

Signal Training Bulletin

COMMITTEE G: Education & Training

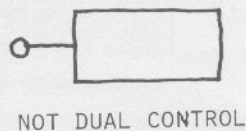
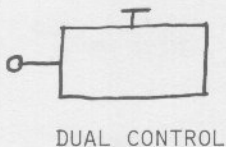
Communication & Signal Division, AAR

A10B- M3 and M23 Power Stitch Machines

Approved January 1981

Definition: A device, the complete operation of which performs the three functions of unlocking, operating and locking a switch, moveable point frog or derail.

Symbol:



Description: The M3 and M23 electric switch machines consist essentially of a motor and gear train for operating and locking the switch and a cam arrangement for operating a circuit controller that includes a point detector with a latch-out device.

Purpose and Application: The M3 and M23 machines are used for turnouts on centralized traffic control mainlines, in interlocking plants and yards. The M23 with its dual control feature is especially advantageous in ctc territory. Motors and gear ratios are available for operation from 20 or 110 volts dc or 100 volts ac. The M23 machine has dual control features with hand control and selector levers. The M3 machine has no hand operation feature except that in an emergency it can be hand cranked. (See Figures 1 and 2)

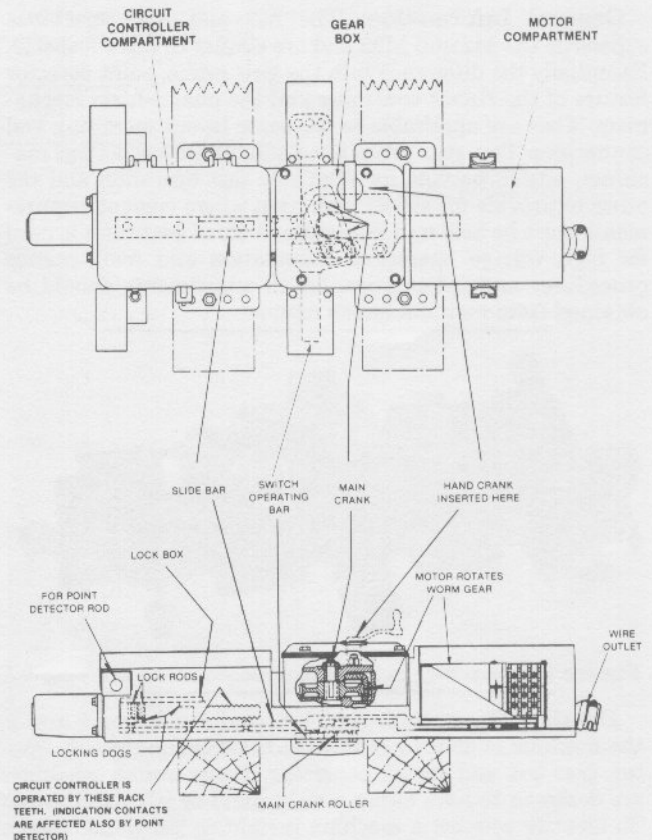


Figure 1- Outline diagram of the M3 switch machine.

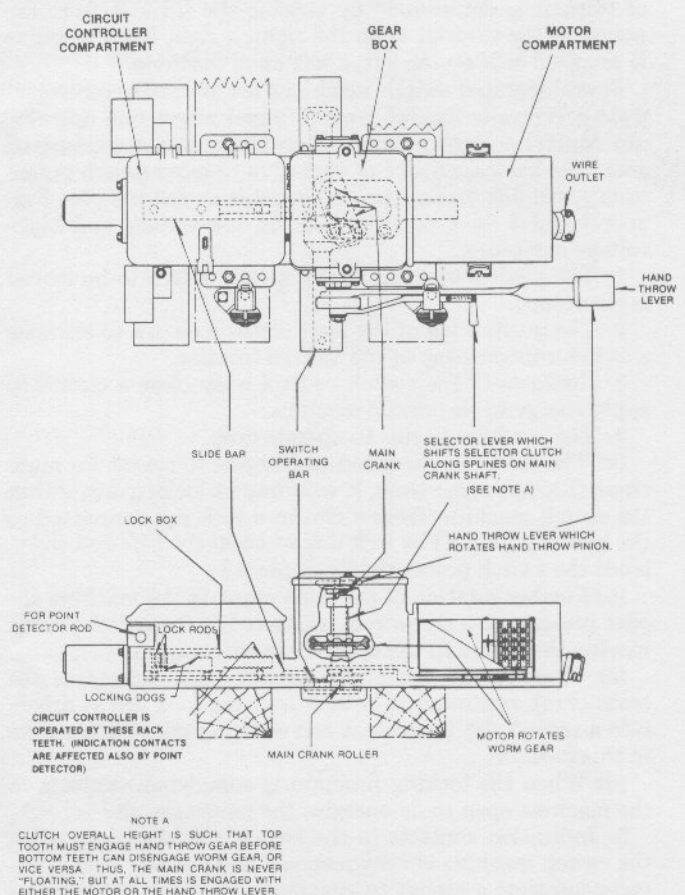


Figure 2- Outline diagram of the M23A switch machine.

General Information: The M3 and M23 machines supersede the M2 and M22 and are similar in most respects. Essentially the difference is in the gear ratios, point detector feature of the circuit controller and the dual control mechanism. They are applicable to the same layout mounting and connectors. Two gear ratios are available for low voltage machines, one to provide for relatively fast operation and the other to provide for slower operation where current requirements must be held to a minimum. A third gear ratio is used for high voltage operation. Installation and maintenance procedures and information on all adjustments should be obtained from manufacturer's manual.

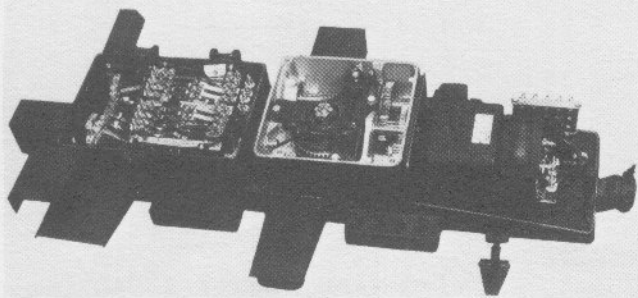


Figure 5- M3 power switch machine.

Detailed Operation: As illustrated in Figures 1 and 2, the machine is divided into three basic compartments, motor, gear box and circuit controller. Power switch machines are designed to have either a right hand or left hand throw. To identify whether a machine is right or left hand, view it from the motor end. If the rods are connected on the right side, it is a right hand machine. Likewise, it is a left hand machine if the rods are connected to the left side. The type of turnout is determined by viewing the turnout from the points, if the turnout is on the right, a right hand machine is required or if on the left, a left hand machine.

Power operated switch machines are normally controlled from a centrally located control panel where one operator can control a large number of switches over a widespread area. The basic sequence of operation to move switch points from normal to reverse or vice versa is as follows (See Figures 3 and 4 for typical circuits for low-voltage and high-voltage machines.)

1- The control lever applicable to the switch to be moved is positioned.

2- The positioning of the lever closes a circuit to energize a switch control relay at the desired location.

3- Contacts of the switch control relay close a circuit to apply energy to the switch machine.

4- The machine begins to operate and:

(a) The motor is energized and begins to rotate the main crank through a gear train. It withdraws a locking dog, within the switch machine, from a slot in a lock rod connected to the switch points. (The lock dog when in the lock rod slot holds the switch points rigidly in place.)

(b) Further rotation of the main crank in the machine applies pressure to a throw rod, connected to the switch points, moving the points to the opposite position.

(c) Upon completion of the switch point movement the main crank continues to rotate until the lock dog is driven into a second slot in the lock rod securing the switch points in this position.

(d) When the locking function is completed, contacts in the machine open to de-energize the motor circuit.

5- Indication contacts in the switch machine close when the switch machine is fully reversed and locked. These contacts complete a circuit to energize a relay which indicates to the operator, by means of a light, that the switch has completed its movement and is locked again.

CHART FOR FIGURES 3 & 4

NOTES:

- (A) - SWITCH MACHINE WIRING IS SHOWN FOR A SWITCH HAVING THE R.H. POINT NORMALLY CLOSED. IF USED FOR SWITCH HAVING THE L.H. POINT NORMALLY CLOSED, INTERCHANGE THE EXTERNAL LEADS TO TERMINALS B AND C AND TO TERMINALS 5 AND 10 (LOW VOLTAGE) OR D AND 35 (HIGH VOLTAGE) ON MAIN TERMINAL BOARD IN SWITCH MACHINE. ALSO REVERSE THE INDICATION CIRCUIT CONTROLLER CAMS.
- (B) - A NUMBER OR LETTER IN A CIRCLE WITHIN THE SWITCH MACHINE DENOTES THE RESPECTIVE TERMINAL POST ON MAIN TERMINAL BOARD. A NUMBER OR LETTER IN A CIRCLE OUTSIDE THE SWITCH MACHINE REFERS TO AN EQUIPMENT REFERENCE OR A NOTE. $\frac{50}{50}$ DENOTES TERMINAL WITHIN SWITCH MACHINE OTHER THAN ON THE MAIN TERMINAL BOARD.
- (C) - EXTERNAL WIRE TO BE ADDED IN FIELD.
- (D) - USE REF. (6) FOR LOW VOLTAGE - NOMINAL (20 VOLTS DC) 15 SEC. MOVEMENT WITH CLUTCH ADJUSTED TO SLIP AT 12A AND FOR HIGH VOLTAGE - NOMINAL (110 VOLTS DC) 4 SEC. MOVEMENT WITH CLUTCH ADJUSTED TO SLIP AT 13A. USE REF. (10) FOR NOMINAL (20 VOLTS DC) 8 SEC. MOVEMENT WITH CLUTCH ADJUSTED TO SLIP AT 20A.
- (E) - FOR APPLICATION OF RN-20 RECTIFIER SEE CHARACTERISTIC SHEET NB.8.3 - SH. 7A.
- (F) - SEE SK54A SERIES FOR SWITCH INDICATION CIRCUITS.

REFERENCES:

- (1) - M3 OR M23 SWITCH MACHINE WITH PERMANENT MAGNET MOTOR:
M3 - D451160 - SH. 03
M23A - D451160 - SH. 05
M23B - D451160 - SH. 06
- (2) - RELAY CASE OR HOUSE.
- (3) - DUAL SELECTOR LEVER CONTACTS ON M-23 MACHINE OR LATCH CONTACTS ACTUATED BY HAND CRANK OPERATION ON M-3 MACHINE WHICH MUST BE MANUALLY RESET.
- (4) - PP-151 MAGNETIC STICK SWITCH CONTROL RELAY, 2NR S-5 & 4NR S-5IC 240 OHM, UN322516-001-D66000-14. BASE UN341785-D66002-1.
- (5) - PN-150 BM BIASED SWITCH CONTROL REPEATER RELAY, 2F-MB0, 240 OHM, UN322517-001-D66000-27. BASE - UN376048-D66002-1.
- (6) - PN-15050 SWITCH OVERLOAD RELAY, 1B & 1C, 5.0 OHM OPER. 65 OHM STICK, UN322512-001-D66000-22. BASE - UN372344-D66002-1. THERMAL RESISTOR - 0.039 OHM IN PARALLEL WITH OPER. COIL IS INCLUDED WITH RELAY.
- (7) - 70 OHMS (INCLUDED WITH PN-15050 RELAY).
- (8) - MOTOR COMPARTMENT HEATER, 15 WATTS, 120V AC-DC, WHEN USED.
- (9) - CIRCUIT CONTROLLER HEATER, 15 WATTS, 120V AC-DC, WHEN USED.
- (10) - PN-15050 SWITCH OVERLOAD RELAY, 1B & 1C, 5.0 OHM OPER. 65 OHM STICK, UN322512-002-D66000-22. BASE - UN372344-D66002-1. THERMAL RESISTOR - 0.035 OHM IN PARALLEL WITH OPER. COIL IS INCLUDED WITH RELAY.

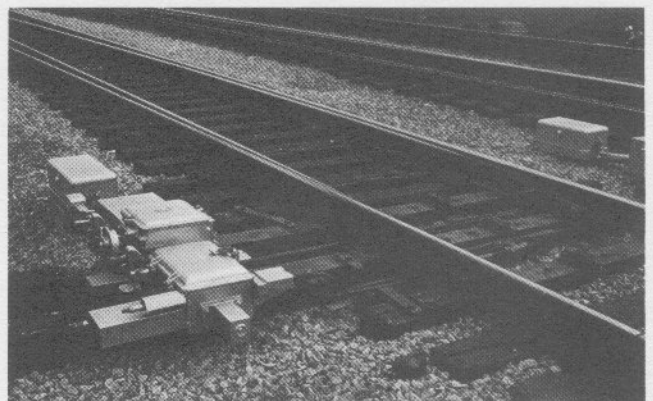


Figure 6- M23 power switch machine in a field location.

Note: This Signal Training Bulletin is for general information only. For specific applications consult the rules, standards and instructions published by your railroad.

SINGLE SWITCH



FIGURE 1 LOW VOLTAGE

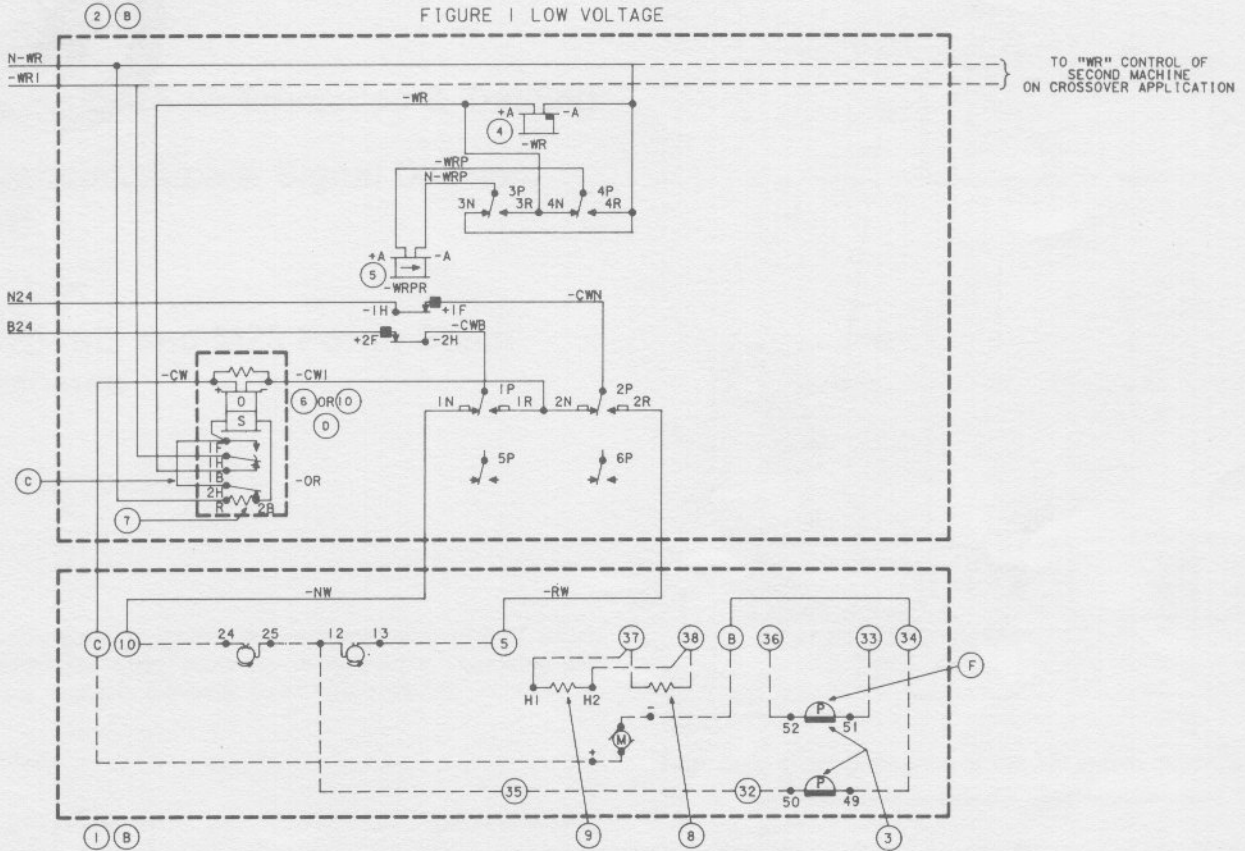


Figure 3- M3/M23 low voltage dc machines with 3-wire control.

FIGURE 2 HIGH VOLTAGE

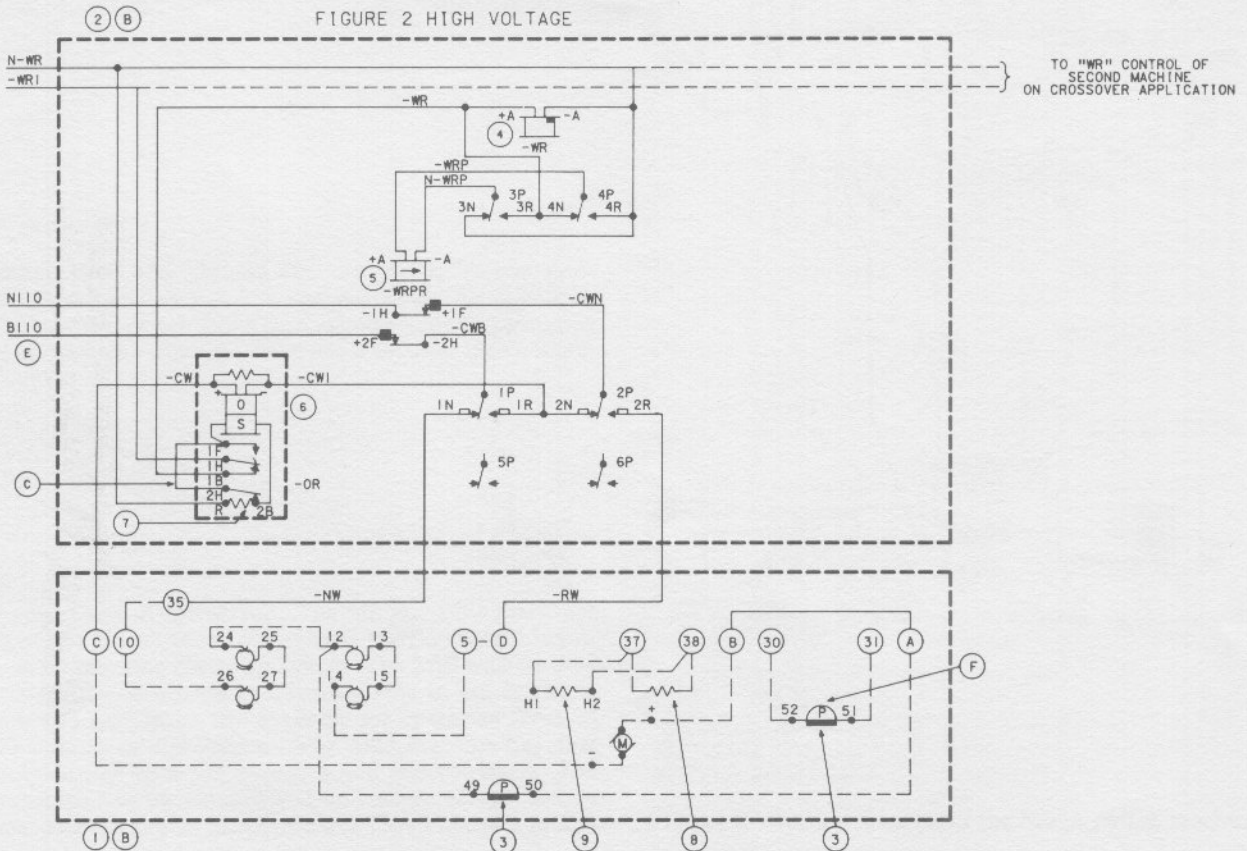


Figure 4- M3/M23 high voltage dc machines with 3-wire control.