

GROUND SHIELD ^R

GROUND WIRE MONITORING RELAY ("LOSS OF GROUND")

For additional information and prices, see Section 18.1.5.

Type GWM - Monitors continuity of grounding or ground check conductors.

FEATURES

Meets USBM, Mine Safety Acts & NEC Requirements.

Fast operation: detects excessive ground resistance, grounding or pilot conductor open circuits.

Deenergizes power circuits to prevent shock hazards.

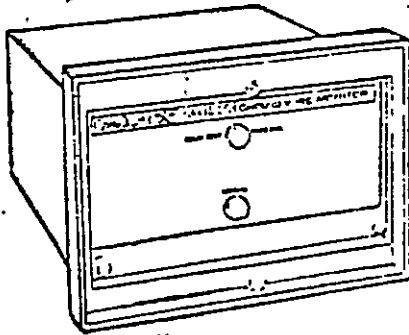
Fail safe ground check circuit.

Alarm and trip outputs.

Dustproof.

Test button and light.

Low ground check voltage.



Type GWM Relay, Drawout Case With Built-in Test and Light

APPLICATION

Used in mining or other applications involving portable load equipment with trailing cables (480V-23 kV).

Provides alarm and/or trip if continuity of ground or pilot wire is accidentally broken at any time.

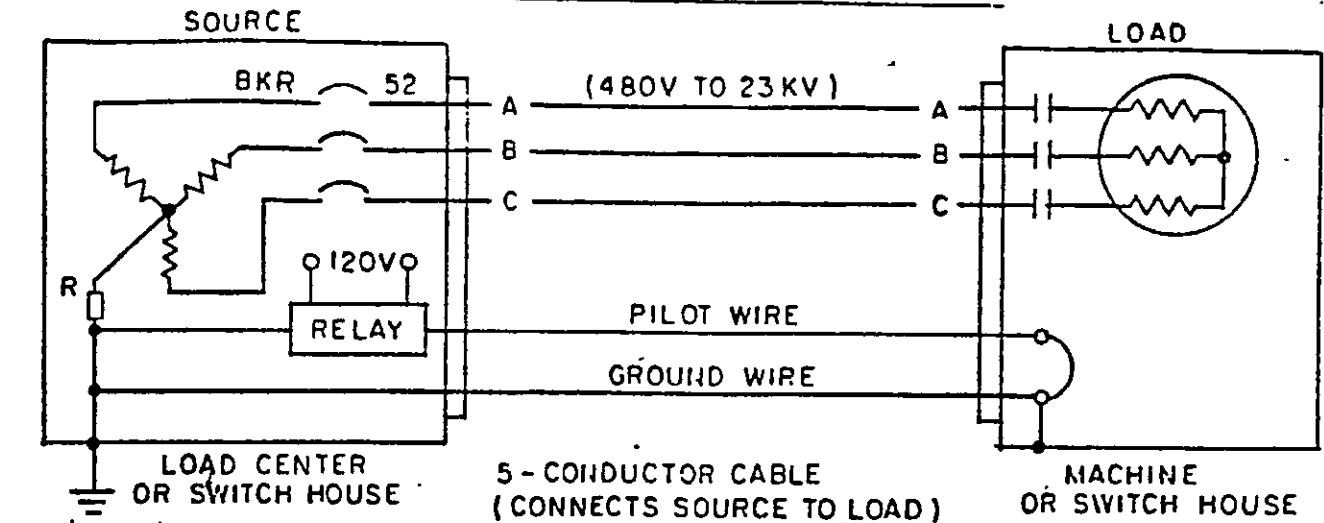
Additionally, Ground Wire Monitor relay will detect excessive grounding path resistance. When properly applied, this will limit the voltage drop in the grounding wire circuit to no more than 100V in HV systems or 40V in LV/MV systems under ground fault conditions.

Type GWM relay can be used with type W, G, G-GC, PCG or other cables which include ground and ground check conductors.

REFERENCES

1. NEC 1975 - Article 250, Part N, 250-154.
2. CFR Title 30 Chapter 1 - Bureau of Mines - 75.800, 75.803, 75.900, 75.902, 77.803, 77.902.

TYPICAL GROUND WIRE MONITORING SYSTEM



SPECIFICATIONS

Protection - Monitors continuity of ground and pilot wires of portable load equipment with trailing power cables.

Sensitivity - Monitor relay will sense ground or pilot wire break or cable runs of excessive length and resistance. The relay will drop out if the path resistance exceeds $4\ \Omega \pm 10\%$ (other operating values available).

Operating Time (Drop Out) - Approximately 2 cycles (35 msec) on wire break; 150 msec on control power loss.

Control Power Req. - 120V (-30%, +10%), 1 ϕ , 60 Hz., 25 VA

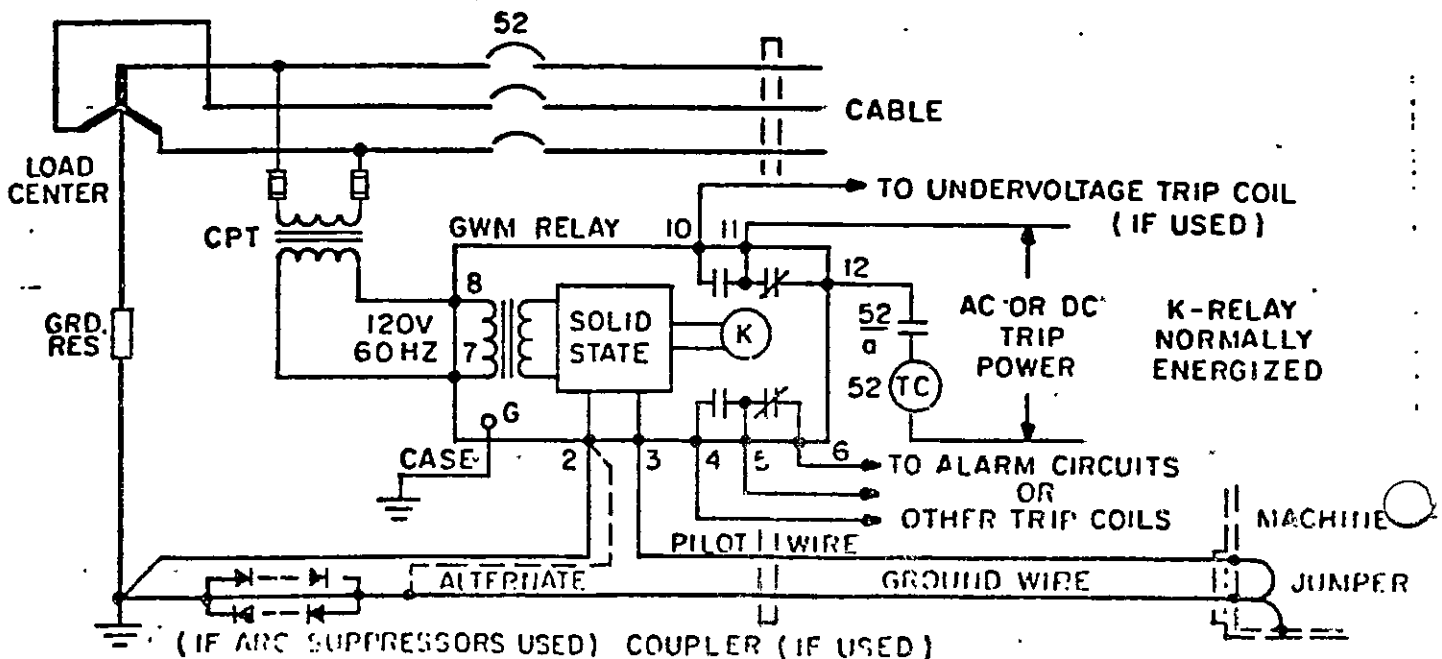
Output Contact Rating - 30 amperes make and carry for 0.2 sec., 3 amperes continuous at 300V.

Ground Check Voltage - Less than 20 volts.

Ambient Temperature - -20°C, +70°C

Built-in Push Button - For periodic testing of the circuit.

GROUND WIRE MONITOR - WIRING DIAGRAMS



TESTING: Relay (Bench)

1. Connect a 4-5 ohm resistor between terminals 2 and 3, or between terminal 3 and pilot wire, if cable is used during tests.
2. Apply 120V AC to terminals 7 and 8. Jumper terminals 2 and 3. Indicator will be lit; output contact between terminals 11 and 12 opens.
3. Remove jumper or operate test PB. Output contact 11-12 should close; light turns off.
4. Remove resistor. Operation should be as under item 3.

TESTING: Relay (Trip Test)

1. Operate test push button.
2. Reclose breaker.

TESTING: System

Momentary cable coupler or pilot-to-ground wire jumper removal in load equipment will operate GROUND WIRE MONITOR.

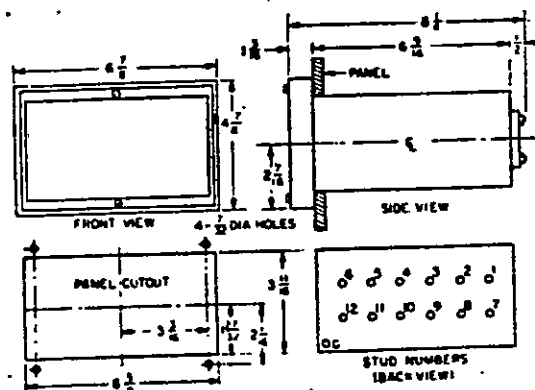
TYPE GWM GROUND WIRE MONITOR RELAYS
(Ground Continuity Check Circuit, normally energized, meets USBM and NEC requirements)

Oper. Level (Path Res.)	Power System		Control Voltage	Catalog No.
	Rated Voltage	Max. Grd. Fault		
50 ohms	above 1kV	2 A	120V AC	202M0065
10 ohms	above 1kV	10 A	120V AC	202M0165
4 ohms	above 1kV	25 A	120V AC	202M0265
2 ohms	above 1kV	50 A	120V AC	202M0365
1.5 ohms	up to 1kV	25 A	120V AC	202M0465

OPTIONAL FEATURES

- Specify "similar to Catalog No. (), except: ()."
- § For 230V AC control voltage — Specify.
- φ For other trip levels or special ratings, refer to nearest I-T-E Sales Office.
- For other relay types and ground fault, overcurrent or voltage protection for AC or DC power systems or machines in mining service, refer to nearest I-T-E Sales Office.
- For applications with diodes or other non-linear impedance grounding devices to suppress interframe arcing, refer to nearest I-T-E Sales Office.

Drawout Mounted Relay



Semi-Flush Mounted Relay — Outline and Drilling

for further information, contact your nearest I-T-E District Sales Office.
Headquarters: 207 Witmer Road • Northham, Penna. 19014 • (215-674-5990)

SCHEMATIC DIAGRAM, GRD WIRE MONITOR, TYPE GWM



Imperial Corporation

608958

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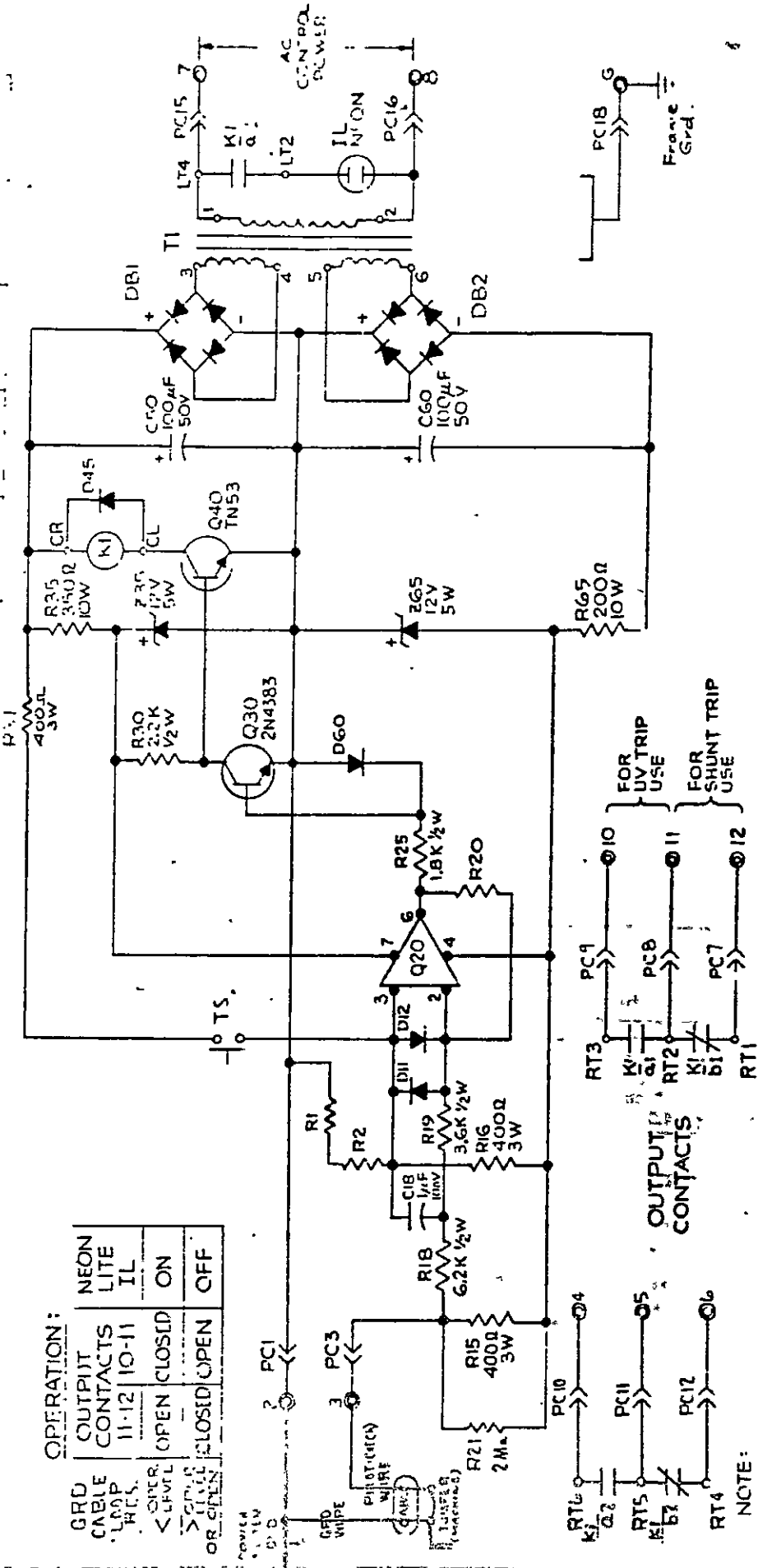
BY RWS	CHD JVC	DATE 9/15/74	DATE 12/10/74
DATE 10/7/74	DATE 9/17/74	DATE 12/10/74	DATE 12/10/74

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CATALOG NO.	OPER. LEVEL	CONTROL POWER	R1	R2	R20
202 MO 265	4 Ω	120V 60HZ	10 3W	2 Ω 5W	271K 1/2W
202 MO 465	1.6 Ω	120V 60HZ	1 Ω 3W	1/4 DIAPER	271K 1/2W
202 MO 365	2 Ω	120V 60HZ	1 Ω 3W	JUMPER	271K 1/2W
202 MO 165	10 Ω	120V 60HZ	3 Ω 3W	5 Ω 5W	271K 1/2W
202 MO 065	10 Ω	120V 60HZ	5 Ω 3W	20 Ω 5W	271K 1/2W

OPERATION:

GRD CABLE TRIP	NEON LITE
11-12	10-11
OPEN CLOSED	OPEN CLOSED
OR OPEN	OR OPEN



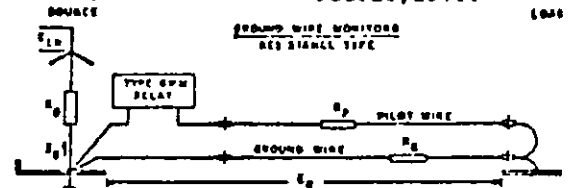
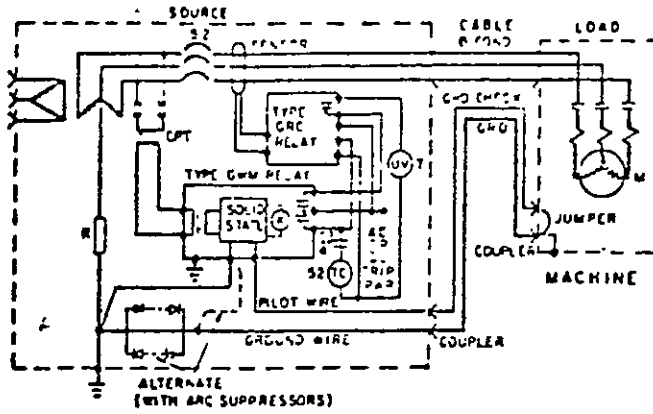
NOTE:

CONTACTS OF RELAY K1 ARE SHOWN IN DEENERGIZED CONDITION, GWM RELAY IS CONTROL POWER FAIL-SAFE, I.E. RELAY K1 IS NORMALLY ENERGIZED AND WILL CLOSE THE CIRCUIT BETWEEN TERMINALS 11 & 12 IF DATA RESISTANCE IS ABOVE 1 LEV1 OR CONTROL POWER IS LOST

Type GWM Ground Wire Monitor Relay

SELECTION GUIDE

Oct. 10, 1976.



E_0 - MAX. ALLOWABLE GROUNDING CIRCUIT VOLTAGE.
(e.g. 100V FOR HV, 40V FOR LV AND MV).

I_0 - MAX. AVAILABLE GROUND FAULT CURRENT $\approx \frac{E_1}{R_C}$

R_0 MAX. = $\frac{E_G \text{ MAX.}}{I_G \text{ MAX.}}$ - MAX. GROUND WIRE RESISTANCE
(BASED ON EXPECTED MAX. LENGTH)

R_p - MAX PILOT WIRE RESISTANCE

$K_C = \frac{R_p}{R_C}$ IS CONSTANT FOR THE CABLE RUN

AC POWER CENTER

R_R - TRIP POINT OF THE GROUND MONITOR RELAY (IN OHMS)

Maximum available ground fault current, ground wire voltage, pilot and ground wire length and resistance should be considered in the selection.

(A). APPROXIMATION:

For example, if the maximum fault current is 50A with a 100V limit of the allowable interframe potential, a Type GWM relay with a $\frac{100V}{50A} = 2.0$ ohm operating point can be used.

Power System		MAX. ALLOWABLE GROUNDING CIRCUIT VOLTAGE.	MAX. GROUND WIRE RESISTANCE	SPECIFY		R_R - TRIP POINT
Rating Voltage	Max. Gnd. Fault	E_0	R_0	Catalog No.		
below 1kV	25A	40V	1.6	202M0455	1.6	Ω
"	15A	"	2.66	202M0365	2	Ω
above 1kV	50A	100V	2	202M0365	2	Ω
"	25A	"	4	202M0265	4	Ω
"	10A	"	10	202M0165	10	Ω
"	2A	"	50	202M0065	50	Ω

(neglects pilot wire resist)

(B). ACCURATE METHOD:

$$R_R \leq \frac{E_G \text{ MAX.}}{I_G \text{ MAX.}} (r + K_C)$$

Assumes: $K_C = \frac{R_p}{R_C}$ IS CONSTANT FOR THE CABLE RUN.

Power System	Max. Gnd. Fault	MAX. ALLOWABLE GROUNDING CIRCUIT VOLTAGE.	MAX. GROUND WIRE RESISTANCE	MAX. TRIP POINT OF THE GROUND MONITOR RELAY (IN OHMS) if:				Catalog No.	R_R - TRIP POINT
				$k_c = 1$	$k_c = 2$	$k_c = 3$	$k_c = 7$		
below 1kV.	25A	40V	1.6 Ω	3.2 Ω				202M0365	2 Ω
					4.8 Ω			202M0265	4 Ω
	15A	40V	2.66 Ω			6.4 Ω		202M0265	4 Ω
							12.8 Ω	202M0165	10 Ω
above 1kV.	50A	100V	2 Ω	4 Ω				202M0265	4 Ω
					6 Ω			202M0265	4 Ω
	25A	100V	4 Ω			10.66 Ω		202M0165	10 Ω
							21.33 Ω	202M0165	10 Ω
10A	100V	10 Ω	20 Ω					202M0265	4 Ω
							16 Ω	202M0165	10 Ω
						12 Ω		202M0165	10 Ω
							32 Ω	202M0165	10 Ω
				30 Ω			202M0165	10 Ω	
					40 Ω			202M0165	10 Ω
						80 Ω		202M0065	50 Ω

