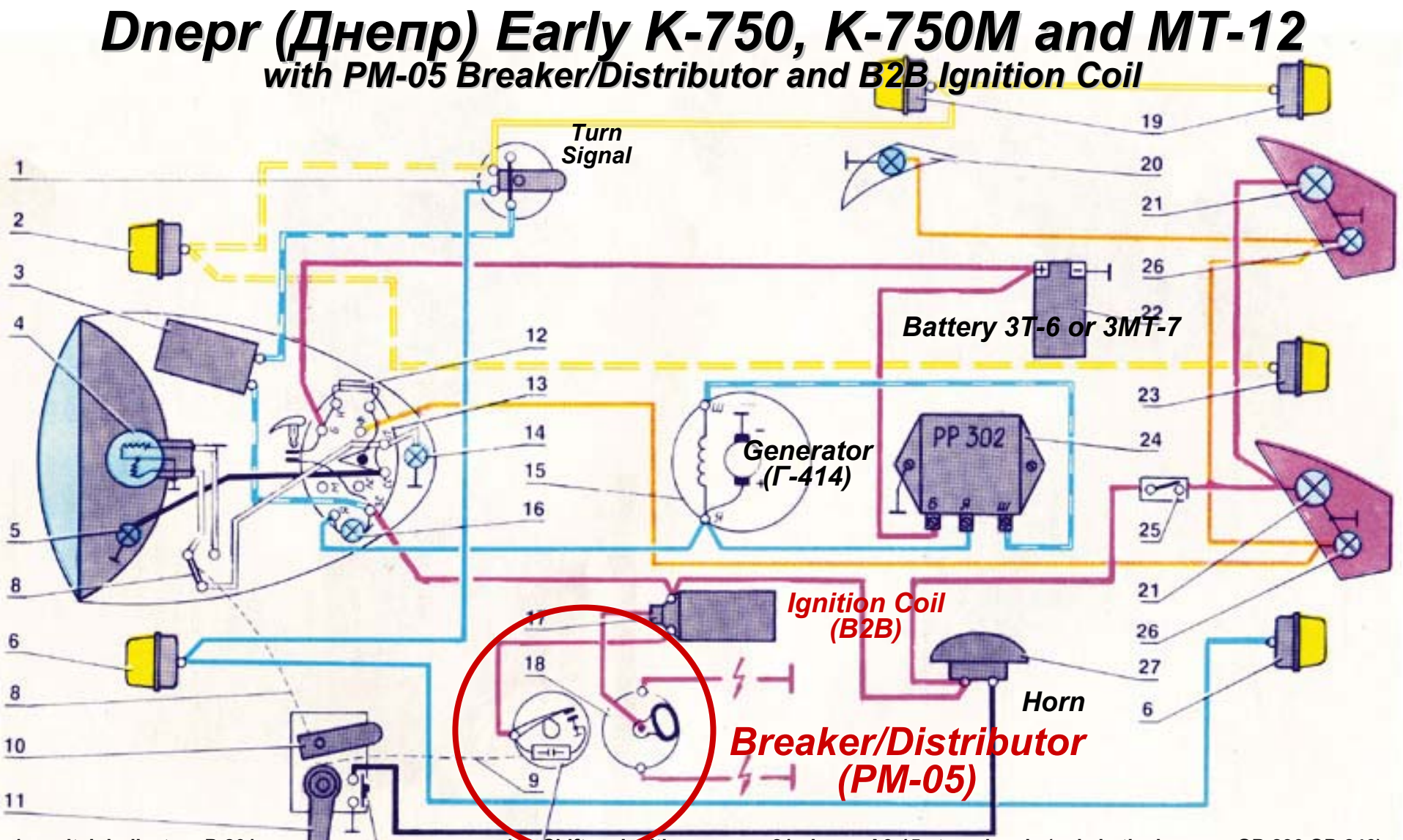
(with Ignition Coil B2B and Distributor PM-05 for Manual Control of Firing Angle)



1 - lamp beam and dipped beam, 2 - key 3 - safety 4 - lamp, 5 - central switch, 6 - wire “ground", 7 - high voltage wire, 8 – spark plugs, 9 - high voltage 10 - ignition coil, 11 - front light stroller, 12 – horn, 13 - wire front canopy sidecar, 14 - tail light sidecar, 15 - tail lamp of motorcycle, 16 - gauge stoplight, 17 - Relay-regulator, 18 – generator, 19 – battery, 20 - Low voltage wiring loom, 21 - the wire "battery – ground, 22 - breaker, 23 - valve, 24 - high voltage wire and 25 - button signal 26 - wire signal 27 - advance ignition; 28 - cord switch driving and parking light, 29 - switch to driving and parking light, 30 - control lamp, 31 - the parking light bulb, 32 - lamp illuminated; 33 - Connecting Jack wires, 34 - cable sidecar lamps, 35 - wire from the sensor to Stop lamp, 36 - wire from the connector to the lamp lighting plate

Dnepr (Днепр) Early K-750, K-750M and MT-12

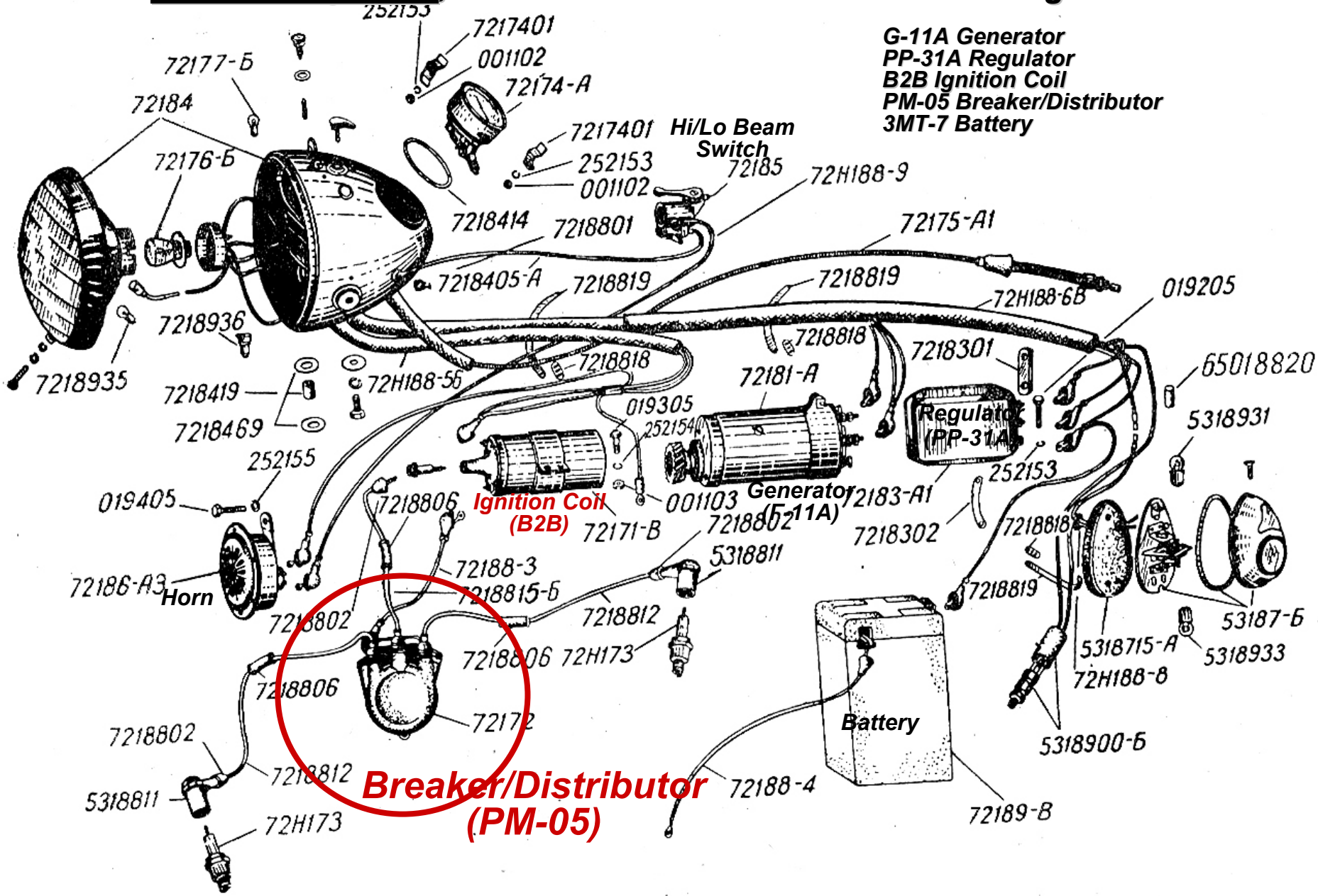
with PM-05 Breaker/Distributor and B2B Ignition Coil



1 - switch indicators P-201
2 - The right front indicator lamp on a motorcycle-alone
3 - Flasher PC-419
4 - lamp head light headlamp A6-32, 21 or A6-32 +32
5 - parking light bulb headlights
6 - Left direction indicators
7 - chopper PM-05
8 - light switch (located in the housing headlights)
9 - cable Shifters Ignition
10 - lever light switch
11 - Shifters Ignition
12 - fuse 15A
13 - central switch (on M-72 & K-750 slightly different notation terminals)
14 - bulb illumination A6-2 scale speedometer
15 - generator
16 - control lamp of the generator A6-0.25
17 - ignition coil KM-01 or B-2B
18 - Splitter
19 - Indices turning right (sidecar)
20 - front position lamp sidecar
21 - Lamp A6-15 stop-signals (only in the lamp, or OP-230 OP-246)
22 - battery 3MT-6 or 3MT-7
23 - right rear indicator lamp on motorcycle-alone
24 - relay-regulator
25 - stop light switch
26 - headlight rear position lamps
27 - horn C-35
28 - horn button

Dnepr (Днепр) Early K-750

with PP-31A Regulator, PM-05 Breaker/Distributor and B2B Ignition Coil



Dnepr (Днепр) Later K-750

with PP-302 Regulator, PM-05 Breaker/Distributor and B2B Ignition Coil

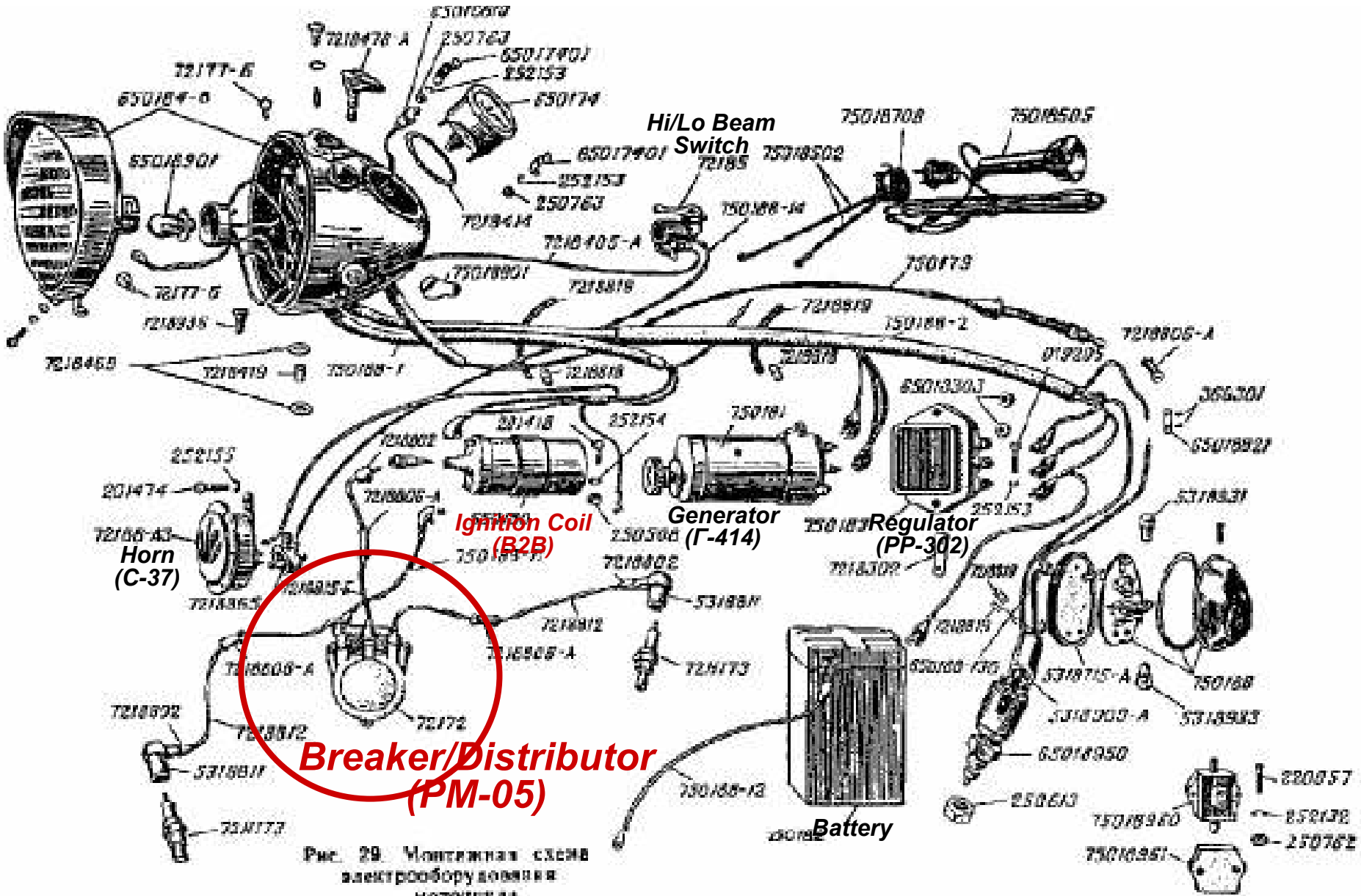
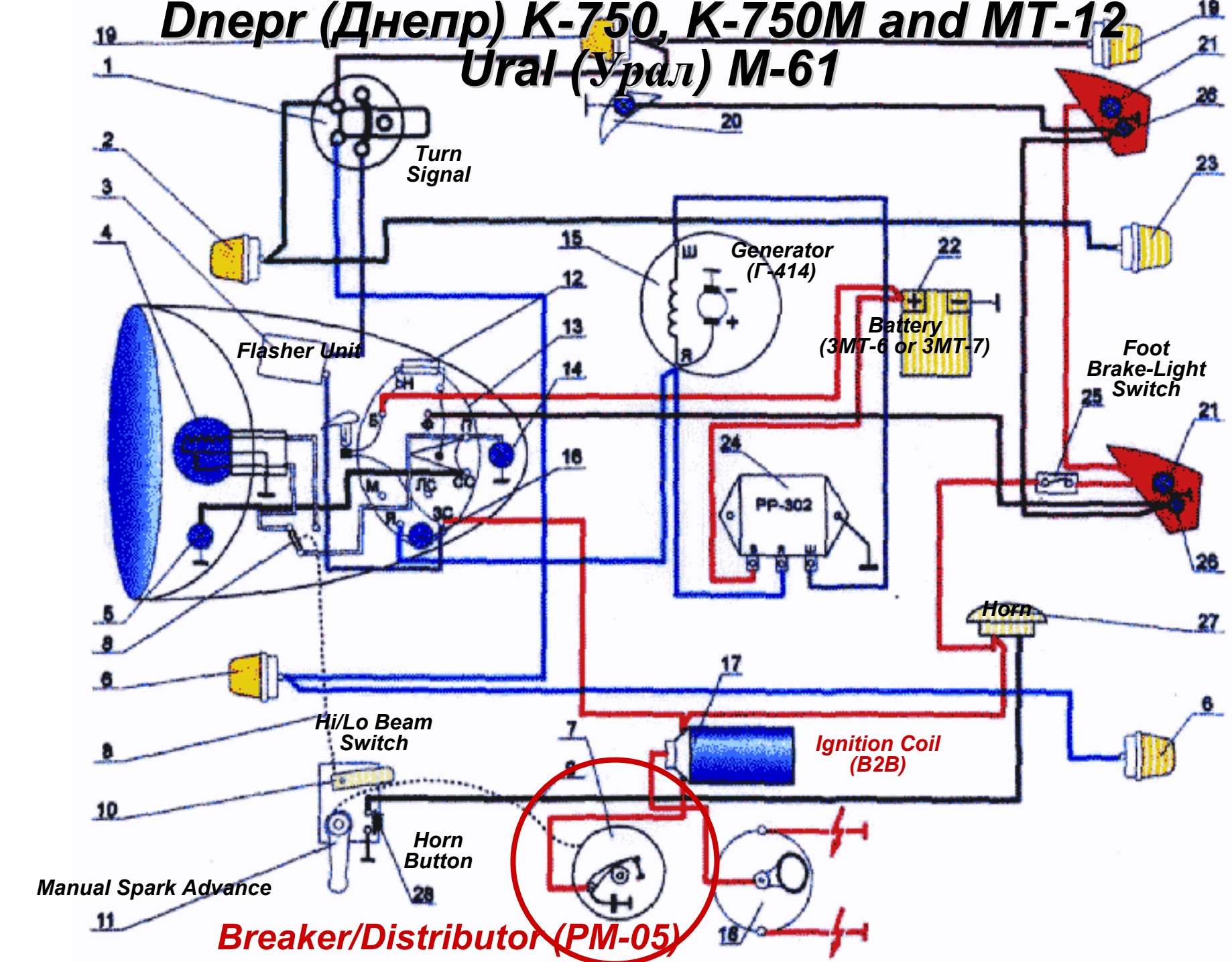


Рис. 29. Монтажная схема электрооборудования мотоцикла

Dnepr (Днепр) K-750, K-750M and MT-12
Ural (Урал) M-61



Dnepr (Днепр) K-750M

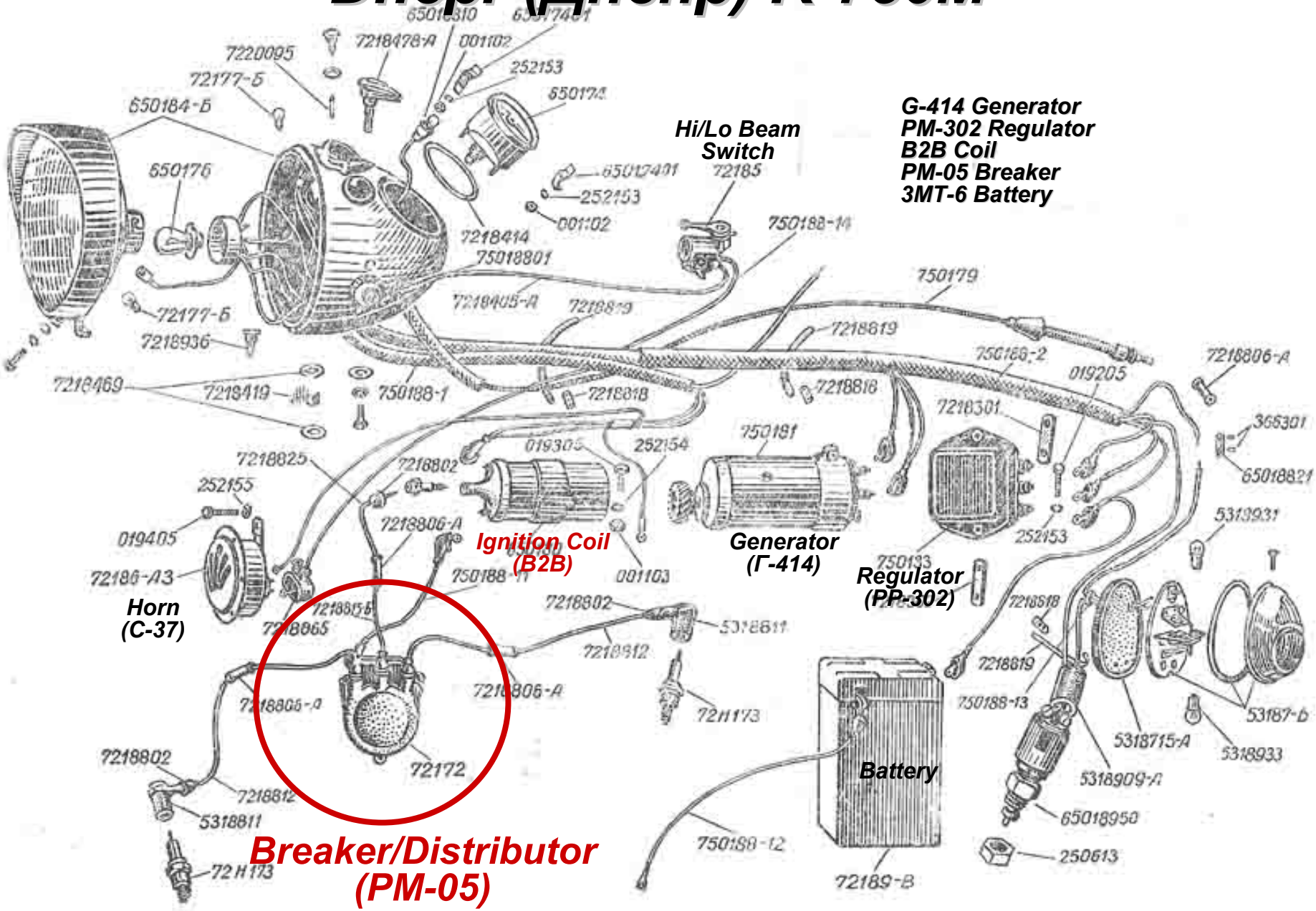
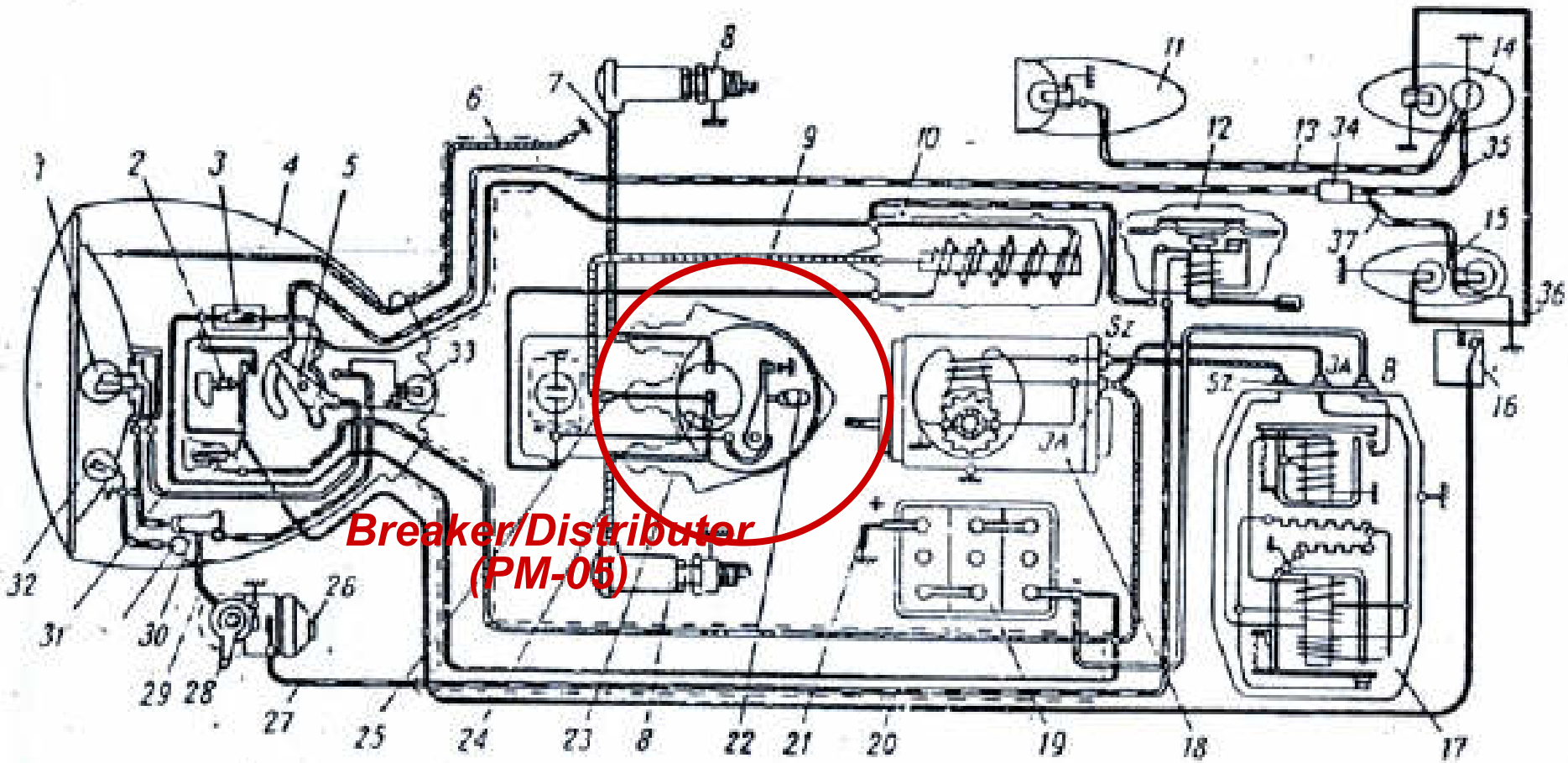


Рис. 34. Монтажная схема электрооборудования мотоцикла

K-750M



Rys. 69. Schemat instalacji elektrycznej motocykla K-750 W

1 — żarówka światła stosowego i światła mijania, 2 — kluczyk, 3 — bezpiecznik, 4 — reflektor, 5 — główny przełącznik, 6 — przewód do „masy", 7, 8, 24, 25 — przewody wysokiego napięcia, 9 — świece zapłonowe, 10 — cewka zapłonowa, 11 — lampa przednia przyczepy, 12 — sygnał dźwiękowy, 13 — przewód do przedniej lampy przyczepy, 14 — lampa tylna przyczepy, 15 — lampa tylna motocykla, 16 — wyłącznik światła hamulcowego („stop"), 17 — regulator prądnicy, 18 — prądnica prądu stałego, 19 — bateria akumulatorów, 20 — przewody niskiego napięcia, 21 — przewód łączący baterię akumulatorów z „masą", 22 — przerywacz, 23 — rozdzielacz zapłonu, 26 — przycisk sygnału dźwiękowego, 27 — przewód sygnału, 28 — dźwignia przyspieszania momentu zapłonu, 29 — linka przełącznika świateł, 30 — przełącznik świateł, 31 — lampka kontrolna, 32 — żarówka światła postojowego, 33 — żarówka oświetlenia skali szybkościomierza, 34 — gniazdo przewodów, 35 — przewód lampy przyczepy, 36 — przewód od włącznika do lamp światła hamulcowego („stop"), 37 — przewód od gniazda przewodów do lampy oświetlenia tablicy rejestracyjnej

K-750, MB-750

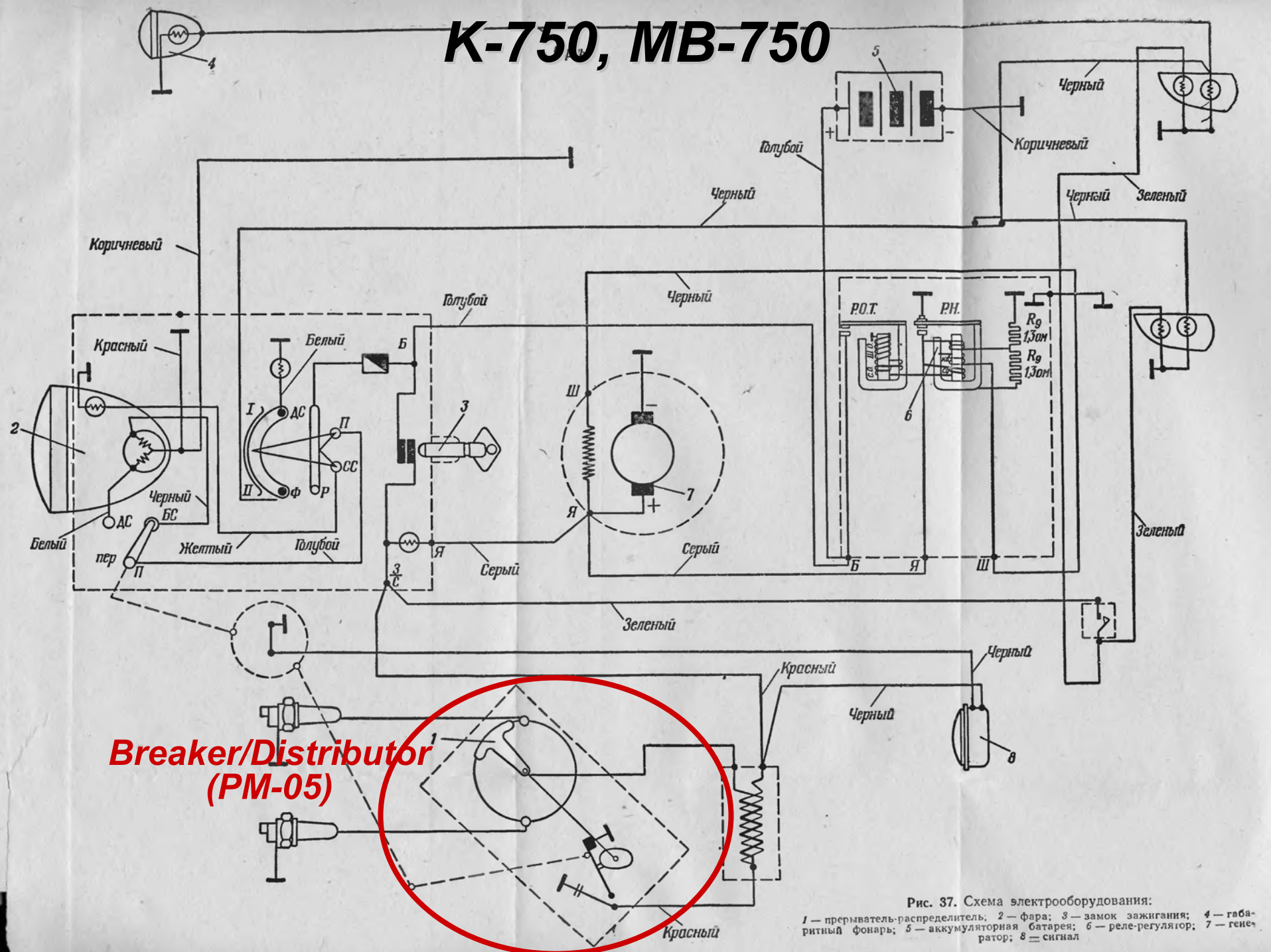


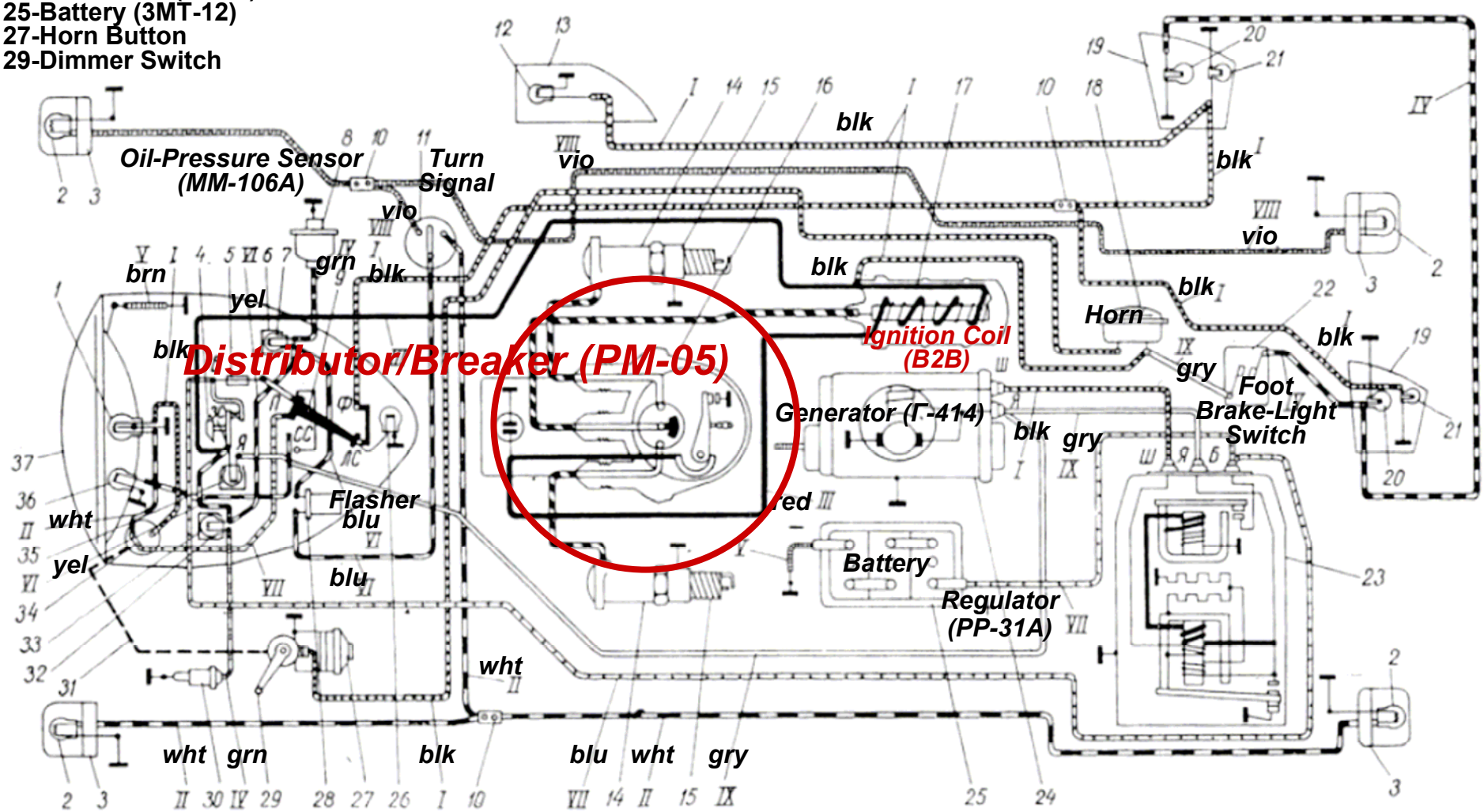
Рис. 37. Схема электрооборудования:

1 — прерыватель-распределитель; *2* — фара; *3* — замок зажигания; *4* — габаритный фонарь; *5* — аккумуляторная батарея; *6* — реле-регулятор; *7* — генератор; *8* — сигнал

Dnepr (Днепр) Early K-650

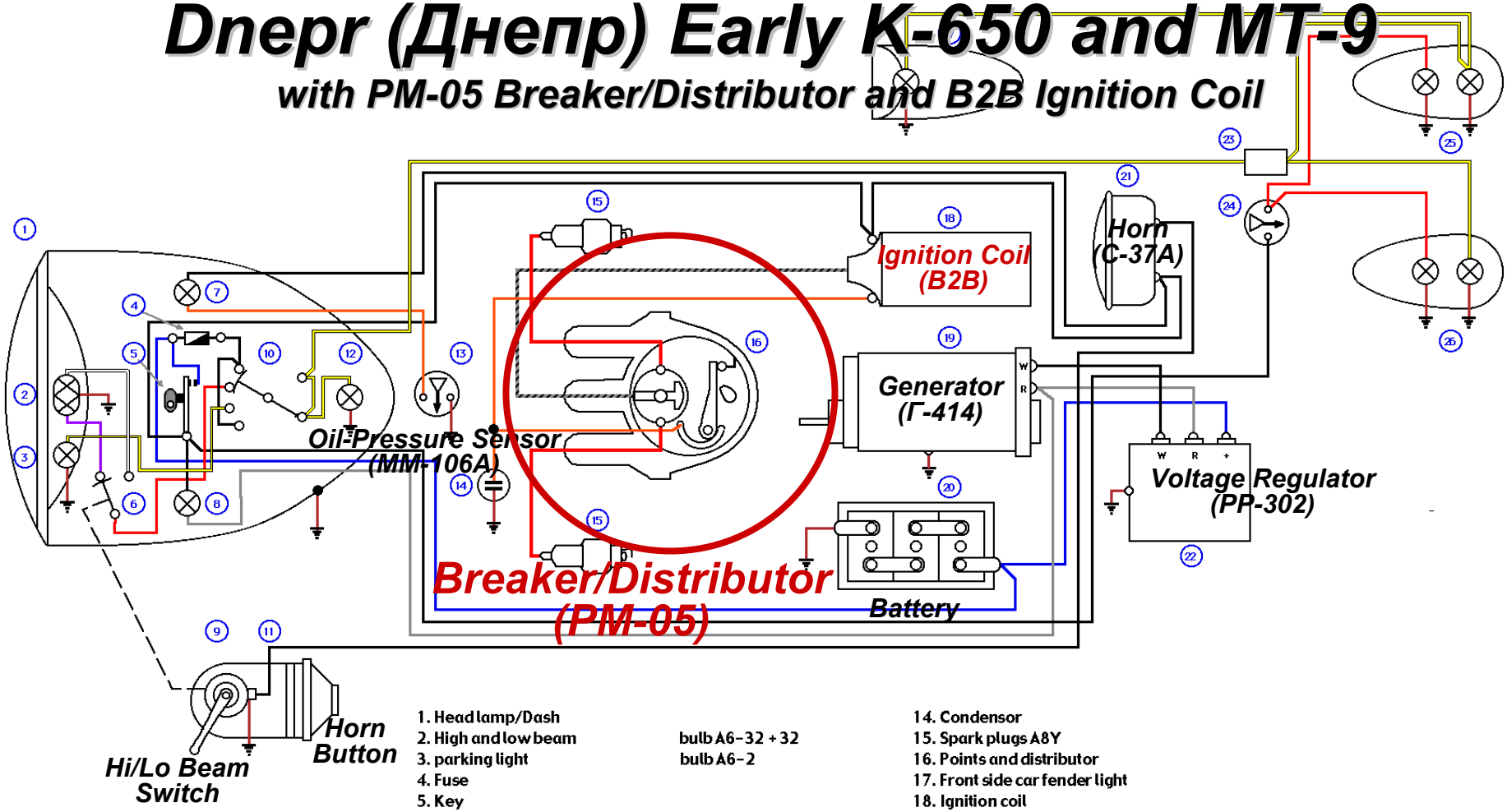
with PM-05 Breaker/Distributor and B2B Ignition Coil

7&8-Oil Pressure Sensor (MM-106) and Emergency Light
15- Spark Plug (Candle) (A8)
16-Interrupter/Distributor (PM-05)
18-Horn (C37A)
22-Foot Brake-Light Switch (BK854)
23-Regulator (PP-31A)
24- Generator (Г-414)
25-Battery (3MT-12)
27-Horn Button
29-Dimmer Switch



Dnepr (Днепр) Early K-650 and MT-9

with PM-05 Breaker/Distributor and B2B Ignition Coil

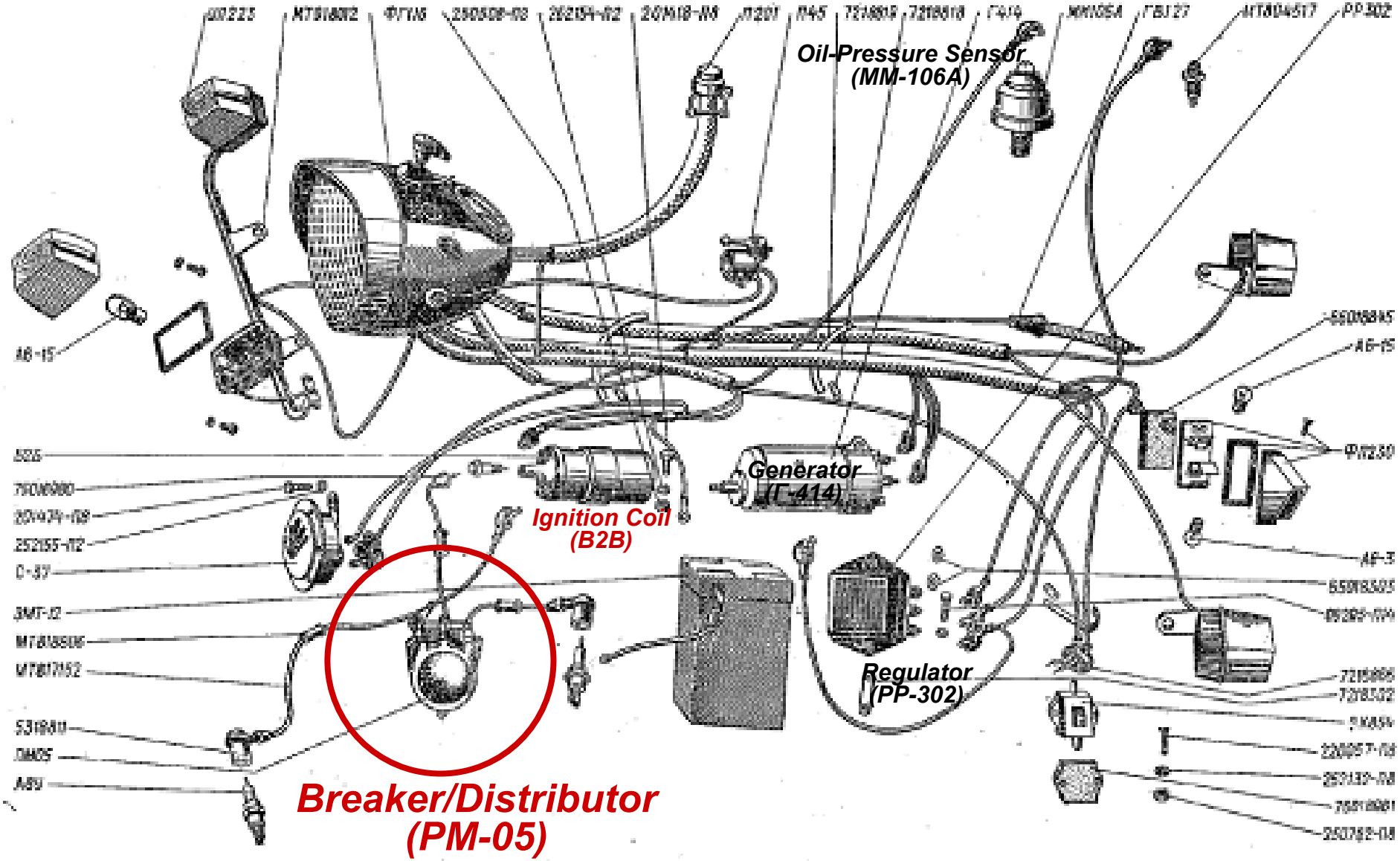


1. Head lamp/Dash		14. Condensor	
2. High and low beam	bulb A6-32 + 32	15. Spark plugs A8Y	
3. parking light	bulb A6-2	16. Points and distributor	
4. Fuse		17. Front side car fender light	
5. Key		18. Ignition coil	
6. dimmer switch		19. DC Generator	
7. Oil pressure indicator	A6-1	20. Battery	3-MT-12
8. Generator charge indicator	lamp A6-0.25	21. Horn	C37A
9. Mechanical dimmer switch lever		22. Regulator	
10. Primary switch		23. Connector	
11. horn button		24. Stop light switch	BK854
12. speedometer bulb		25. Rear side car fender light	
13. Oil pressure switch		26. Rear light	

1968 K-650, Dniepr MT-9

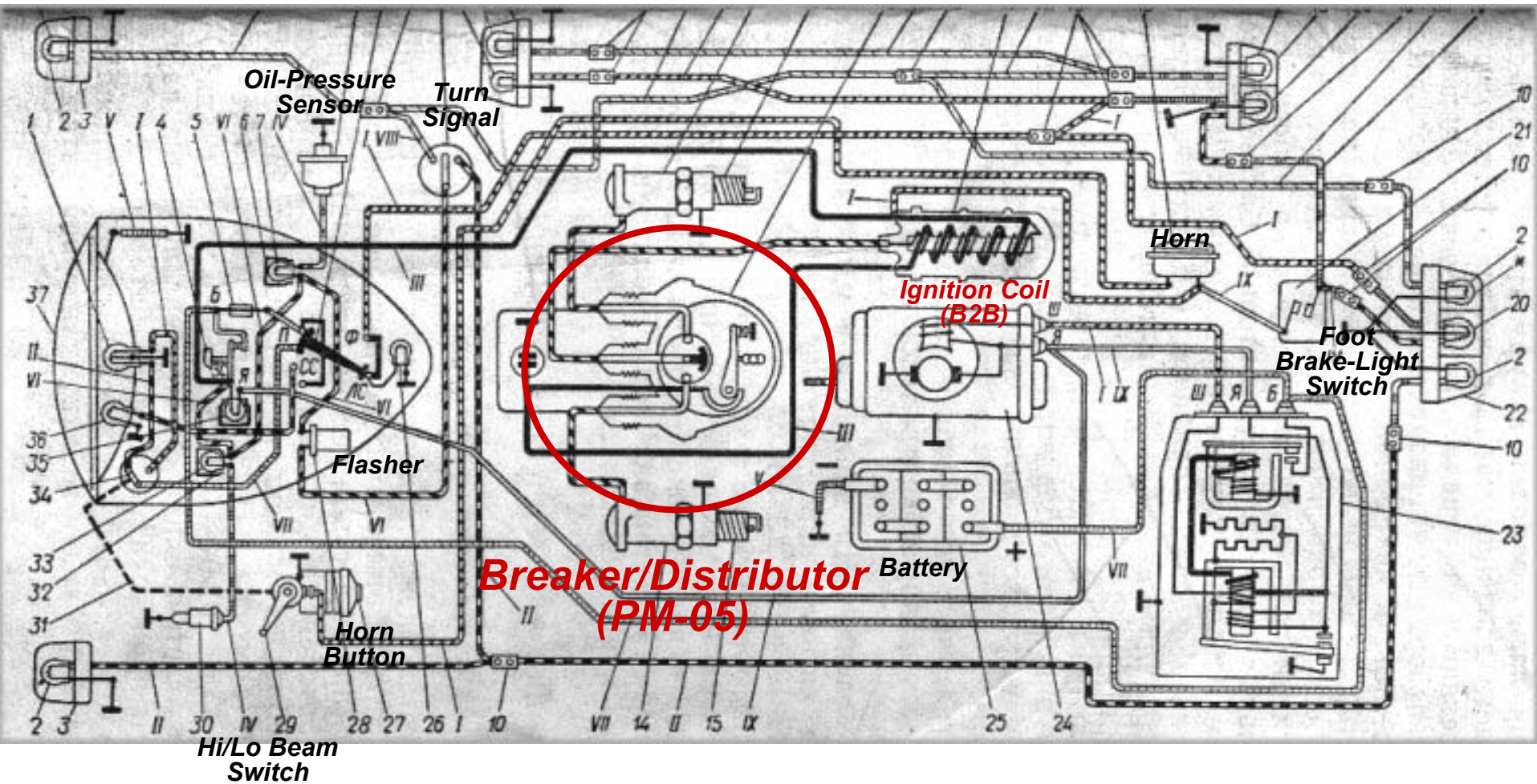
wykonał:
Carl Allison

Dnepr (Днепр) MT-9 with Manual Control of Firing Angle
(B2B Ignition Coil and PM-05 Breaker/Distributor)

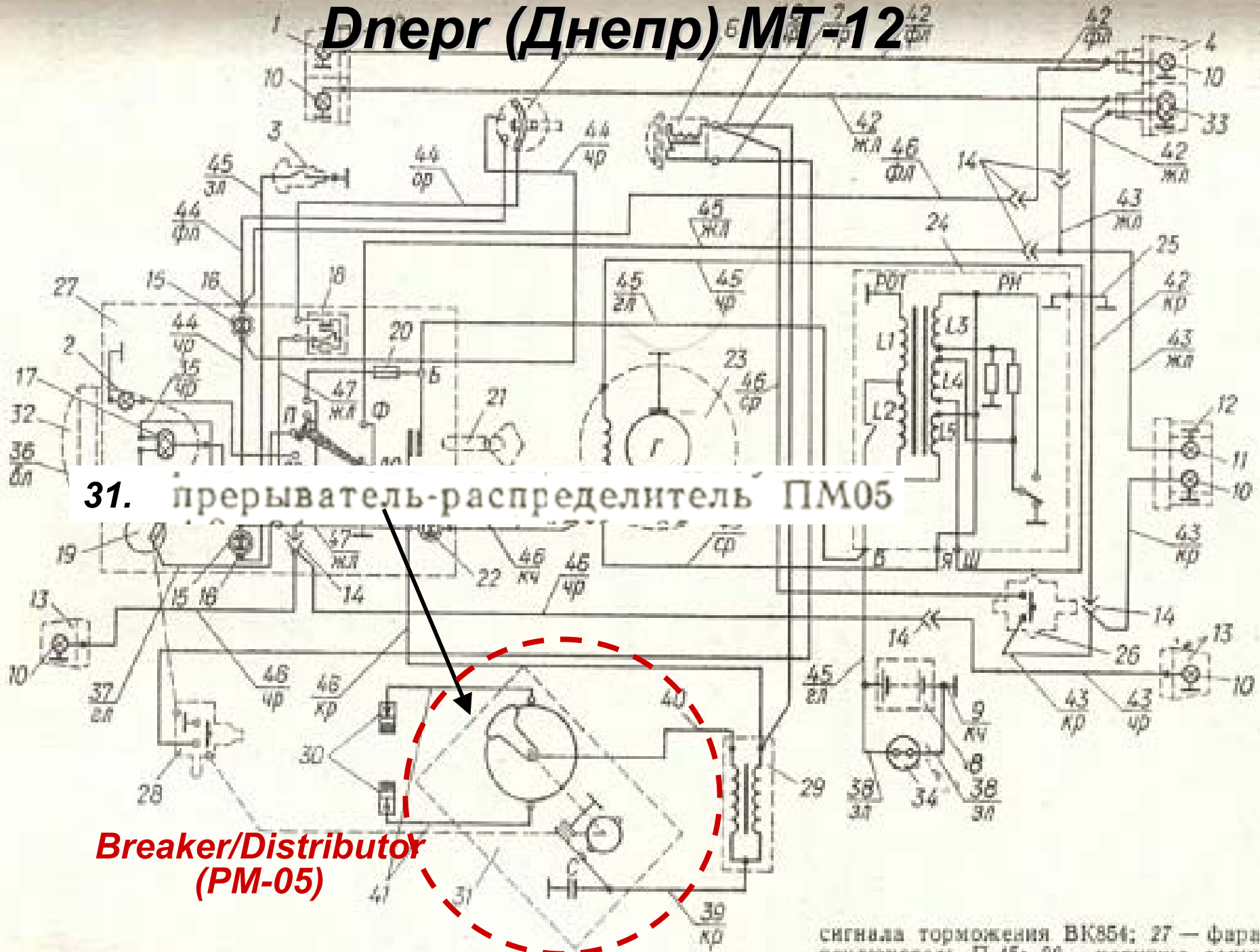


Dnepr (Днепр) MT-9: Manual Control of Firing Angle

(B2B Ignition Coil and PM-05 Breaker/Distributor)



Dnepr (Днепр) MT-12



сигнала торможения ВК854; 27 — фара

Dnepr (Днепр) MB-750, MT-12 (1961)

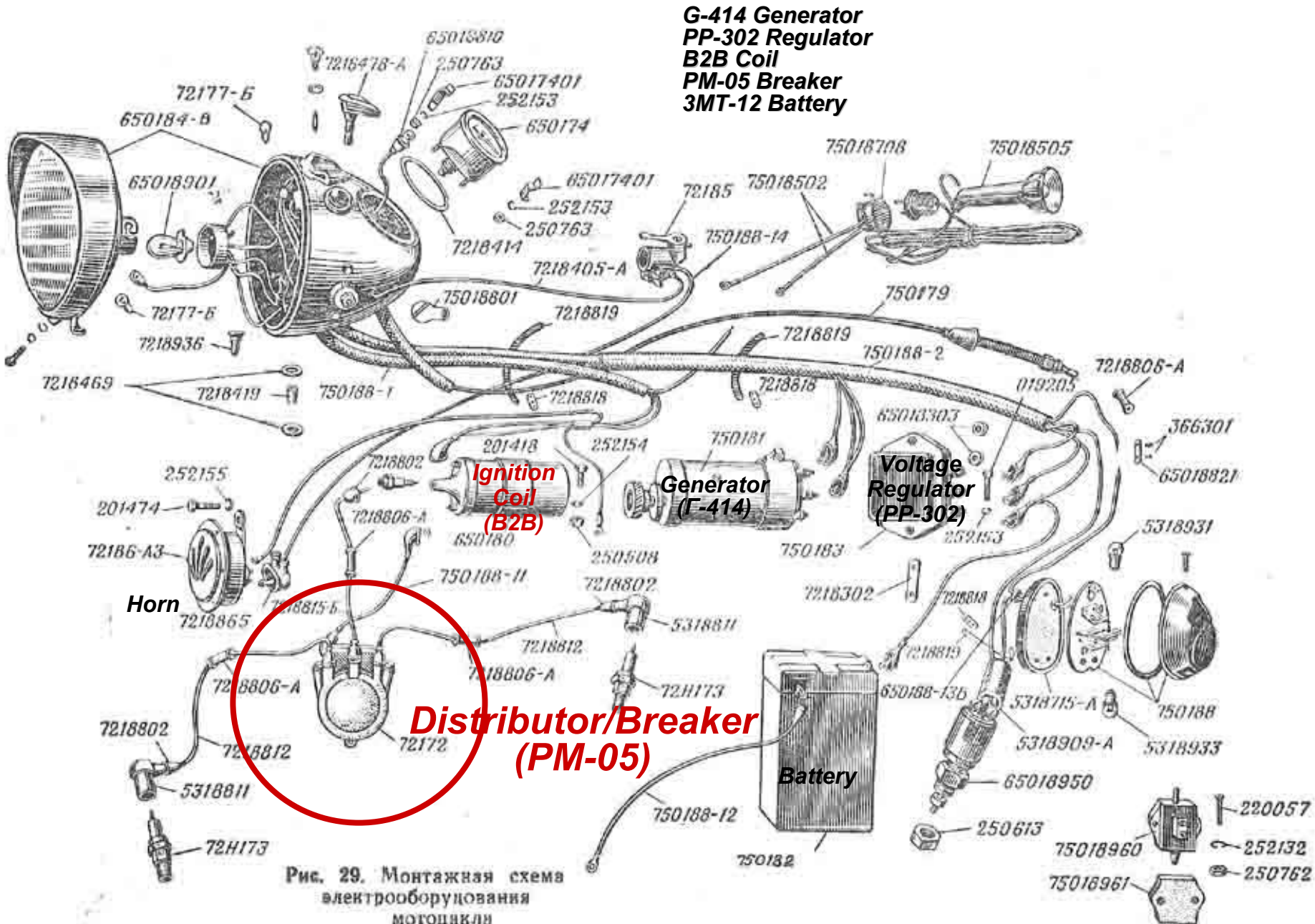


Рис. 29. Монтажная схема электрооборудования мотоцикла