

Instructions For Type M and Type MD, DC Contactors Sizes 5, 6, 7, 8 and 9 600 Volts, Maximum

I.L. 17149



THE CONTACTORS

Type M contactors are rear connected and Type MD contactors are front connected. Both types are single-pole devices, available in five sizes, in normally-open or normally-closed contact configurations, for DC applications up to 600 volts. Continuous current ratings are shown in Table I.

Interrupting ratings of normally-open (NO) contactors are ten times their eight-hour continuous current ratings except as noted below. The types M-810-R and MD-810-R have an interrupting rating of 25,000 amperes. Spring-closed, normally-closed (NC) contactors have interrupting ratings equal to their one hour continuous current ratings. The type M-810-R and MD-810-R contactors are also different in that they have coils rated for intermittent duty unless a suitable resistor is inserted in series with the coils after the contactor has closed.

The contactors are of unit construction with all parts assembled on a common frame. The armature hinges on a knife edge bearing which requires little maintenance. Size 5 contactors, as well as Size 6 and Size 7 contactors, with normally-open (NO) poles have a single coil. All other contactors covered by this instruction leaflet have two coils, see Table V.

For contactors with normally-open poles, kickout springs hold the contacts open even when the contactor is tilted at an angle of 30 degrees with the vertical. For contactors with normally-closed poles the operating springs close the contacts when its coil is de-energized. The force exerted by the springs can be varied by means of an adjusting screw.

The arc shield on all contactors is supported by the blowout pole pieces. It is capable of being swung upward for inspection of the contacts. It may be removed altogether by withdrawing the bolt at the top rear of the arc box.

An arc horn in the arc shield relieves the moving contact of excessive burning. The arc which is drawn between the contacts when the contactor opens moves outward under the influence of the magnetic blowout field and transfers from the moving contact to the arc horn. The latter is maintained at the potential of the moving contact by connection to the stop bracket through a blade which projects from the bottom of the arc shield. Electrical contact to the blade is maintained (when the arc shield occupies its lowered, operating position) by a pair of silver alloy faced jaws for all types except 810-R and 910 which have a bolted connection.

TABLE I — CURRENT RATINGS

Contactor Size	Type	Pole and Contact Config.*	Open 1-Hr. Ampere Rating	Open 8-Hr. Ampere Rating
Rear Connected				
5	M-501	1 NC	400	300
5	M-510	1 NO	400	300
6	M-601	1 NC	800	600
6	M-610	1 NO	800	600
7	M-701	1 NC	1200	900
7	M-710	1 NO	1200	900
8	M-810	1 NO	1800	1350
8R	M-810-R	1 NO	1800	1350
9	M-910	1 NO	3333	2500
Front Connected				
5	MD-501	1 NC	400	300
5	MD-510	1 NO	400	300
6	MD-601	1 NC	800	600
6	MD-610	1 NO	800	600
7	MD-701	1 NC	1200	900
7	MD-710	1 NO	1200	900
8	MD-810	1 NO	1800	1350
8R	MD-810-R	1 NO	1800	1350
9	MD-910	1 NO	3333	2500

* NO = Normally Open, NC = Normally Closed

INSTALLATION

This industrial type control is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe-operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment. Mounting provisions are shown in Table II.

TABLE II — MOUNTING PROVISIONS

Contactor Size	Type Prefix	Panel Material	Non-Conducting Mounting Means	Thru-Panel Conducting Studs
5, 6, 7	M	Insul.*	1 Stud	2
8, 8R, 9	M	Insul.*	2 Studs	2
5, 6, 7	MD	Steel	4 Bolts	None
8, 8R, 9	MD	Steel	4 Bolts	None

* Insulating Material up to 3 inches thick

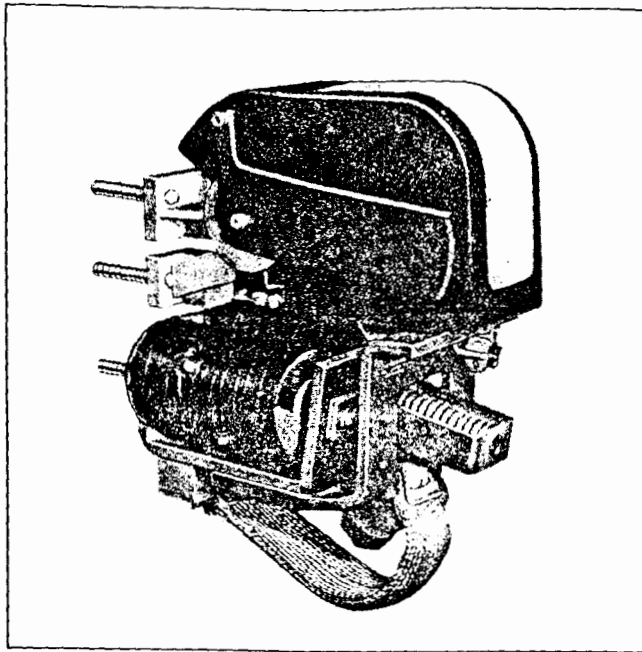


Fig. 1 Type M-810 Rear-Connected Contactor

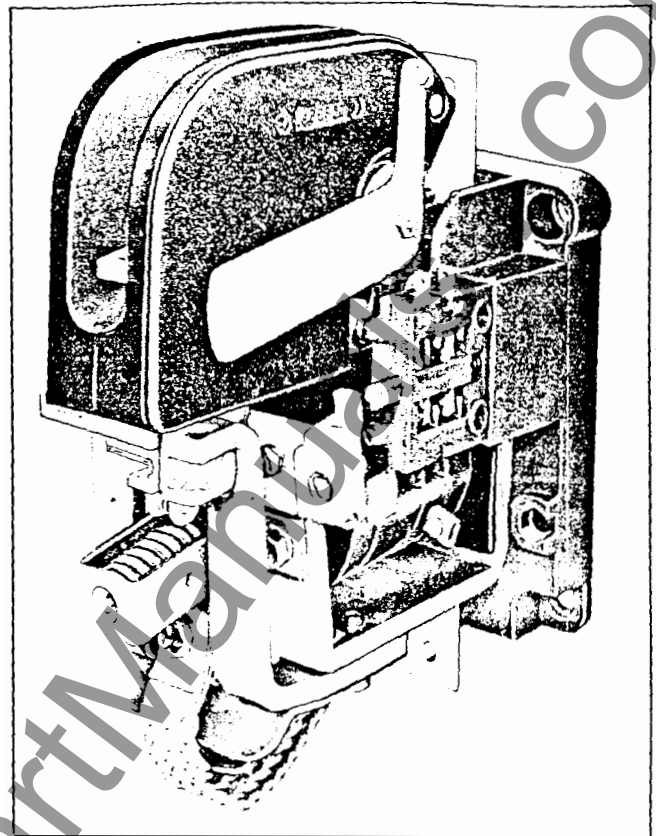


Fig. 2 Type MD-510 Front-Connected Contactor

AUXILIARY CONTACTS

Two auxiliary contact assemblies can be mounted on each of the contactors listed in Table I. For additions to existing contactors, each auxiliary contact must be ordered as two components (contact assembly plus mounting and operating hardware). When replacing an auxiliary contact, only the contact assembly need be ordered. See Table III.

SPRING-CLOSED (NC) CONTACTORS

Each spring-closed contactor is designed to operate

with a positive snap action. In the un-energized state, the armature is at rest against a post situated above the main magnet, and below the stationary contact assembly. When the operating coil is first energized, a heavy copper ring encircling the path of the main flux provides sufficient leakage flux through the stop post to momentarily freeze the armature against it. As the

TABLE III — AUXILIARY CONTACTS

Order each set of auxiliary contacts as two components, the auxiliary contact assembly plus the mounting and operating hardware.

Auxiliary Contact Arrangement	Auxiliary Contact Assembly Part Number	Plus:	Mounting and Operating Hardware Part Number				
			For Contactor Type — M or MD:				
			501 510	601 610	701 710	810 810-R	910
INO-INC 2 NO 2 NC	843D943G04 843D943G05 843D943G06	}	2087A63G01 2087A63G04	2087A63G02 2087A63G17	2087A63G02 2087A63G17	2087A63G05 2087A63G05	2087A63G06

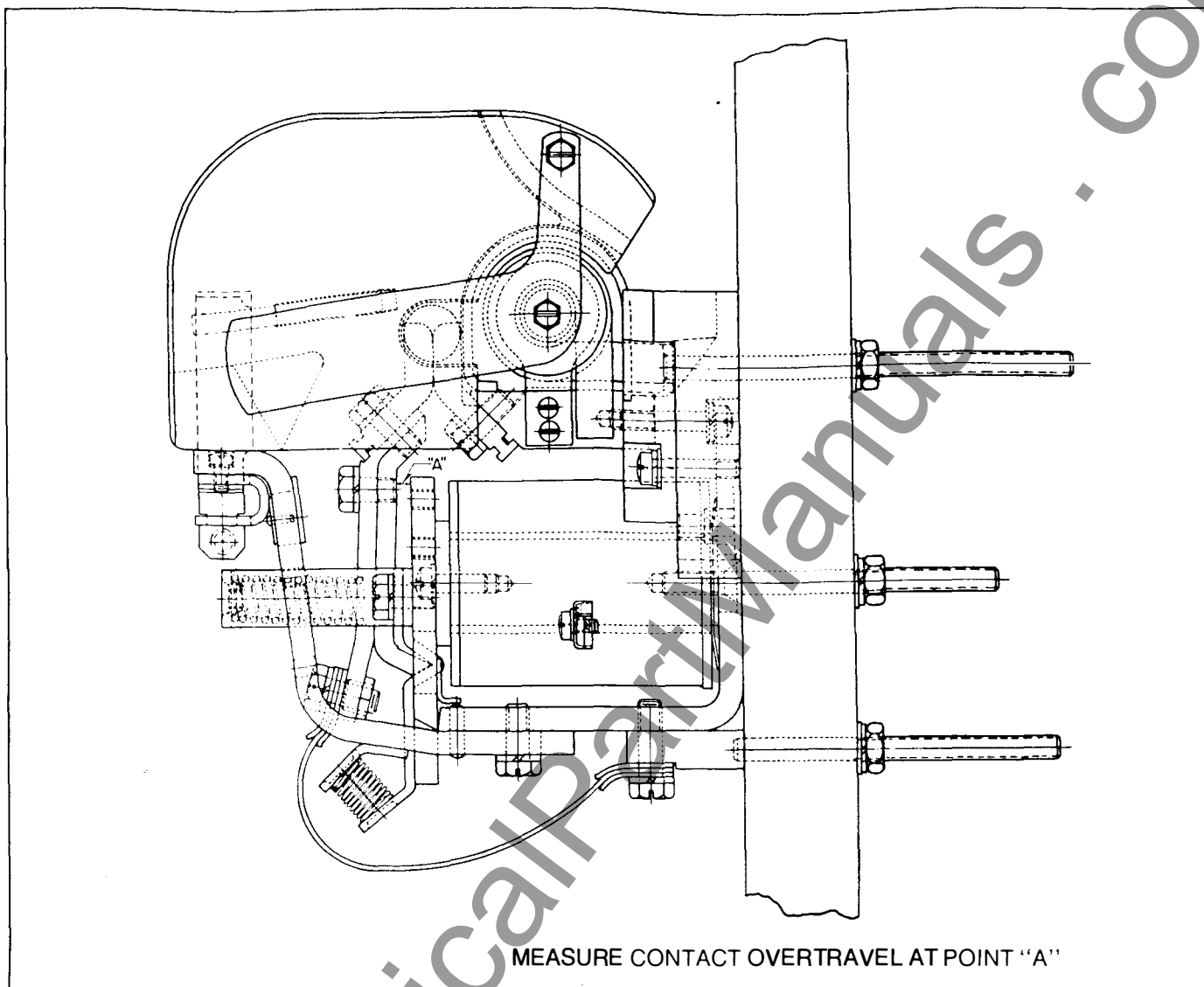


Fig. 3 Type M-810 Contactor with Armature Closed

current in the operating coil approaches its steady state condition, its rate of change decreases and the blocking action of the short-circuiting ring diminishes, and finally the armature is attracted toward the main core in a fast positive movement.

MAINTENANCE

Arc Shield

This industrial type controller is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, checkout, safe operation, or

maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

The arc shield and its arc horn are essential to the performance of these contactors and the arc shield parts should always be in place. On the sizes 5, 6 and 7 and Type 810 contactors, the arc shield should always be pushed down so that it rests on the stop bracket. This insures proper engaging of the knife blade with the connector switch jaws. This engagement is a bolted connection on the Type 810-R and Type 910 contactors.

An arc shield may be removed by first removing the arc shield retaining bolt (located at the top of the L-shaped side plates), then raising the arc shield until the

knife blade clears the stop bracket. Pull the arc shield forward, clear of the contactor.

In replacing the arc shield, insure that the pole piece plugs are aligned with the recesses in the arc shield walls to permit proper reassembly. The arc box retaining bolt is made of non-magnetic material. A steel bolt used in this location will short-circuit the magnetic blow-out field and impair interruption of the arc.

Armature and Bearing

The knife-edge bearing requires no maintenance. A shelf is provided on the armature plate to minimize the dust and dirt collecting between the armature and frame. Oil should not be used at any point on these contactors.

Contacts

Order replacement contact kits by the part number shown in Table IV. When contacts are new and the armature is seated either electrically or mechanically, the gap between the contact support bracket and the top of the armature plate, Dimension "A" in Figure 3, should be as shown in Table IV. Change contacts when this dimension is reduced to $\frac{1}{32}$ inch.

The moving and stationary contacts may be replaced by removing the bolts holding the contacts to their respective supports.

Table IV shows the proper contact gap, contact over-travel, and contact forces with new contacts.

To measure the final contact force, close the contacts and by means of a spring scale hooked to a loop of thin tape or wire measure the force necessary to separate the contacts. Give consideration to the thickness of the tape or wire used when comparing values read on the spring scale with the tabulated values in this leaflet.

If after new contacts are installed, the forces are not correct, it may be necessary to replace the contact spring, or adjust the number of spring shims in the spring seat.

Magnet Operation

Failure of the magnet to operate the contactor may result from an open-circuited operating coil, from a circuit condition in which the voltage is low, from excessive spring forces, or from friction between parts. Failure of the contactor to release may be caused by friction or by defective kickout springs. Readjustment of the operating spring forces on spring-closed (NC) contactors may be necessary after the contacts have worn considerably. See below.

Operating Springs

Adjust the operating springs of spring-closed contactors to obtain a reading of 24 ounces on size 5 contactors and 28 ounces on size 6 and size 7 contactors with a push scale. This push spring scale is applied $\frac{1}{8}$ " up from the bottom of the armature. Readings are made when the armature starts to move.

TABLE IV — CONTACT MEASUREMENTS AND KITS

Contactor Type	Contact Force In Pounds		*Contact Overtravel (Inches)	Contact Gap (Inches)	Replacement Contact Kit (Part Number)
	Initial	Final			
M-501, MD-501	7½ to 8¾	8½ to 10½	$\frac{13}{64}$	$\frac{5}{16} \pm \frac{1}{16}$	26D2610G22
M-601, MD-601	14½ to 17½	22½ to 27½	$\frac{11}{32}$	$\frac{1}{2} \pm \frac{1}{16}$	26D2610G24
M-701, MD-701	14½ to 17½	22½ to 27½	$\frac{11}{32}$	$\frac{1}{2} \pm \frac{1}{16}$	26D2610G24
M-510, MD-510	6 to 7	13½ to 16½	$\frac{13}{64}$	$\frac{25}{32} \pm \frac{1}{16}$	26D2610G15
M-610, MD-610	13½ to 15½	36 to 44	$\frac{11}{32}$	$\frac{7}{8} \pm \frac{1}{16}$	26D2610G16
M-710, MD-710	13½ to 15½	36 to 44	$\frac{11}{32}$	$\frac{7}{8} \pm \frac{1}{16}$	26D2610G16
M-810, MD-810	12 to 14	38 to 44	$\frac{13}{32}$	$\frac{7}{8} \pm \frac{1}{16}$	26D2610G18
M-810-R, MD-810-R	27 to 33	72 to 88	$\frac{13}{32}$	$\frac{7}{8} \pm \frac{1}{16}$	26D2610G19
M-910, MD-910	18 to 22	54 to 66	$\frac{13}{32}$	$\frac{7}{8} \pm \frac{1}{16}$	26D2610G20

* Dimension "A" in Figure 3

TABLE V — OPERATING COILS						
Contactor Type	Coils/ Device	Operating Coil Part Number for Control Voltage of:				
		115 VDC	125 VDC	230 VDC	250 VDC	550 VDC
M & MD-501	1	30B4375G04	30B4375G24	30B4375G05	30B4375G12	30B4375G06
M & MD-510	1	45A5515G01	45A5515G07	45A5515G04	45A5515G12	45A5515G05
M & MD-601	2	30B4377G23*	30B4377G24*	30B4377G01*	30B4377G13*	30B4377G25*
M & MD-610	1	30B4377G01	30B4377G10	30B4377G05	43B4377G07	30B4377G06
M & MD-701	2	30B4377G23*	30B4377G24*	30B4377G01*	30B4377G13*	30B4377G25*
M & MD-710	1	30B4377G01	30B4377G10	30B4377G05	30B4377G07	30B4377G06
M & MD-810	2	435A929G01*	435A966G01*	L482211G01*	334P064G02*	L482213G01#
M & MD-810-R	2	333P902H01#†	333P902H01#†	L482211G01#†	L482211G01#†	L482211G01*†
M & MD-910	2	435A931G01*	435A967G01*	L483507G01*	L549720G01*	L483508G01#

* This coil is rated for one half of the control voltage. Two coils connected in series are required.
 # This coil is rated for the control voltage. Two coils connected in parallel are required.
 † These coils are intermittently rated when used as indicated. In normal practice a series resistance is inserted in the coil circuit after the contactor is closed. See Table VI and Figure 4.

TABLE VI — RESISTOR COMPONENTS				
For insertion into the coil circuit of Type M and MD-810-R Contactors after pick-up				
Control Voltage	Resistor Part No.	Qty. Req'd.	Resistor Connection	Resulting Ohms
115 VDC	57D1333G30.	1	Not Appl.	20
230 VDC	57D1336G10	2	Parallel	75
550 VDC	57D1336G12	2	Series	400

OPERATING COILS

When replacing an operating coil verify the voltage rating of the coil as being correct for the application, particularly where two coils are connected in series. Expect the surface temperature of the coils to be high after a period of continuous energization. The coils are designed to make maximum use of the magnet wire insulation class. Replacement coils are shown in Table V.

Steps to follow in removing an operating coil are:

1. Raise arc shield.
2. Remove the two bolts securing the stop bracket or spring bracket to the frame.
3. Allow the assembly to hang by the shunt, or in the case of spring-closed contactors disconnect shunt from lower stud. This permits removal of the armature and spring bracket assembly.
4. Remove the pole face bolt or bolts.
5. Disconnect leads and slide the coil forward until it clears the magnet core.

To install a new operating coil, reverse the above procedure. On devices with two coils, connect the coils

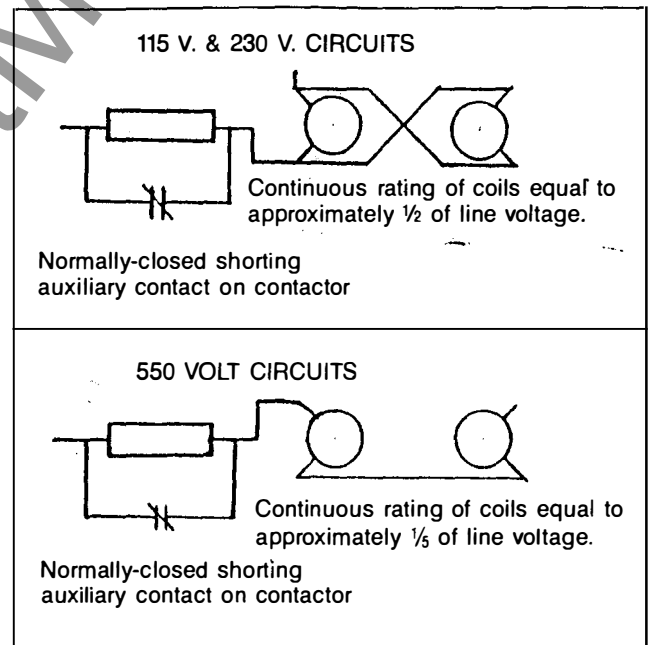


Fig. 4 Type M & MD-810-R Coil Circuits

in series or in parallel, depending upon the control voltage to be applied and the coil rating. Coils for the Type M or MD-810-R require that resistance be inserted into the coil circuit by the opening of a normally-closed auxiliary contact when they are energized longer than one minute out of every ten. See Table VI for resistor part selection and Figure 4 for the coil circuit. Mounting hardware for one resistor is part number 57D1340G01. Mounting hardware for two resistors is part number 57D1340G02.

MECHANICAL INTERLOCK

A Type M-27 mechanical interlock (see Figure 5) may be employed to safeguard a pair of normally-open contactors against the closing of one if the other is already closed. Another version can be used to interlock three contactors against the closing of either or both of two contactors if the center one is already closed.

Mechanical interlocks must be selected in accordance with the frame size of the contactor as tabulated in Table VII.

The mechanical interlock is mounted on the stop bracket of the contactor and requires no additional panel drilling. Adjustment is obtained by moving the interlock mounting bracket. With one contactor energized and the other de-energized, all vertical play of the operating arm should be removed. Check the interlocking action to make sure that no binding occurs.

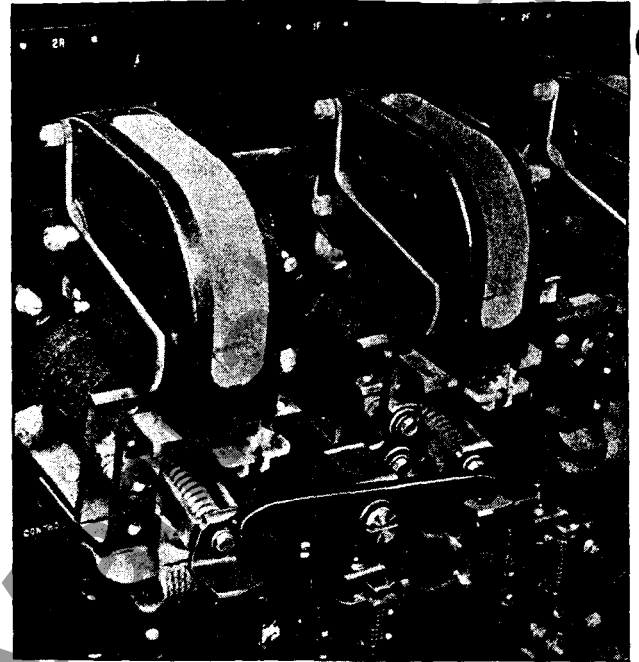


Fig. 5 Type M-27 Mechanical Interlock

TABLE VII — MECHANICAL INTERLOCKS				
Contactor Type	For Two Contactors of Same Type		For Three Contactors of Same Type	
	Part Number for Either Spacing	Center-to-Center Spacing	Part Number for Either Spacing	Center-to-Center Spacing
M-510, MD-510	25A1669G01	6 or 7 inches	25A1669G02	6 or 7 inches
M-610, MD-610	25A1669G01	7½ or 9 inches	25A1669G02	7½ or 9 inches
M-710, MD-710	25A1669G01	7½ or 9 inches	25A1669G02	7½ or 9 inches
M-810, MD-810	25A1669G01	11 inches	25A1669G02	11 inches
M-810-R, MD-810-R	25A1669G03	11 inches	25A1669G04	11 inches
M-910, MD-910	25A1669G01	11 inches	25A1669G02	11 inches