Type AZ Magnetic Time Delay Relays For D-C Operation

INSTRUCTIONS

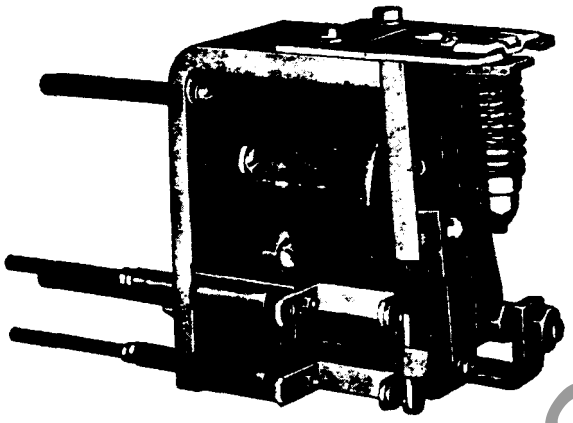

FIG. 1—TYPE AZ-11S REAR CONNECTED RELAY (MAXIMUM OF THREE CONTACTS) (PHOTO 290037)

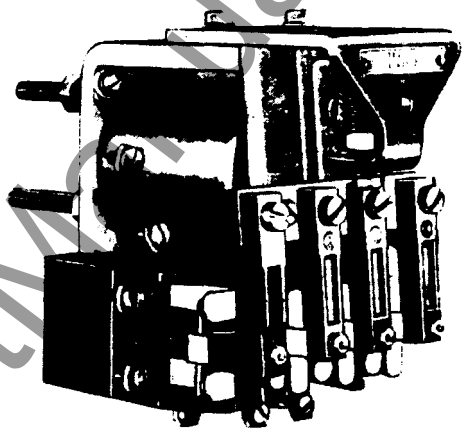

FIG. 2—TYPE AZ-31S FRONT CONNECTED RELAY (MAXIMUM OF FOUR CONTACTS) (PHOTO 290032)

APPLICATION

The Type AZ time delay relays are d-c magnetically operated relays which were specifically designed for controlling the accelerating contactors of definite time limit acceleration controllers. These relays are particularly well suited for application to d-c steel mill or marine control.

RATING

These relays are available in two frame sizes; the small frame is for a short time and the large frame is for a long time delay period.

The main and auxiliary contacts on these relays are rated as shown in the table in Fig. 3.

Description	D-C RATING	
	Continuous Carrying Capacity In Amperes	Max. Interrupting Capacity For Inductive Coil Loads In Volt-Amperes*
Main Contact	5	150
Auxiliary Normally Open Contact	5	150
Auxiliary Normally Closed Contact	5	150

* For relays with a main single-break normally closed contact, the main stationary contact position must be adjusted for ¼ inch gap for this rating.

FIG. 3—CONTACT RATING TABLE

Relay Frame Size	Time Delay Period Initiated By Coil Circuit	Ring Case Material	Additional Armature Shim Thickness In Inches	Minimum Time With Ring Case Only And Max. Spring Pressure*	Maximum Time With Case + 4 Rings And Min. Spring Pressure*
Small	Opened	Copper	.....	⅔ Second	2 Seconds
Small	Shorted	Copper	.....	1⅓ Seconds	3 Seconds
Small	Opened	Copper	.005 Tk.	⅓ Second	1 Second
Small	Shorted	Copper	.005 Tk.	⅔ Second	1⅓ Seconds
Small	Opened	Brass	.....	⅓ Second	1¾ Seconds
Small	Shorted	Brass	.....	1 Second	2⅔ Seconds
Small	Opened	Brass	.005 Tk.	⅙ Second	¾ Second
Small	Shorted	Brass	.005 Tk.	½ Second	1⅙ Seconds
Large	Opened	Copper	.....	1 Second	3½ Seconds

*The time delay periods will be shorter than those indicated if the coil energization time is of a very short duration.

FIG. 4—TIME DELAY RANGE FOR VARIOUS OPERATING CONDITIONS

Type AZ Magnetic Time Delay Relays
For D-C Operation

INSTRUCTIONS—Continued

Relay operating coils are available for either intermittent or continuous service at rated voltage. The coil winding and auxiliary contact current carrying parts are insulated from the frame for 600 volts.

The time delay period may be initiated by either opening or shorting the coil circuit. The approximate time delay ranges for various operating conditions are as indicated in Fig. 4.

CONSTRUCTION

The Type AZ relays are of exceptionally sturdy unit construction and have a knife-edge bearing between the armature and the frame. They are completely assembled and tested at the factory before shipment. Relay assemblies are available with terminals for either rear or front connection.

As these relays have a knife-edge bearing and as there are very few moving parts, they are mechanically suitable for withstanding a very large number of operations. The knife-edge type of bearing is not greatly affected by dust or dirt. The ground surfaces of the armature, frame and core are plated with hard chromium. In addition to providing good protection against corrosion and mechanical wear, the chromium plating also provides some shim action and insures that the time delay period will not vary with operation. All contact buttons are fine silver and will provide very good mechanical and electrical performance. For relays with a main contact which also serves as the armature stop, the main contact is electrically and mechanically connected to the armature and frame. The main contact has a single-break contact gap.

Only two different hot moulded stationary contact bases are required in the manufacture of all of the various relay combinations. Each of the bases is suitable for front or rear connection. The auxiliary contacts have double-break contact gaps.

The contact arrangement and frame size are indicated in the type numbers and letters. The first number following the type letters—AZ—indicates the number of normally open contacts; the second number means the number of normally closed contacts (this number includes the main contact which also acts as an armature stop on relay assemblies per Fig. 1); and the letter "S" or "L" indicates the frame size. The table in Fig. 5 illustrates the formation of type designations.

Single winding coils are used to operate these relays. The operating coil can be removed from the front of a relay and the only tool usually required is a screw driver. It may be necessary on some relay assemblies to remove a normally closed auxiliary moving contact assembly in order to disengage the armature from the frame. For relay assemblies per Fig. 2, the two bolts which hold the armature stop bracket to the frame must also be removed.

Provision has been made on the frame and other parts so that a shunt may be added to bridge the armature knife-edge bearing on assemblies with a main contact, if it is desired.

As these relays are operated by means of a single winding coil, a non-magnetic spacer is assembled between the relay frame and the armature knife-edge bearing.

These relays operate upon an inductive time delay principle and a ring case and copper ring assembly installed between the coil and the core serves as a short-circuited low resistance winding.

Typical Type Designation	TYPE DESIGNATION COMPOSED OF				FOR THIS RELAY BASE				Weight of Relay With Coil in Pounds
	Letters	Number of Normally Open Contacts	† Number of Normally Closed Contacts	Frame Size (S = Small) (L = Large)	Maximum Number of Normally Open Contacts	Maximum Number of Normally Closed Contacts	Total Number of Normally Open or Closed Contacts	Normally Closed Main Contact	
AZ-01S	AZ	0	1	S	2	3	3	Yes	7
AZ-22S	AZ	2	2	S	4	2	4	No	7¾
AZ-12L	AZ	1	2	L	2	3	3	Yes	11
AZ-40L	AZ	4	0	L	4	2	4	No	11¾

† On some assemblies, this number includes the main contact.

FIG. 5—TYPE LETTER AND NUMBER DESIGNATION TABLE

Type AZ Magnetic Time Delay Relays For D-C Operation

INSTRUCTIONS—Continued

OPERATION

When a relay coil is energized with a d-c voltage that is within the operating limits, the armature will be attracted toward and will seal against the core pole-face. The time delay period can then be initiated by either opening or shorting the coil circuit. When the magnetic field of the coil collapses, a current will be induced into the ring case and copper rings which are inside the coil and surround the iron core. This induced current flows in such a direction that it sustains the magnetic field and holds the armature closed even after the coil has been de-energized. When the decaying magnetic field force becomes less than the force of the armature kick-out spring, the armature will be released and will move to its open position to end the time delay period. This operation principle is illustrated in Fig. 6.

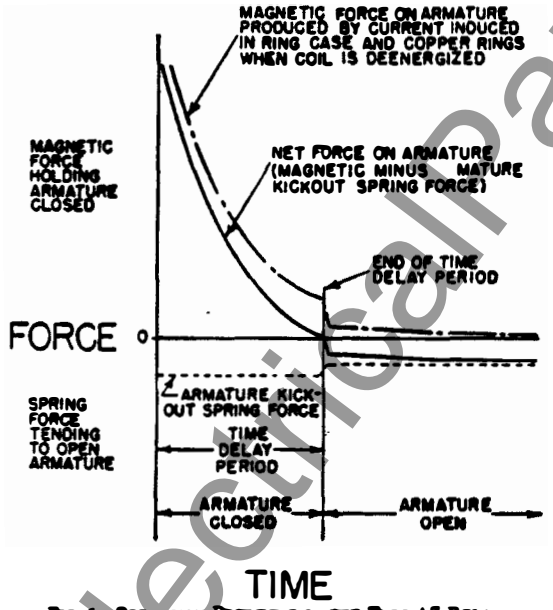

FIG. 6—OPERATION PRINCIPLE OF THE TYPE AZ RELAY (DWG. 13-B-5876)

As these relays operate upon an inductive time delay principle, they will provide very reliable operation and consistent time delay periods as the timing is based upon an electrical phenomenon. The timing is not dependent upon a mechanical system which is usually subject to wear and change with operation.

The non-magnetic spacer in the magnetic circuit provides a uniform drop-out characteristic and prevents the armature from being held closed by residual magnetism.

When a relay is operated by short-circuiting the coil, the time delay period is longer than that given under similar conditions when the coil circuit is opened. This occurs as the coil winding itself acts as an additional short-circuited winding. An additional non-magnetic shim may be added to the sealing surface of the armature if it is desired to reduce the time delay period to a very low value. Tapped holes are provided in the armature of relay assemblies similar to the one shown in Fig. 1 for mounting the additional shim.

When a coil is short-circuited, it must be connected in series with a motor armature or a resistor so that the voltage supply will not be short-circuited. For the coil connection scheme "B" shown in Fig. 7 and for 115 volt operation, a 150 ohm-100 watt resistor is generally used in series with the coil. A 600 ohm-100 watt resistor is usually satisfactory to use for 230 volt service.

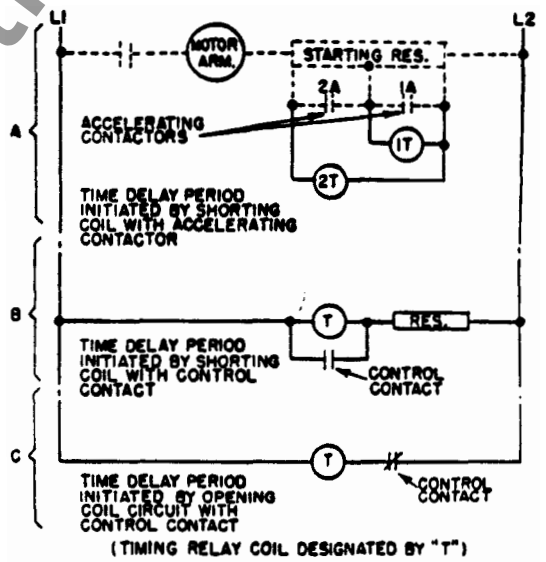

FIG. 7—TYPICAL COIL CIRCUIT CONNECTION DIAGRAMS (DWG. 13-B-5876)

When a relay has a main contact and no normally closed auxiliary contacts, the pick-up voltage can be substantially reduced by decreasing the armature travel and main contact gap. For circuit closing applications, the main contact gap may be reduced to 1/8 or 1/16 inch.

In general, continuously rated operating coils are used. However, when the energization time is extremely short and the coil duty is very intermittent, it is recommended that an intermittently rated coil be used so that the full time delay period can be obtained. The use of an intermittently rated operating coil will also decrease the armature pick-up time or the time from the coil energization until the armature seals against the core.

Type AZ Magnetic Time Delay Relays For D-C Operation

INSTRUCTIONS—Continued

ADJUSTMENTS

The time delay period of a relay can be varied by adjusting the armature kick-out spring force; the time varies inversely with the pressure. The time delay period can also be more effectively changed by varying the number of copper rings in the ring case which surrounds the iron core.

The effect of varying both the spring pressure and the number of copper rings in the ring case is shown in Fig. 8 for one particular set of operating conditions. Refer to the table in Fig. 4 for the time delay periods given by other operating conditions.

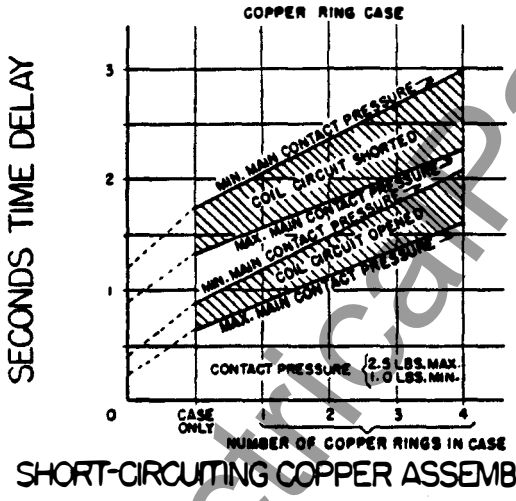

FIG. 8—APPROXIMATE TIME DELAY PERIOD FOR A SMALL FRAME RELAY (DWG. 13-B-5876)

To change the time delay period by varying the number of rings in the ring case, the armature assembly must be removed.

For relays similar to the one shown in Fig. 1, this can usually be done without any tools except a screw driver by compressing the armature kick-out spring until the ends of the spring stud yoke which engage in the slots in the top bearing plate are free of the plate as shown in Fig. 9; the complete armature assembly can then be removed by pulling it in a forward direction. If the particular relay assembly has a shunt around the knife-edge bearing or has a normally closed auxiliary contact, the moving contact assembly and shunt must be removed before any attempt is made to remove the armature assembly.

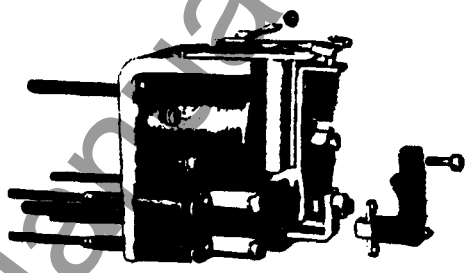

FIG. 9—RELAY WITH THE SPRING STUD YOKE DISENGAGED FROM THE SLOTS IN THE TOP BEARING PLATE (PHOTO 292698)

A spring clip which snaps over and into a groove in the core holds the ring case in place. It also serves as a handle or bail for pulling the ring case assembly out of the coil. THE COIL MOUNTING SCREW SHOULD ALWAYS BE LOOSENED AND THE RING CASE SPRING CLIP DIS-ENGAGED FROM THE GROOVE IN THE CORE BEFORE ANY ATTEMPT IS MADE TO REMOVE THE COPPER RING CASE ASSEMBLY.

Copper rings may be added or removed through the rectangular slot in the surface of the ring case as shown in Fig. 10. A maximum of four copper rings can be inserted into the copper or brass ring case.

FIG. 10—VIEW SHOWING THE INSERTION OR REMOVAL OF A COPPER RING FROM THE RING CASE TO CHANGE THE TIME PERIOD (PHOTO 292699)

MAINTENANCE

Failure to Operate—Failure of a relay to operate may be caused by the coil circuit being open, power failure or low voltage, or mechanical interference. Failure of a relay armature to be released may result from the coil circuit being energized, mechanical interference, or a broken armature kick-out spring.

Type AZ Magnetic Time Delay Relays For D-C Operation

INSTRUCTIONS—Continued

Contact Pressure—With a main contact gap of ¼ inch, the main contact pressure can be varied between the limits of 1 to 2.5 pounds by changing the length of the armature kick-out spring. The auxiliary contact pressures should be approximately 4 ounces initial and 6 ounces final.

Contact Gap and Overtravel—In general, the main stationary contact should be set for ¼ inch gap. The main contact gap is the distance between the stationary and moving contacts when the armature is in the sealed or closed position. The auxiliary contacts should have a total gap of ½ inch (two gaps in series) and from 5/64 to ⅛ inch over-travel. The ½ inch auxiliary contact gap can be obtained on relays with a main contact only when the main contacts are adjusted for ¼ inch gap.

Contact Replacement—The contacts should be replaced when they become severely burned or worn away. In general, the auxiliary contacts should be replaced when the overtravel decreases to 1/32 inch. Moderately burned and blackened silver contacts usually do not require replacement or dressing as the discolored surface is usually still a good conductor. The auxiliary moving contacts should move freely in their guides and on their guide pins. To remove the auxiliary stationary contacts, the studs or screws which hold them to the moulded base must be removed. This can usually be done easiest by removing the complete base assembly from the relay.

Lubrication is not required on the contacts. The use of oil or grease is very undesirable as it helps to collect dirt and dust.

Frame and Armature—For proper operation and to secure consistent time delay periods, the frame and armature sealing surfaces must be as clean as possible. Any dirt or foreign matter in the magnetic circuit will decrease the maximum possible time delay period. The knife-edge bearing does not require any lubrication.

Coil Replacement—In order to remove the coil, the armature assembly should be removed as previously described under the paragraph heading of "ADJUSTMENTS." After the coil mounting screw has been removed, the copper ring case assembly can be removed by disengaging the spring clip which snaps over and into a groove in the core. The spring clip can be used as a bail or handle for pulling the ring case assembly out of the coil. After the leads to the coil terminals have been disconnected, the coil can be removed by pulling it in a forward direction.

Westinghouse Electric Corporation
General Control Division
Asheville, N.C. 28813

Printed in U.S.A.