SIEBE ENVIRONMENTAL CONTROLS

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MMR-400 & MMR-500 Series

Electric/Electronic Gear Train Modular Motors
General Instructions

APPLICATION

The MMR-400 and -500 Series Motors are offered for the replacement of specific Honeywell and Johnson motors and are to be used in the operation of dampers, valves and other equipment in HVAC systems.

Each MMR package contains:

One (1)	MMR Motor
One (1)	Factory installed Weather Resistant Kit
One (1)	Mounting bracket for mounting MMR to Honeywell Q618A valve linkage, Johnson Y20EBD valve linkage, and mounting Honeywell shaft mounted auxiliary switches or potentiometer
Three (3)	#8-32 x 7/16" pan head screws with integral lock washers.
Four (4)	1/4"-20 x 7/8" hexhead screws with lock washers and nuts.
One (1)	Spacer collar for use with Honeywell Q618A valve linkage.
One (1)	Shaft extension kit for mounting auxiliary kits to "Load" shaft of MMR-400 or "Load, Normally Closed—CCW Spring Return" shaft of MMR-500. Kit contains shaft extension, washer, and screw.
One (1)	TOOL-16 (used with MMR "-002" models only.)
One (1)	General instruction Sheet

Other Barber-Colman Components Required:

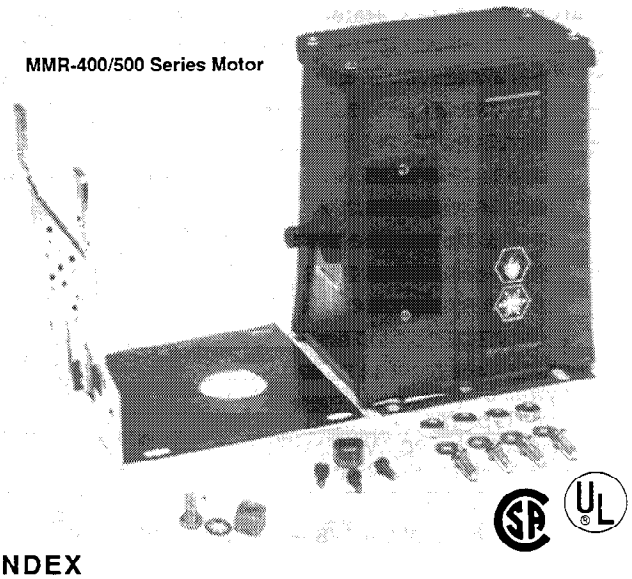
One(1)	MMC Control Module (refer to Control Circuit table for selection of required module.)

Other Barber-Colman Components That May Be Required:

One(1)	AM-231 Transformer Kit (if power voltage not 24 VAC).
One(1)	AM-233 Interface Kit (if Honeywell W-859 used).
One(1)	AM-241 or -242 Auxiliary Switch Kit (if external auxiliary switches are required and existing switches are unusable).

Damper Linkage - if Existing Linkage Sets are Damaged:

AM-111	Crank arm for 5/16" (7.9 mm) damper shaft.
AM-112	Crank arm for 3/8" (9.5 mm) damper shaft.
AM-113	Crank arm for 1/2" (12.7 mm) damper shaft.
AM-115	Crank arm for 7/16" (11.1 mm) damper shaft.
AM-122	Linkage connector, straight type.
AM-123	Damper clip.
AM-125	5/16" (7.9 mm) diameter x 20" (508 mm) damper rod.
AM-125-048	5/16" (7.9 mm) diameter x 48" (1219 mm) damper rod.
AM-132	Ball joint connector.
AM-230	Motor crank arm (required if existing Honeywell or Johnson motor crank arm is not re-useable.
AM-234	Damper linkage kit.
AM-235	Multiple damper linkage kit.
AM-301	90° angle mounting bracket.



MMR-400/500 Series Motor

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SECTION I-GENERAL INSTRUCTIONS

SPECIFICATIONS

TABLE 1. SPECIFICATIONS

Motor Part Number	Torque		VA (Maximum)	Duty Cycle	Auxiliary Switch SPDT Snap-Acting**	Spring Return	Shipped from Factory with Shaft
	Rated	Limit*					
MMR-500	50 lb-in (5.6 N-m)	65 lb-in (7.3 N-m)	20	50%	None	Yes	Full CCW Position
MMR-500-002					2		
MMR-400	150 lb-in (16.9 N-m)	180 lb-in (20.3 N-m)	23		None	No	
MMR-400-002					2		

*Will not exceed under stall conditions.

**Differential factory set at 2°, field adjustable 2° to 10°. Switches must not be used for safety or limiting applications.

Control Circuit:
Select the MMC Series Control Module for the control circuit being used.

Control Signal	Control Module
Honeywell Series 40,60,80 Johnson Type "A"	MMC-468
Honeywell Series 90, W973, W7100 Johnson Types "B" and "J"	MMC-90
Johnson Type "G"	MMC-8000
Honeywell Series W859, W899 Johnson Type "E"	MMC-401*

*MMC-401 can be used only with MMR-500 Series motor.

Power Supply Required: 24Vac Class 2 (+10/-15%) 50/60 Hz.

Output Shaft, See Figures 2, 3 & 4:

Description, Dual 3/8" (9.5 mm) square shafts with 3/64" x 3/16" (1.2 mm x 4.8 mm) keyways and #8-32 1/2" (12.7 mm) tapped hole in each end of shaft.

Rotation, (See Table 2) Shaft rotation as viewed from the front of the motor. *The front of the motors defined as the left end when facing the auxiliary switches adjustments.*

Dead Weight Load, 200lb. (90.9 kg) either end.

Timing, (See Table 3).

TABLE 2. SPECIFICATIONS

Motor Part Number	Shaft Rotation			Nominal Damper Area Sq. Ft. (Sq. M)*	
	Energized	Spring Return	Maximum	Parallel Blade	Opposed Blade
MMR-500	CW	CCW	160° (Factory Set), Adjustable To 75°, 90°,110°	28 (2.6)	36 (3.3)
MMR-500-002					
MMR-400	CW** or CCW**	——		84 (7.8)	108 (10.0)
MMR-400-002					

* Damper ratings are nominal and based on standard (not low leakage) dampers at 1" (25.4 mm) W.C. pressure and 2000 fpm (10 m/s).

** Actuator shipped from the factory at full CCW as viewed from "Load" end.

TABLE 3. TIMING AT RATED TORQUE

Motor Part No.	Timing 160° @ 75°F (24°C)	
	Drive	Spring Return
MMR-500 MMR-500-002	55 sec. ± 5 sec.	42 sec. ± 5 sec.
MMR-400 MMR-400-002	50 sec. ± 5 sec.	——

Environment:

Ambient Temperature Limits,

Shipping and Storage -40 to 160°F (-40 to 71°C).

Operating

MMR-500 -40 to 140°F (-40 to 60°C).

MMR-400 -40 to 140°F (-40 to 60°C).

50% duty cycle, 10 minute maximum continuous run time.

MMR-400/500 with AM-231 Transformer Kit -40 to 130°F (-40 to 54°C).

MMR-400/500 with AM-233 Kit and Honeywell W-859 -40 to 125°F (-40 to 51°C).

Humidity, 5 to 95% RH, non-condensing.

Vibration, Maximum 1 G in any plane.

Locations, NEMA type 1 when mounted in any position; NEMA type 3R when mounted in vertical position up only, AM-232 gasket kit (factory installed) and Appleton ST-50 flexible metal conduit connection with STG-50 gasket field installed.

Connections:

Control, 1/4" quick-connect (spade lug) terminals.

Auxiliary Switch, Screw terminals.

TABLE 4. AUXILIARY SWITCH AMP RATINGS*

24 Vac	
FLA	LRA
7.2 1/3 HP	43.2

* If both contacts are used, the second contact is limited to 40 VA.

TABLE 5. AUXILIARY SWITCH SCREW TERMINAL DESIGNATION

Terminal	Function
NO_1	Normally Open
NC_1	Normally Closed
C_1	Common
NO_2	Normally Open
NC_2	Normally Closed
C_2	Common

Housing: Glass reinforced thermoplastic (PET) UL-94-5V flame rated housing material to meet UL-465 requirements for air plenum mounting, plated steel base. One (1) 1/2" conduit knock-out on two sides of housing.

Mounting: Any position. Seven mounting holes for 1/4" machine screws.

Dimensions: 7-1/4" high x 5-9/16" wide x 5-5/8" deep (184 mm x 141 mm x 143 mm), See Figure 1.

SECTION I-GENERAL INSTRUCTIONS

THEORY OF OPERATION

MMR-400 and MMR-500 Series modular motors are designed to be used with MMC-Series control modules. Functions, detailed wiring and typical application information will be found on control module General Instruction sheets.

The motor output shaft will travel between 0° and 160° depending on the control signal applied and setting of the internal field adjustable stop lever.

PRE-INSTALLATION

Inspection

Visually inspect the carton for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the carton and visually inspect the device for obvious defects. Return damaged or defective products.

Required Installation Items

- Appropriate MMC-Series control module.
- Wiring diagram.
- Tools (not provided):

  Volt-ohm meter.

  Appropriate screwdriver or wrench for mounting screws or bolts.

  Appropriate drill and drill bit for mounting screws or bolts.
- Appropriate accessories.
- Mounting screws or bolts (not provided).

INSTALLATION

CAUTION

1. Installer must be a qualified, experienced technician.
2. Disconnect power supply before installation to prevent electrical shock and equipment damage.
3. Make all connections in accordance with the wiring diagram, and in accordance with national and local electrical codes. *Use copper conductors only that are suitable for 85°C. Wire to Class 2 circuits only.*
4. Do not exceed ratings of the device.
5. Avoid locations where excessive moisture, corrosive fumes or vibrations are present. NEMA Type 1 housings are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment. NEMA Type 3R housings, when mounted in vertical position up only, AM-232 gasket kit (factory installed), and Appleton ST-50 flexible metal conduit connector with STG-50 gasket field installed are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, sleet and external ice formation.

Mounting (See Figure 1 for mounting dimensions).

Motor Location: The motor can be mounted in any position in a weather protected area. Seven 9/32" (7.1 mm) mount-ing holes for 1/4" screws or bolts are provided in the base of the motor (see Figure 1). Two (2) mounting screws or bolts on one side and one (1) screw on other side of motor are the minimum number of required fasteners. Locate the motor as close to the damper as possible.

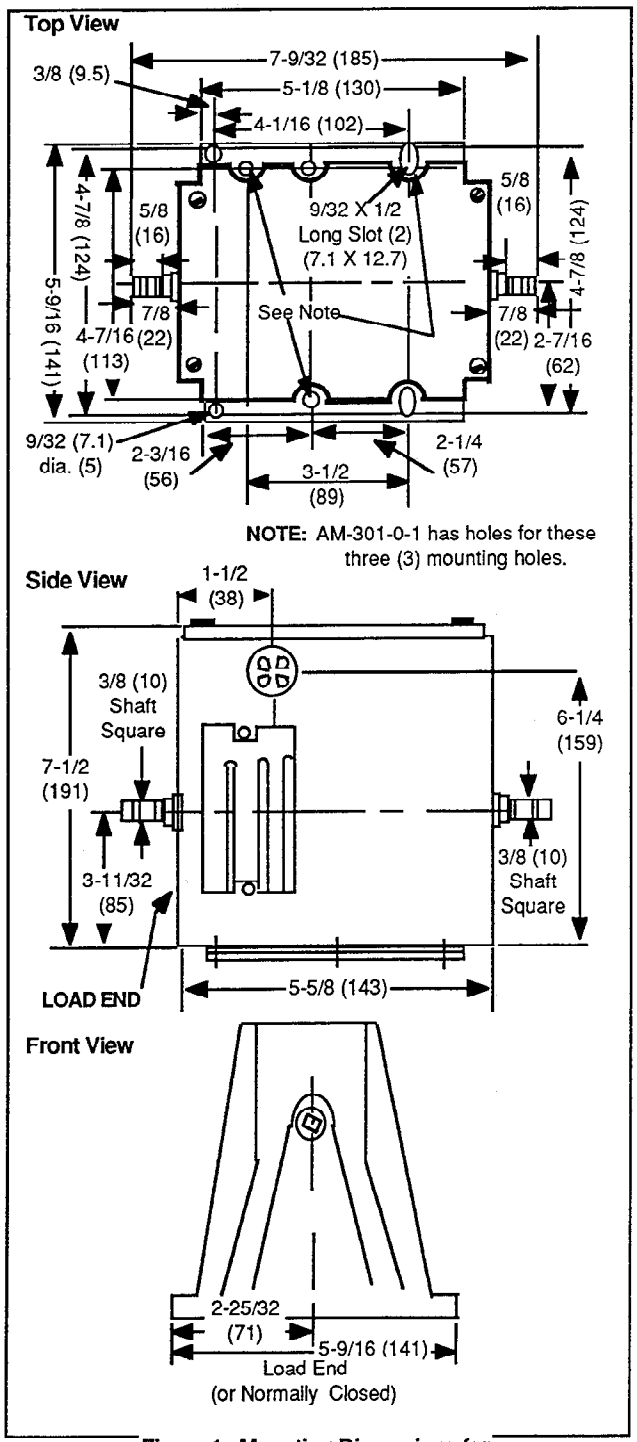
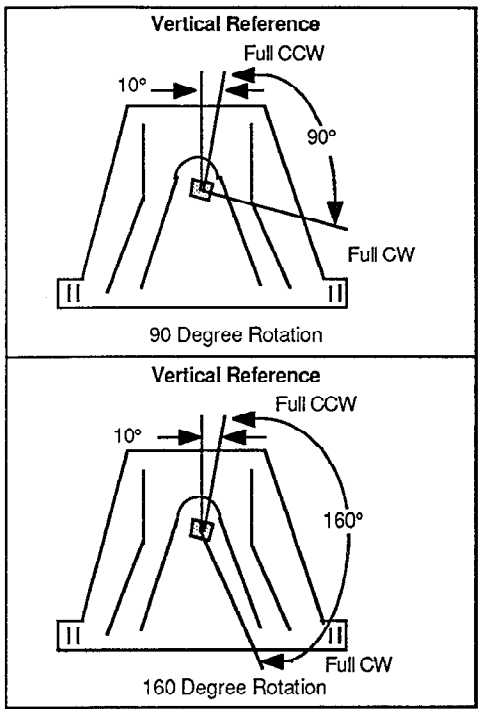


Figure 1. Mounting Dimensions for MMR-400, MMR-500 Series



Full CW and CCW Position of Output Shaft as Viewed from the Load (Normally Closed) End of the Motor

Figure 2. Motor Output Shaft Rotation

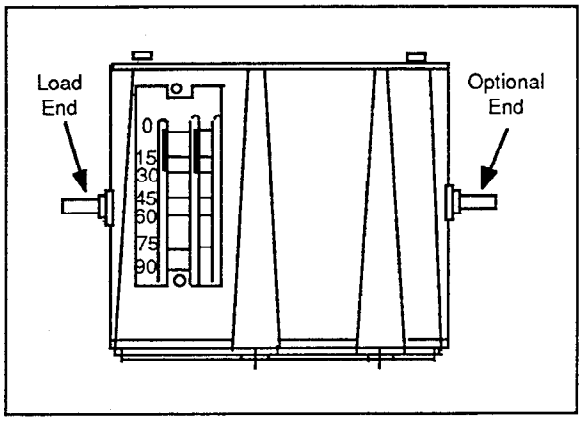


Figure 3. Output Shaft Designation for MMR-400 Series

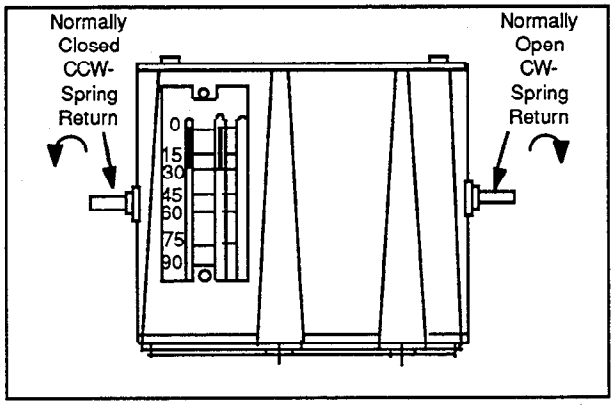


Figure 4. Output Shaft Designation for MMR-500 Series

SECTION I-GENERAL INSTRUCTIONS

MMC CONTROL MODULE - MOUNTING AND WIRING GUIDLINES

(See Figure 5)

Consult MMC Control Module General Instructions for complete mounting and wiring details.

1. Select the proper control module for the required application.
2. See **Field Adjustments** section of these instructions before installing control module.
3. Make the wiring connections in accordance with job wiring diagram and as detailed in the MMC Control Module General Instruction Sheet.
4. Remove the four (4) top cover screws from the modular motor and remove the cover.

NOTE

If maximum output shaft rotation needs to be changed (factory set at 160°). See Field Adjustments before installing control module.

5. Pick up the control module by the metal installation handle.
6. Place control module guidepost holes over insertion guide posts and push straight down on both ends of the metal insertion handle until module is secured to motor terminal cover.
7. Install the wiring label included with control module on the inside of the motor cover so that the configuration of the motor can be determined at a later date.
8. Proceed with field wiring.

WIRING MOTOR TO LINE VOLTAGE POWER SOURCES

(See Figure 5 for terminal designations)

MM and MMR Modular Motors require 24 Vac power Class 2 source if motor is to be wired to line voltage power source (120, 208, and 240 Vac):

1. Use existing transformer (if available) or ...
2. Use an external line-to-24 Vac transformer or ...
3. Use Barber-Colman AM-231 Transformer Kit (120/208/240 Vac multiple tap primary to 24 Vac secondary). Consult AM-231 Transformer Kit General Instructions for complete installation instructions.

CAUTION

When multiple motors are powered from the same transformer, they must be in phase. That is, connect the same transformer lead to the TR1 terminal on all motors and connect the other transformer lead to the TR2 on all motors.

Not all control modules — check the appropriate control module General Instructions — enable multiple motors to be powered from the same transformer.

FIELD ADJUSTMENTS

SETTING MAXIMUM OUTPUT SHAFT ROTATION
(See Figures 5 and 6)

The internal mechanical stop has been factory set to limit the maximum shaft rotation to 160°.

NOTE

When MMR motor is used with a control module that does not have a maximum shaft rotation adjustment potentiometer, maximum shaft rotation for less than 160° must be set by the internal mechanical stop lever.

The shaft rotation may be changed to 75°, 90°, or 110° by:

1. Removing the four (4) single slotted screws on the top of the motor cover.
2. Remove the cover.
3. Remove the control module from the top of the motor using the metal installation handle.
4. Run the motor until the stop lever on the output gear is accessible (See Figures 5 and 6):

   MMR-400 Series:

   a. Apply 24Vac across P21 and P25. Motor should drive clockwise(CW) as viewed from the "Load" end.
   b. Apply 24Vac across P21 and P24. Motor should drive counterclockwise(CCW) as viewed from the "Load" end.

   MMR-500 Series:

   a. Apply 24Vac across P21 and P25. Motor should drive clockwise(CW) as viewed from the "Normally Closed - CCW Spring Return" end.
   b. Remove power and the motor should spring return counterclockwise as viewed from the "Normally Closed - CCW Spring Return" end.
   c. During spring return apply 24Vac across P21 and P23. The motor should stop. Remove power and the motor should continue to spring return.
5. Lift the stop lever away from the output gear using a thin single blade screwdriver [4" (102 mm) long min.] until the lever can be rotated to a different setting.
6. Move the stop lever to the required setting.
7. Place the control module guide post holes over the insertion guide posts and push straight down on the metal insertion handle until the module is secured to the motor terminal cover.
8. Replace motor cover and cover screws.

SETTING INTERNAL AUXILIARY SWITCHES
(MMR-400-002 & MMR-500-002 Only) (See Figure 7)

Remove the internal auxiliary switch cover plate, located just below a knockout, by loosening the two (2) single slotted screws on the plate.

Settings - Field Adjustable:

For switch settings between 0° and 90° shaft rotation.

1. Move the appropriate switch adjustment lever to the required setting (each "click" on the movement of the lever is approximately 3°).
2. Power the motor and run through full stroke to check switch action using continuity test.
3. Replace the adjustment lever cover plate and screws.

For switch settings between 90° and 160° shaft rotation.

1. Insert TOOL-16 into place on auxiliary switch #1 or #2 cam.
2. Rotate the cam 90° CW with respect to the "Load" or "Normally Closed - CCW Spring Return" end of the motor, add "90°" to the auxiliary switch settings marked next to the adjustment levers.
3. Power the motor and run through full stroke to check switch action using continuity test.
4. Replace the adjustment lever cover plate and screws.

Differential - Factory Set at 2° (approximately) field adjustable at 10° (approximately) (See Figures 7 and 8):

1. Insert TOOL-16 into place on auxiliary switch #1 or #2 cam.
2. Rotate the cam 180°. The switch differential will now be 10° (approximately).
3. Power the motor and run through full stroke to check switch action using continuity test.
4. Replace the adjustment lever cover plate and screws.

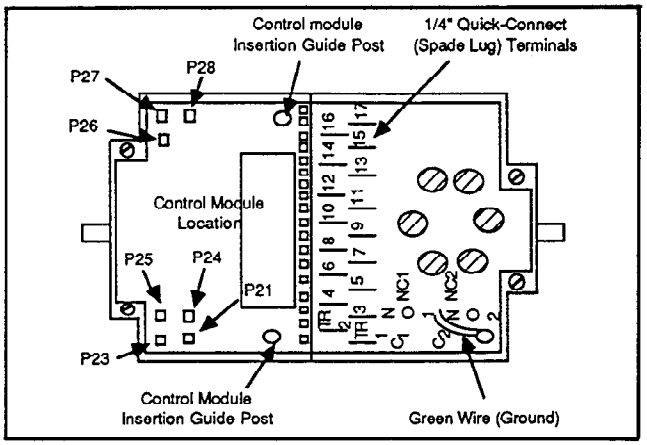


Figure 5. Terminal Board Connections and Control Module Location

SECTION I -GENERAL INSTRUCTIONS

CHECKOUT

After the entire system has been installed, the following check for proper operation can be made:

1. Be sure that the system power is connected and ON.
2. Be sure control (manual or automatic) is operating the modular motor properly per system requirements.
3. Action of auxiliary switch (on MMR-400-002 and MMR-500-002 only):
   a. C made to NC when motor is at de-energized and spring return to 0°.
   b. C made to NO when motor shaft rotation reaches auxiliary switch setting.
4. Be sure there is no binding of the linkage at any point in the stroke.
5. If the motor fails to run, check the field wiring to insure proper voltage supply.
6. If the field wiring is correct and the motor fails to run, remove the control module and check motor function using the following procedure (See Figure 5):

   MMR-400 Series:

   a. Apply 24Vac across P21 and P25. Motor should drive clockwise(CW) as viewed from the "Load" end.
   b. Apply 24Vac across P21 and P24. Motor should drive counterclockwise(CCW) as viewed from the "Load" end.

   MMR-500 Series:

   a. Apply 24Vac across P21 and P25. Motor should drive clockwise(CW) as viewed from the "Normally Closed - CCW Spring Return" end.
   b. Remove power and the motor should spring return counterclockwise as viewed from the "Normally Closed - CCW Spring Return" end.
   c. During spring return apply 24Vac across P21 and P23. The motor should stop. Remove power and the motor should continue to spring return.

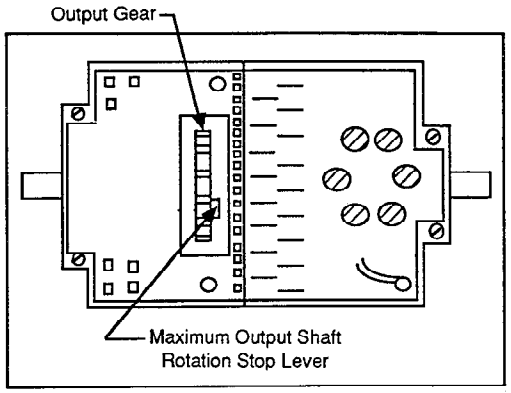


Figure 6. Maximum Output Shaft Rotation Stop Lever Location

7. To check the potentiometer proceed as follows:
   a. Measure the resistance across motor terminals P26 and P27. Resistance should be as shown in Table 6.
   b. Measure the resistance across motor terminals P28 and P27. Resistance should be as shown in Table 6.

TABLE 6. POTENTIOMETER RESISTANCE CHANGE FOR FULL STROKE (160° Rotation) OF THE MOTOR

Load End or N.C. End of Motor	Optional End or N.O. End of Motor	Resistance Terminal P27 (Wiper) to P26	Resistance Terminal P27 (Wiper) to P28
CCW End of Motor Stroke	CW End of Motor Stroke	343Ω ±11%	657Ω ±11%
CW End of Motor Stroke	CCW End of Motor Stroke	957Ω +15%, -10%	0 to 75Ω

CAUTION

This device is limited to 50% duty cycle. To achieve maximum service life, check the system to verify proper operation. The actuator shaft should not be continuously moving. After initial start-up and system stabilization, the actuator shaft should be moving less than 50% of the time. Exceeding 50% duty cycle limit will result in reduced life.

NOTE

If the actuator shaft is continuously moving, the system may be "hunting." System instability or "hunting" can be caused by:

- Throttling range too narrow
- Integral term set too fast
- Large temperature fluctuations caused by external influences at the sensor (e.g., fork lift truck exhaust, open garage doors)
- Oversized valves or mechanical equipment
- Other control strategies which may cause continuous actuator movement

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance.

FIELD REPAIR

None. Replace with a functional motor.

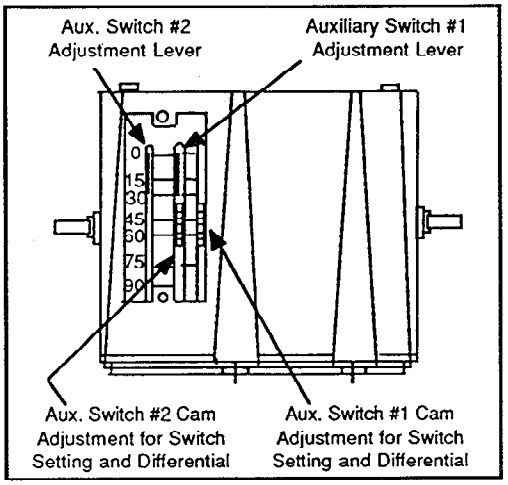


Figure 7. Auxiliary Switch Adjustments
(Shown with Adjustment Lever Cover Removed)

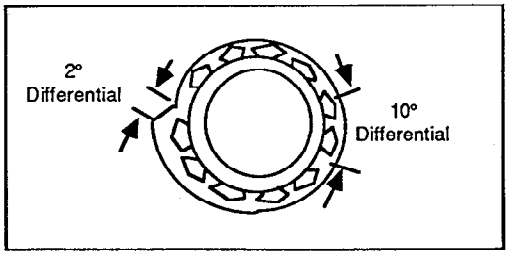


Figure 8. Auxiliary Switch Cam Differential

TABLE 7. HONEYWELL MOTOR COMPETITIVE CROSS REFERENCE

Use the following table to confirm that the proper MMR motor, MMC control module, and other required accessories have been selected.

Descriptive Data of Motor (Actuator) Being Replaced								Required Replacement Items				Wiring Termination Conversion MMR Motor (Actuator) and MMC Control Module Versus the Motor (Actuator) Being Replaced														Replacement	Comments
Part Number	Torque Lb.-In.	Voltage (Hertz)	Spring Return	Stroke Degrees	Timing Sec.	Auxiliary Switches	Input Signals	Motor (Actuator)	Plug-In Control Module	AM-231 Cover Trans.	AM-233 W859 Mtg. Kit	TR1	TR2	3	4	5	9	16	17	C1	NO1	NC1	C2	NO2	NC2		
M204A1068	108	24 (50/60)	None	180	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T	T	R	W	B										Direct	5
M405B1011	27	208 (60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3, 4
M405B1028	27	240 (60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3, 4
M405B1102	27	120 (60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req	*	*													Direct	3, 4
M405C1002	50	120 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3
M405C1010	50	208 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3
M405C1069	50	240 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3
M405D1001	50	120 (50/60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3, 4
M405D1027	50	240 (50/60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3, 4
M445A1000	50	120 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M445A1018	50	120 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M445A1026	50	208 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M445A1042	50	208/240	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M445A1117	50	120 (50/60)	N.C.	90	30	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	1, 2, 3
M445C1008	50	120 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M445D1007	50	120 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Req.	Not Req.	*	*													Direct	3
M465B1007	25	240 (50/60)	N.C.	90	23	2 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel	Bl/Red	Bl/Blue	Bl/Yel	Functional	2, 3, 6
M604C1059	108	24 (60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B										Direct	
M634A1009	35	24 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	Black	Black	Red	Yel	Blue										Direct	6
M634B1008	35	120 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Req.	Not Req.	*	*	Red	Yel	Blue										Direct	6
M634B1016	35	240 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Req.	Not Req.	*	*	Red	Yel	Blue										Direct	6
M634C1007	35	24 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	Black	Black	Red	Yel	Blue										Direct	6
M634C1049	35	120 (50/60)	None	160	60	2 SPDT	SPDT	MMR-400-002	MMC-468	Req.	Not Req.	*	*	Red	Yel	Blue				Red	Blue	Yel	Bl/Red	Bl/Blue	Bl/Yel	Direct	2, 6
M644A1008	150	24 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B										Direct	
M644A1016	150	24 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B										Direct	
M644A1024	150	24 (50/60)	None	90	30	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B										Direct	1
M644A1172	150	24 (50/60)	None	160	60	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B										Direct	
M644D1005	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	SPDT	MMR-400-002	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B				Red	Blue	Yel	Bl/Red	Bl/Blue	Bl/Yel	Direct	1, 2
M644D1013	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	SPDT	MMR-400-002	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B				Red	Blue	Yel	Bl/Red	Bl/Blue	Bl/Yel	Direct	1, 2
M644D1039	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	SPDT	MMR-400-002	MMC-468	Not Req.	Not Req.	T1	T2	R	W	B				Red	Blue	Yel	Bl/Red	Bl/Blue	Bl/Yel	Direct	1, 2
M644L1014	150	120 (50/60)	None	90	30	1 SPDT	SPDT	MMR-400-002	MMC-468	Req.	Not Req.	*	*	R	W	B				Red	Blue	Yel				Direct	1, 2
M805B1004	27	24 (60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2													Direct	3, 4
M805C1003	27	24 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2													Direct	3
M805D1002	27	24 (60)	N.O.	160	60	0	SPST	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2													Direct	3, 4
M845A1001	50	24 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Not Req.	Not Req.	T1	T2							Red	Blue	Yel				Direct	2, 3
M845A1027	50	120 / 208 / 240 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M845A1035	50	120 / 208 / 240 (50/60)	N.C.	90	30	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	1, 2, 3
M845B1000	50	24 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Not Req.	Not Req.	T1	T2							Red	Blue	Yel				Direct	2, 3
M845B1018	50	120 (50/60)	N.C.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3
M845C1009	50	24 (50/60)	N.C.	160	60	0	SPST	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2													Direct	3
M845E1007	50	120 (50/60)	N.O.	160	60	1 SPDT	SPST	MMR-500-002	MMC-468	Req.	Not Req.	*	*							Red	Yel	Blue				Direct	2, 3, 4
M865B1008	25	24 (50/60)	N.C.	90	23	1 SPDT	SPST	MMR-500-002	MMC-468	Not Req.	Not Req.	*	*							Red	Blue	Yel				Direct	2, 3, 6

Comments:

*** Attach AM-231 transformer leads as follows: Brown leads to TR1 and TR2 of actuator and appropriate two leads to power source, Black = common, White = 120 VAC, Red/Yellow = 208 VAC and Orange = 240 VAC.**

1. Set actuator stroke to match the actuator being replaced. Check the closed position of the actuator shaft. Adjust damper linkage as required.

2. Adjust the auxiliary switch(s) to match the differential and switch point of the actuator being replaced.

3. Install jumper between terminals 3 and 5.

4. The MM or MMR-500 series of spring return actuators can be used for normally open or closed applications depending on which end of the actuator the damper or valve linkage is attached. Attach linkage to the normally open end for these applications.

5. Set travel for 160° and adjust the linkage

6. Replacement actuator mounts the same but is larger. For models with an auxiliary switch the actuator being replaced had a Full Load Amp rating of 8.0 @120 VAC and 4.0 @ 240 VAC while the replacement is 7.2 @ 120 VAC and 3.6 @ 240 VAC.

7. Replacement actuator's auxiliary switches have 2° or 10° differential. If adjustable differential is required order AM-242 seperately.

8. Replacement actuator is slower than actuator being replaced. Check application to determine if speed is critical.

9. The replacement actuators cannot replace slave actuators in mechanical mousetrap master- slave actuator systems (systems in which one master actuator drives the other actuators with Q69 auxiliary potentiometer). They can replace master actuator.

TABLE 7. HONEYWELL MOTOR COMPETITIVE CROSS REFERENCE (Continued)

Descriptive Data of Motor (Actuator) Being Replaced								Required Replacement Items				Wiring Termination Conversion MMR Motor (Actuator) and MMC Control Module Versus the Motor (Actuator) Being Replaced														Replace-ment	Comments
Part Number	Torque Lb.-In.	Voltage (Hertz)	Spring Return	Stroke Degrees	Timing Sec.	Auxiliary Switches	Input Signals	Motor (Actuator)	Plug-In Control Module	AM-231 Cover Trans.	AM-233 W859 Mtg. Kit	TR1	TR2	3	4	5	9	16	17	C1	NO1	NC1	C2	NO2	NC2		
M904E1358	108	24 (50/60)	None	160	60	0	135Ω	MMR-400	MMC-90	Not Req.	Not Req.	T	T	R				B	W							Direct	9
M905E1118	27	24 (60)	N.O.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Not Req.	T	T	R				B	W							Direct	4, 9
M905F1008	27	24 (60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Not Req.	T	T	R				B	W							Direct	9
M934A1003	35	240 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 9
M934A1029	35	24 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel							Functional	6, 9
M934A1045	35	24 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1060	35	240 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1086	35	120 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 9
M934A1094	35	120 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1201	35	240 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 9
M934A1219	35	120 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 9
M934A1227	35	24 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel							Functional	6, 9
M934A1243	35	24 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1250	35	120 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1268	35	240 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1284	35	120 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 9
M934A1292	35	120 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934A1318	35	120 (50/60)	None	90	35	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	1, 2, 6, 9
M934A1326	35	120 (50/60)	None	90	35	0	135 Ω	MMR-400	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	1, 6, 9
M934A1334	35	24 (50/60)	None	90	35	0	135 Ω	MMR-400	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel							Functional	1, 6, 9
M934A1342	35	24 (50/60)	None	160	60	0	135 Ω	MMR-400	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel							Functional	6, 9
M934D1000	75	120 (50/60)	None	160	60	1 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel				Functional	2, 6, 9
M934D1018	75	120 (50/60)	None	160	60	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 9
M934D1026	75	120 (50/60)	None	90	35	1 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel				Functional	1, 2, 6, 9
M934D1034	75	120 (50/60)	None	90	35	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	1, 2, 6, 9
M934D1042	75	120 (50/60)	None	90	35	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	1, 2, 6, 9
M934D1059	75	120 (50/60)	None	90	35	2 SPDT	135 Ω	MMR-400-002	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	1, 2, 6, 9
M944A1002	150	24 (50/60)	None	160	60	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	9
M944A1010	150	24 (50/60)	None	160	60	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	9
M944A1028	150	24 (50/60)	None	90	30	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	1, 9
M944A1076	150	24 (50/60)	None	160	60	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	9
M944A1192	150	24 (50/60)	None	90	30	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	1, 9
M944A1218	150	24 (50/60)	None	160	60	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	9
M944C1042	150	24 (50/60)	None	90 or 160	30 or 60	0	135Ω	MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1							Direct	1, 9
M944D1009	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	135Ω	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2, 7, 9
M944D1017	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	135Ω	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R1				B1	W1	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2, 7, 9
M945A1009	50	24 (50/60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	9
M945A1017	50	24 (50/60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	9
M945A1033	50	120 (50/60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Req.	--	*	*	R				B	W							Direct	9, 10
M945A1066	50	24 (50/60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	9
M945A1074	50	24 (50/60)	N.C.	90	30	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	1, 9
M945A1082	50	24 (50/60)	N.C.	90	30	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	1, 9
M945A1124	50	24 (50/60)	N.C.	90	30	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	11	T2	R				B	W							Direct	1, 9

Comments:

* Attach AM-231 transformer leads as follows: Brown leads to TR1 and TR2 of actuator and appropriate two leads to power source, Black = common, White = 120 VAC, Red/Yellow = 208 VAC and Orange = 240 VAC.

1. Set actuator stroke to match the actuator being replaced. Check the closed position of the actuator shaft. Adjust damper linkage as required.
2. Adjust the auxiliary switch(s) to match the differential and switch point of the actuator being replaced.
3. Install jumper between terminals 3 and 5.
4. The MM or MMR-500 series of spring return actuators can be used for normally open or closed applications depending on which end of the actuator the damper or valve linkage is attached. Attach linkage to the normally open end for these applications.
5. Set travel for 160° and adjust the linkage
6. Replacement actuator mounts the same but is larger. For models with an auxiliary switch the actuator being replaced had a Full Load Amp rating of 8.0 @120 VAC and 4.0 @ 240 VAC while the replacement is 7.2 @ 120 VAC and 3.6 @ 240 VAC.
7. Replacement actuator's auxiliary switches have 2° or 10° differential. If adjustable differential is required order AM-242 seperately.
8. Replacement actuator is slower than actuator being replaced. Check application to determine if speed is critical.
9. The replacement actuators cannot replace slave actuators in mechanical mousetrap master- slave actuator systems (systems in which one master actuator drives the other actuators with Q66 auxiliary potentiometer). They can replace master actuator.
10. If used with W859, AM-233 is required and AE-201 remote mounted transformer is required instead of AM-231.

TABLE 7. HONEYWELL MOTOR COMPETITIVE CROSS REFERENCE (Continued)

Descriptive Data of Motor (Actuator) Being Replaced								Required Replacement Items				Wiring Termination Conversion MMR Motor (Actuator) and MMC Control Module Versus the Motor (Actuator) Being Replaced														Replacement	Comments
Part Number	Torque Lb.-in.	Voltage (Hertz)	Spring Return	Stroke Degrees	Timing Sec.	Auxiliary Switches	Input Signals	Motor (Actuator)	Plug-In Control Module	AM-231 Cover Trans.	AM-233 W859 Mtg. Kit	TR1	TR2	3	4	5	9	16	17	C1	NO1	NC1	C2	NO2	NC2		
M945A1157	50	24 (50/60)	N.C.	90 or 160	30 or 60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	1, 9
M945D1006	50	24 (50/60)	N.C.	160	60	2 SPDT	135Ω	MMR-500-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	2, 9
M945F1004	50	24 (50/60)	N.O.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				W	B							Direct	4, 9
M945H1002	50	24 (50/60)	N.C.	160	60	2 SPDT	135Ω	MMR-500-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	2, 9
M945M1006	50	24 (50/60)	N.C.	160	60	0	135Ω	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	9
M954A1035	150	24 (50/60)	None	90 or 160	30 or 60	0		MMR-400	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	1
M954B1034	150	24 (50/60)	None	90	30	2 SPDT		MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2
M954B1042	150	24 (50/60)	None	90	30	2 SPDT		MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2
M954B1059	150	120 (50/60)	None	90	30	2 SPDT	135Ω,	MMR-400-002	MMC-90	Req.	--	*	*	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2, 10
M954B1067	150	24 (50/60)	None	160	60	2 SPDT	4 to 20 mADC,	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	2
M954C1058	150	24 (50/60)	None	90	30	1 SPDT	0 to 7 mADC	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel				Direct	1, 2
M954C1066	150	24 (50/60)	None	90	30	1 SPDT	as produced	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel				Direct	1, 2
M954C1074	150	24 (50/60)	None	160	60	1 SPDT	by W973 or	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel				Direct	2
M954D1016	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	W7100,	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2
M954D1024	150	24 (50/60)	None	90 or 160	30 or 60	2 SPDT	2-Position	MMR-400-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel	BlRed	BlBlue	BlYel	Direct	1, 2
M955A1024	50	24 (50/60)	N.C.	90 to 160	30 to 60	0	and W859	MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	1
M955C1014	50	24 (50/60)	N.C.	90 to 160	30 to 60	1 SPDT		MMR-500-002	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W	Red	Blue	Yel				Direct	1, 2
M955D1005	50	24 (50/60)	N.C.	160	60	0		MMR-500	MMC-90	Not Req.	Req. W859	T1	T2	R				B	W							Direct	
M955D1039	50	120 (50/60)	N.C.	90	30	0		MMR-500	MMC-90	Req.	--	*	*	R				B	W							Direct	1, 10
M965A1007	25	24 (50/60)	N.C.	160	40	0	135Ω	MMR-500	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel							Functional	6, 8, 9
M965A1023	25	120 (50/60)	N.C.	160	40	0	135Ω	MMR-500	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	6, 8, 9
M965A1049	25	120 (50/60)	N.C.	90	23	0	135Ω	MMR-500	MMC-90	Req.	Not Req.	*	*	Red				Blue	Yel							Functional	1, 6, 8, 9
M965B1006	25	24 (50/60)	N.C.	160	40	2 SPDT	135Ω	MMR-500-002	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 8, 9
M965B1022	25	24 (50/60)	N.C.	90	23	1 SPDT	135Ω	MMR-500-002	MMC-90	Not Req.	Not Req.	Black	Black	Red				Blue	Yel	Red	Blue	Yel				Functional	1, 2, 6, 8, 9
M975A1006	25	24 (50/60)	N.C.	160	40	0	135Ω,	MMR-500	MMC-90	Req.	Not Req.	*	*	R				B	W							Functional	6, 8
M975A1014	25	24 (50/60)	N.C.	90	23	0	4 to 20 mADC,	MMR-500	MMC-90	Req.	Not Req.	*	*	R				B	W							Functional	6, 8
M975B1005	25	24 (50/60)	N.C.	160	40	2 SPDT	0 to 7 mADC as produced by W973 or W7100, 2-Position and W859	MMR-500-002	MMC-90	Req.	Not Req.	*	*	R				Blue	Yel	Red	Blue	Yel	BlRed	BlBlue	BlYel	Functional	2, 6, 8

Comments:

* Attach AM-231 transformer leads as follows: Brown leads to TR1 and TR2 of actuator and appropriate two leads to power source, Black = common, White = 120 VAC, Red/Yellow = 208 VAC and Orange = 240 VAC.

1. Set actuator stroke to match the actuator being replaced. Check the closed position of the actuator shaft. Adjust damper linkage as required.
2. Adjust the auxiliary switch(s) to match the differential and switch point of the actuator being replaced.
3. Install jumper between terminals 3 and 5.
4. The MM or MMR-500 series of spring return actuators can be used for normally open or closed applications depending on which end of the actuator the damper or valve linkage is attached. Attach linkage to the normally open end for these applications.
5. Set travel for 160° and adjust the linkage
6. Replacement actuator mounts the same but is larger. For models with an auxiliary switch the actuator being replaced had a Full Load Amp rating of 8.0 @120 VAC and 4.0 @ 240 VAC while the replacement is 7.2 @ 120 VAC and 3.6 @ 240 VAC.
7. Replacement actuator's auxiliary switches have 2° or 10° differential. If adjustable differential is required order AM-242 seperately.
8. Replacement actuator is slower than actuator being replaced. Check application to determine if speed is critical.
9. The replacement actuators cannot replace slave actuators in mechanical mousetrap master- slave actuator systems (systems in which one master actuator drives the other actuators with Q68 auxiliary potentiometer). They can replace master actuator.
10. If used with W859, AM-233 is required and AE-201 remote mounted transformer is required instead of AM-231.

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

REUSING HONEYWELL Q209A-10XX MOTOR MOUNTED POTENTIOMETER (See Figure 9).

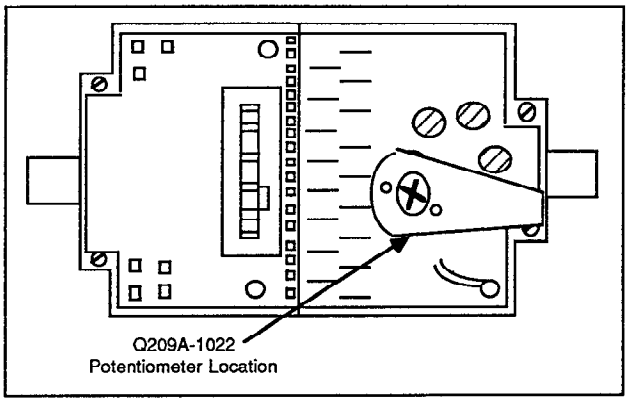


Figure 9. Motor Mounted Potentiometer (Q209A-1022) Location

1. If a Honeywell motor has a Q209A-10XX motor mounted potentiometer that will be used in the replacement motor, remove the potentiometer from the Honeywell motor.
2. Wire and electrically insulate the potentiometer with tape. Place it in the replacement MMR motor wiring compartment.
3. For wiring details see MMC-90 General Instructions sheet (F-23350).
4. Make any of the necessary adjustments to the potentiometer.

MOUNTING HONEYWELL Q607 AUXILIARY SWITCH KIT TO MMR MODULAR MOTOR.

If a Honeywell motor is replaced that has an Q607) auxiliary switch kit that will continue to be used, use the following instructions to mount device to MMR motor.

REMOVING AUXILIARY SWITCH KIT FROM HONEYWELL MOTOR

1. Remove cover of auxiliary kit by prying off cover housing.
2. Remove auxiliary kit housing from mounting bracket by removing the two (2) screws from inside the housing.
3. With slotted screwdriver, depress wire spring on the bottom of the housing and slip housing out of the mounting bracket tab.
4. Remove screws and auxiliary kit mounting bracket from Honeywell motor.

INSTALLING AUXILIARY SWITCH KIT ON MMR FOR DAMPER APPLICATIONS:

1. Slide the formed side of the bracket onto the motor shaft and secure the motor base to the straight side of the bracket with the 1/4"-20 X 7/8" hexhead bolts provided. (Refer to Figure 10)

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer must be mounted to motor shaft if the kits are to be mounted to the "Load" or "Normally Closed - CCW Spring Return" end of the MMR motor.

2. Mount the Honeywell mounting bracket onto the Barber-Colman mounting bracket by using the three (3) #8-32 screws provided.
3. Mount the Honeywell switch kit (Q607) to the mounting bracket using the two (2) existing Honeywell screws.
4. Reconnect electrical wires and re-assemble Q607 cover after the modular motor has been securely mounted.
5. Reset, if necessary, switch cams to original specifications.

INSTALLING AUXILIARY SWITCH KIT ON MMR FOR VALVE APPLICATIONS:

WHEN MOUNTING MMR MOTOR TO HONEYWELL Q601E LINKAGE (See Figure 10).

1. Slide the formed side of the bracket onto the motor shaft and secure the motor base to the straight side of the bracket with the 1/4"-20 X 7/8" hexhead bolts provided. (Refer to Figure 10)

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer must be mounted to motor shaft if the kits are to be mounted to the "Load" or "Normally Closed - CCW Spring Return" end of the MMR motor.

2. Mount the Honeywell mounting bracket onto the Barber-Colman mounting bracket by using the three (3) #8-32 screws provided.
3. Mount the Honeywell switch kit (Q607) to the mounting bracket using the two (2) existing Honeywell screws.
4. Reconnect electrical wires and re-assemble Q607 cover after the modular motor has been securely mounted.
5. Reset, if necessary, switch cams to original specifications.

WHEN MOUNTING MMR MOTOR TO HONEYWELL Q618A LINKAGE (See Figure 11).

1. Mount the formed side of the Barber-Colman mounting bracket to the MMR and the Q618A linkage (the Q618A is mounting previous to the auxiliary kit installation).

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer must be mounted to motor shaft if the kits are to be mounted to the "Load" or "Normally Closed CCW" end of the MMR motor.

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

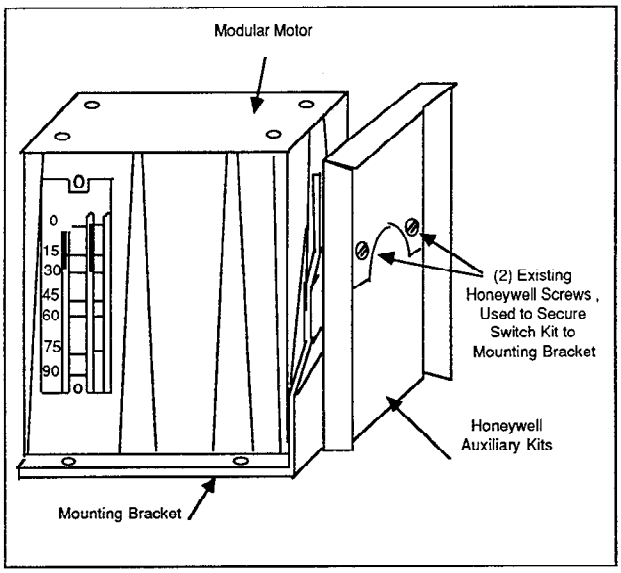


Figure 10. Mounting Auxiliary Kits to Modular Motor

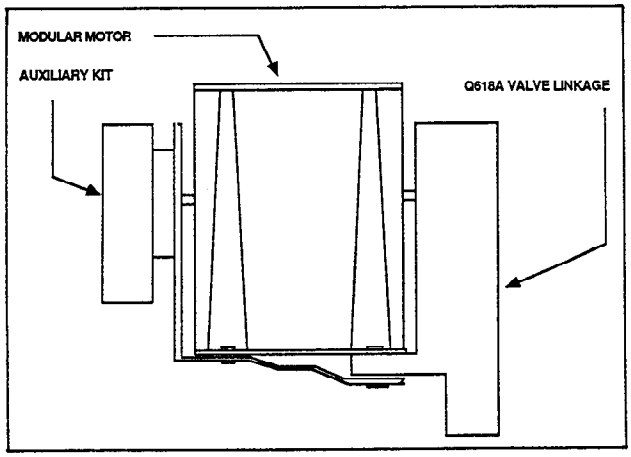


FIGURE 11. INSTALLATION OF MODULAR MOTOR AND AUXILIARY KITS ON HONEYWELL Q618A VALVE LINKAGE

2. Mount the Honeywell mounting bracket onto the straight side Barber-Colman mounting bracket by using three (3) #8-32 X 7/16" screws provided. The formed side of the bracket is used to mount the MMR to the Q618A linkage.

3. Mount the Honeywell switch kit (Q607) to the mounting bracket using the two (2) existing Honeywell screws.

4. Reconnect electrical wires and re-assemble Q607 cover after the modular motor has been securely mounted.

5. Reset, if necessary, switch cams to original specifications.

MOUNTING HONEYWELL Q181A AUXILIARY POTENTIOMETER KIT TO MMR MODULAR MOTOR.

If a Honeywell motor is replaced that has an Q181A auxiliary potentiometer kit that will continue to be used, use the following instructions to mount device to MMR motor.

REMOVING Q181A AUXILIARY POTENTIOMETER KIT FROM HONEYWELL MOTOR

1. Loosen cover screws and remove cover of Q181A potentiometer kit.

2. Remove potentiometer kit from the motor by loosening the two (2) #8-32 screws in the back of the mounting case.

NOTE

Be careful not to lose the drive pin couping that is rests against the drive pin.

3. Loosen the two (2) Allen head screws with an appropriate Allen head wrench and remove the shaft coupling from the Honeywell motor output shaft.

INSTALLING Q181A AUXILIARY POTENTIOMETER KIT ON MMR FOR DAMPER APPLICATIONS:

1. Slide the formed side of the bracket onto the motor shaft and secure the motor base to the straight side of the bracket with the 1/4"-20 X 7/8" hexhead bolts provided. (Refer to Figure 10)

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer (from the MMR) must be mounted to motor shaft if the potentiometer kit is to be mounted to the "Load" or "Normally Closed - CCW Spring Return" end of the MMR motor.

2. Install the shaft coupling on the motor shaft so the slots are on the top and bottom when the motor is in the fully CCW position. Tighten both set screws.

3. Make certain that the cam follower is on the low side of the cam. Fit the drive pin coupling over the drive pin and put the Q181A in place on the mounting bracket. The drive pin shaft should engage the shaft coupling.

4. Mount the Q181A on the mounting bracket with the two (2) #8-32 screws provided with the kit.

5. Run the modular motor over its entire travel to make certain the potentiometer wiper arm is not driven beyond the windings.

6. Replace the cover of the kit.

INSTALLING AUXILIARY POTENTIOMETER KIT ON MMR FOR VALVE APPLICATIONS:

WHEN MOUNTING MMR MOTOR TO HONEYWELL Q601E LINKAGE.

1. Slide the formed side of the bracket onto the motor shaft and secure the motor base to the straight side of the bracket with the 1/4"-20 X 7/8" hexhead bolts provided. (Refer to Figure 10)

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer (from the MMR) must be mounted to motor shaft if the potentiometer kit is to be mounted to the "Load" or "Normally Closed - CCW Spring Return" end of the MMR motor.

2. Install the shaft coupling on the motor shaft so the slots are on the top and bottom when the motor is in the fully CCW position. Tighten both set screws.

3. Make certain that the cam follower is on the low side of the cam. Fit the drive pin coupling over the drive pin and put the Q181A in place on the mounting bracket. The drive pin shaft should engage the shaft coupling.

4. Mount the Q181A on the mounting bracket with the two (2) #8-32 screws provided with the kit.

5. Run the modular motor over its entire travel to make certain the potentiometer wiper arm is not driven beyond the windings.

6. Replace the cover of the kit.

WHEN MOUNTING MMR MOTOR TO HONEYWELL Q618A LINKAGE.

1. Mount the formed side of the Barber-Colman mounting bracket to the MMR and the Q618A linkage (the Q618A is mounted previous to the auxiliary kit installation).

NOTE

The square shaft extender with #8-32 X 5/8" screw and washer (from the MMR) must be mounted to motor shaft if the potentiometer kit is to be mounted to the "Load" or "Normally Closed - CCW Spring Return" end of the MMR motor.

2. Install the shaft coupling on the motor shaft so the slots are on the top and bottom when the motor is in the fully CCW position. Tighten both set screws.

3. Make certain that the cam follower is on the low side of the cam Fit the drive pin coupling over the drive pin and put the Q181A in place on the mounting bracket. The drive pin shaft should engage the shaft coupling.

4. Mount the Q181A on the mounting bracket with the two (2) #8-32 screws provided with the kit.

5. Run the modular motor over its entire travel to make certain the potentiometer wiper arm is not driven beyond the windings.

6. Replace the cover of the kit.

DAMPER APPLICATIONS:

Use existing damper linkage if possible. If existing linkage is unusable, replace with appropriate Barber-Colman components. Refer to Other Barber-Colman Components - page 1.

If additional damper linking instructions are required - see AM-230 Series General Instructions (F-23377) for specific installation instructions.

MOUNTING MMR MOTOR TO HONEYWELL VALVE LINKAGES:

Mounting MMR Motor to Honeywell Q618A Valve Linkages: (See Figure 11, 12 & 13)

The MMR modular motor can be mounted to Honeywell Q618A valve linkage by using the mounting bracket, the spacer collar, and four (4) 1/4"-20 x 7/8" hexhead bolts, lockwashers and nuts provided.

The following step by step instructions define the procedure for removal of Honeywell Modutrol Series motors from Q618A linkage on 2-Way and 3-Way Globe Valves and replacement with the appropriate Barber-Colman Modular Motor.

Use the following table to confirm that the MMR motor selected can be used on the Honeywell valve in the system.

TABLE 8 HONEYWELL VALVE AND LINKAGE CROSS REFERENCE

Descriptive Data of Valve Body Being Replaced					Valve Linkage / Required Motor		
					Q618A1032	Q618A1024	Q601E1000
Part Number	Size	Cv	Dimension "A"	Dimension "B"	/ All MMR	/ MMR-400	/ MMR-400
					Maximum Close-Off Pressure (PSIG)		
2-Way; Stem Down to Close,250 PSIG Static, Equal Percentage Flow Characteristics, Screwed Ends FNPT							
V5011F1121	1/2"	2.5	3-3/8"	---	150	150	---
V5011F1139	1/2"	4.0	3-3/8"	---	150	150	---
V5011F1147	3/4"	6.3	3-1/2"	---	122	150	---
V5011F1154	1"	10.0	4-3/8"	---	106	150	---
V5011F1162	1-1/4"	16.0	5"	---	60	141	---
V5011F1170	1-1/2"	25.0	5-3/4"	---	39	91	---
V5011F1188	2"	40.0	5-3/4"	---	22	55	---
V5011F1196	2-1/2"	63.0	7-1/2"	---	12	32	---
V5011F1204	3"	100.0	8-7/8"	---	8	20	---
2-Way; Stem Down to Close,125 PSIG Static, Equal Percentage Flow Characteristics, 125 LB. Flanged							
V5011A1734	2-1/2"	63.0	9-1/2"	---	10	26	---
V5011A1767	3"	100.0	11"	---	7	20	---
V5011A1858	4"	160.0	13"	---	---	---	10
V5011A1882	5"	250.0	15"	---	---	---	6
V5011A1916	6"	360.0	16-1/2"	---	---	---	4
2-Way; Stem Down to Close,100 PSIG Static, Stainless Steel Trim, Linear Flow Characteristics, Screwed Ends FNPT							
V5011G1137	1/2"	0.4	3-3/8"	---	150	150	---
V5011G1145	1/2"	0.63	3-3/8"	---	150	150	---
V5011G1152	1/2"	1.0	3-3/8"	---	150	150	---
V5011G1160	1/2"	1.6	3-3/8"	---	150	150	---
V5011G1078	1/2"	2.5	3-3/8"	---	150	150	---
V5011G1186	1/2"	4.0	3-3/8"	---	150	150	---
V5011G1194	3/4"	6.3	3-1/2"	---	122	150	---
V5011G1202	1"	10.0	4-3/8"	---	106	150	---
V5011G1210	1-1/4"	18.0	5"	---	60	141	---
V5011G1228	1-1/2"	25.0	5-3/4"	---	39	91	---
2-Way; Stem Down to Close,100 PSIG Static, Stainless Steel Trim with Disc, Linear Flow Characteristics, Screwed Ends FNPT							
V5011G1103	2"	40.0	5-3/4"	---	22	55	---
V5051G1111	2-1/2"	63.0	7-1/2"	---	12	32	---
V5051G1129	3"	100.0	8-7/8"	---	8	20	---
3-Way Mixing; 250 PSIG Static, Screwed Ends FNPT							
V5013F1079	1/2"	4	3-1/8"	2-1/2"	130	150	---
V5013F1087	3/4"	6.3	3-3/8"	2-5/8"	120	150	---
V5013F1095	1"	10	3-7/8"	2-5/8"	70	150	---
V5013F1103	1-1/4"	16.0	4-1/4"	2-5/8"	50	146	---
V5013F1111	1-1/2"	25.0	4-3/4"	2-3/4"	35	98	---
V5013F1129	2"	40.0	5-7/8"	3-1/8"	20	67	---
3-Way Mixing; 125 PSIG Static, 125 Flanged Ends							
V5013B1003	2-1/2"	63.0	9-1/2"	6-7/16"	---	32	---
V5013B1011	3"	100.0	11"	6-5/8"	---	22	---
V5013B1029	4"	160.0	13"	8-11/16"	---	---	9
v5013B1037	5"	250.0	15"	9-5/8"	---	---	8
V5013B1045	6"	360.0	16-1/2"	10-11/16"	---	---	5
3-Way Diverting; 125 PSIG Static, 125 Flanged Ends *							
V5013C1001	2-1/2"	63.0	9-1/2"	6-7/16"	---	32	---
V5013C1019	3"	100.0	11"	6-5/8"	---	22	---
V5013C1027	4"	160.0	13"	8-11/16"	---	---	9
V5013C1035	5"	250.0	15"	9-5/8"	---	---	8
V5013C1043	6"	360.0	16-1/2"	10-11/16"	---	---	5

* **CAUTION :**
The common port of the Honeywell valve is a side port and the replacement is the bottom port.
Dimension "A" = The face to face dimension on the valve.
Dimension "B" = The dimension from the centerline of the pipe to the bottom of the lower ("B") port.

NOTE:
Ratings per Honeywell valve specification data sheets.

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

REMOVING HONEYWELL MOTOR

1. Disconnect power.
2. Remove top cover of motor.
3. Label leads by terminal designation (Eg. R, W, B, TR1,TR2 etc.) and remove wiring from Motor. Be sure and also label wires for auxiliary switches or devices.
4. Remove any auxiliary equipment attached to the auxiliary end or motor housing.
5. Remove conduit connection.
6. Remove linkage cover.
7. Remove Stem Button Clamp screw.
8. Remove Stem Button Clamp

NOTE

On Spring Return motors insert heavy duty screwdriver at the top or bottom of the linkage slide in the back slot of linkage frame. Pry the linkage slide upward or downward to free Stem Button Clamp (See Figure 13).

9. Loosen the two (2) setscrews and lift the linkage and motor assembly from the valve bonnet.

NOTE

The two captive screws are located at the back of the cam assembly behind the cam. If the screws are not visible, power the motor until the cam is completely up or down so the screws can be accessed.

10. Loosen the two (2) captive mounting screws and remove from linkage.
11. Remove motor mounting bolts.
12. Separate motor from linkage. Compress slide mechanism slightly to release cam.
13. Loosen Hex Set Screw and remove cam.

INSTALLING BARBER-COLMAN MMR MODULAR MOTOR

1. Select the appropriate modular motor, plug-in control module and accessories and install using instructions in Section I -GENERAL INSTRUCTIONS.
2. On non-spring return motors (MMR-400) select "Load" end of modular motor. On spring return motors (MMR-500) select "Normally Closed - CCW Spring Return" end when installing to a N.C. Honeywell valve and select "Normally Open - CW Spring Return" end when installing to a N.O. Honeywell valve. (See Figures 3 & 4).

NOTE

Auxiliary kits should be installed to mounting bracket before MMR motor is installed to valve linkage.

3. Place spacer collar (provided with MMR motor) on motor shaft.
4. Push cam on shaft.

NOTE

Key on cam must fit into keyway on motor shaft.

5. Snug spacer to cam and secure setscrew.
6. Place MMR motor on the formed end of the bracket and insert two (2) 1/4"-20 X 7/8" hexhead bolts in the auxiliary end (See Figure 11) Snug bolts but do not tighten.
7. Insert Q618 mounting foot between motor base and bracket.
8. Depress top roller of slide mechanism (See Figure 12).
9. Slip cam into linkage slide mechanism and loosely secure modular motor and adaptor bracket to motor mounting holes in Q618 linkage assembly with two (2) 1/4"-20 X 7/8" hexhead bolts.
10. Push motor forward to engage cam fully on linkage.
11. Tighten the four (4) 1/4"-20 X 7/8" hexhead motor mounting bolts securely.
12. Secure linkage to valve bonnet by tightening the two (2) setscrews.
13. Insert stem button clamp and secure with screw.

NOTE

If motor is in full N.O. (clockwise) or N.C. (counterclockwise) insert heavy duty screwdriver at the top or bottom of the linkage slide in the back slot of linkage frame and pry upward or downward to set Stem Button Clamp.

14. Reconnect appropriate control and power wiring. (See Table 6 - Wiring Terminations).
15. Replace top cover on modular motor.
16. Checkout:
    a. Motor should run freely through complete stroke.
    b. Linkage should operate without binding.
    c. Valve must close off tightly at bottom of stroke on 2-Way application (both ends of stroke on 3-Way application) check for 1/32" deflection of the roller bracket in closed position.
17. Replace linkage cover - secure with screw.

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

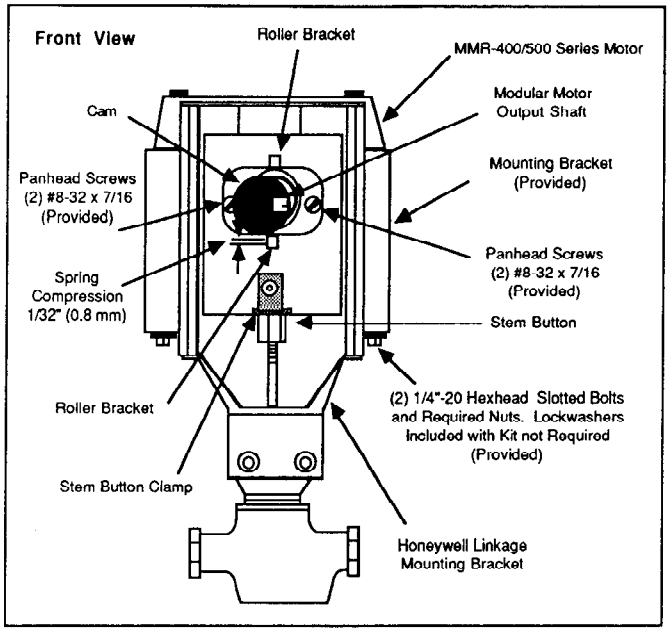


Figure 12. Honeywell Q618A Valve Linkage
(Shown with Cover Removed)

Mounting to Honeywell Q601E Valve Linkages: (See Figures 14 through 19)

The following step by step instructions define the procedure for removal of Honeywell Modutrol Series Motors from Q601 linkage on 2-Way and 3-Way Globe Valves and replacement with the appropriate Barber-Colman Modular Motor.

REMOVING HONEYWELL MOTOR

1. Disconnect power.
2. Remove top cover of Motor.
3. Label leads by terminal designation (Eg. R, W, B,TR1, TR2 etc.) and remove wiring from switch. Be sure and include wire for auxiliary switches or devices.
4. Remove any auxiliary equipment attached to the auxiliary end or motor housing.
5. Remove conduit connection.
6. Remove linkage cover.
7. Loosen spring adjust locknut.
8. Remove pressure from valve seat stem by turning spring adjustment screw CCW.
9. Loosen crank arm clamp screw (See figure 14).
10. Loosen and remove the four (4) mounting bolts for the motor.
11. Separate motor from crank arm using screwdriver to pry crank arm connection from motor shaft.

INSTALLING BARBER-COLMAN MMR MODULAR MOTOR

1. Select the appropriate modular motor, plug-in control module and accessories.

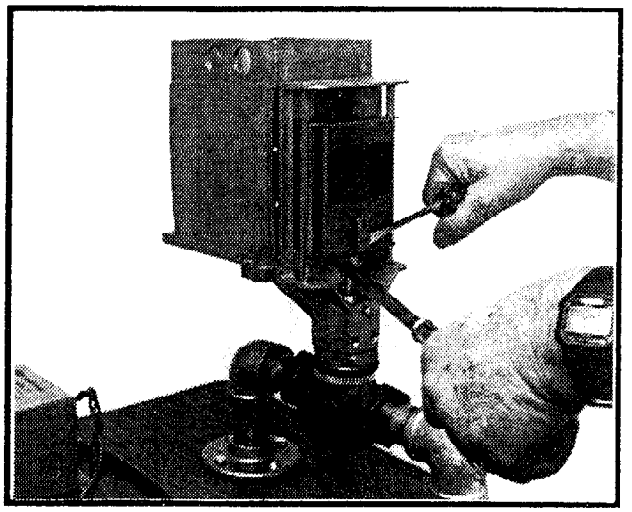


Figure 13. Removal of Stem Button Clamp.

2. On non-spring return motors (MMR-400) select "Load" end of modular motor. On spring return motors (MMR-500) select "Normally Closed - CCW Spring Return" end when installing to a N.C. Honeywell valve and select "Normally Open - CW Spring Return" end when installing to a N.O. Honeywell valve. (See Figures 3 & 4).

   NOTE

   Auxiliary kits should be installed to mounting bracket before MMR motor is installed to valve linkage.

3. Insert end of modular motor in linkage crank arm and bolt motor to valve linkage with four (4) 1/4" bolts furnished (See Figure 15).
4. After making sure all surfaces of crank arm are engaged with motor shaft, tighten crank arm clamp screw securely.

   On spring return motors, with shaft in full unpowered position, turn spring adjust screw down (CW) until top of washer is even with pointer. With 3-Way Valve check for tight close-off at powered end of travel (See Figures 16 &17).
5. TO ASSURE TIGHT CLOSE-OFF OF VALVE:
   On non-spring return motors, with shaft in full CCW position, turn spring adjust screw down (CW) until top of washer is even with pointer. With 3-Way Valve check for tight close-off at CW end of travel (See Figures 16 &17).
6. Tighten spring adjust lock nut.
7. Reconnect appropriate control and power wiring.
8. Checkout:
   a Motor should run freely through complete stroke.
   b. Linkage should operate without binding.
   c. Valve must close off tightly at bottom of stroke on 2-Way application (both ends of stroke on 3-Way application). If not achieving full travel or close-off with MMC-90 card recheck travel adjust potentiometer.
9. Replace cover on linkage and modular motor.

SECTION II REPLACEMENT OF A HONEYWELL MOTOR

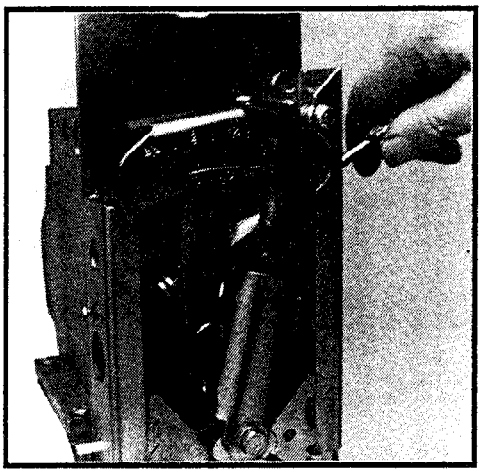


Figure 14. Loosening Crank Arm Clamp Screw.

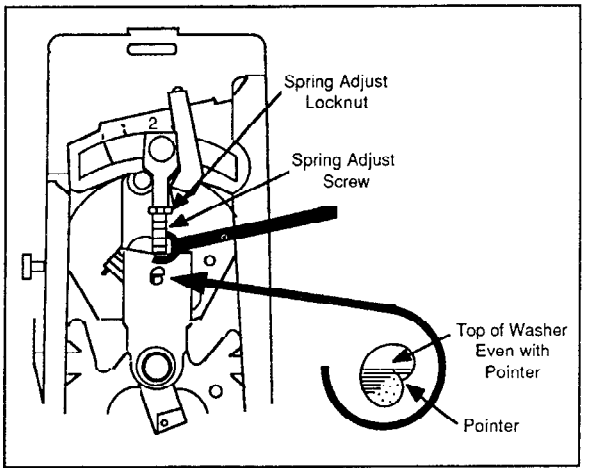


Figure 17. Q601E Strain Relief Adjustment - Valve Closed

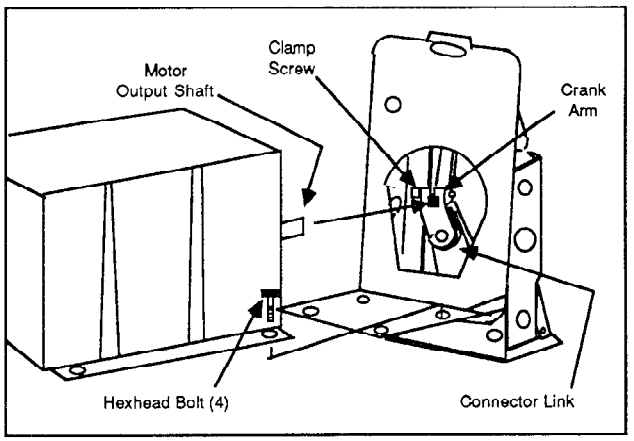


Figure 15. Mounting the Modular Motor on Q601 Valve Linkage

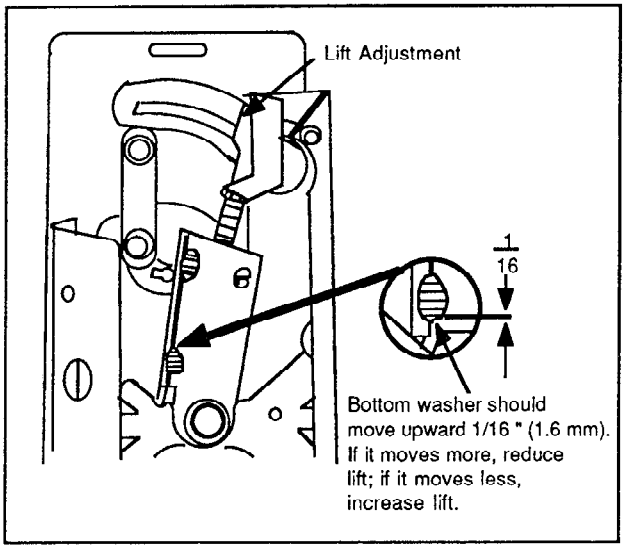


Figure 18. Q601E Strain Relief Adjustment Valve at Top of Stroke

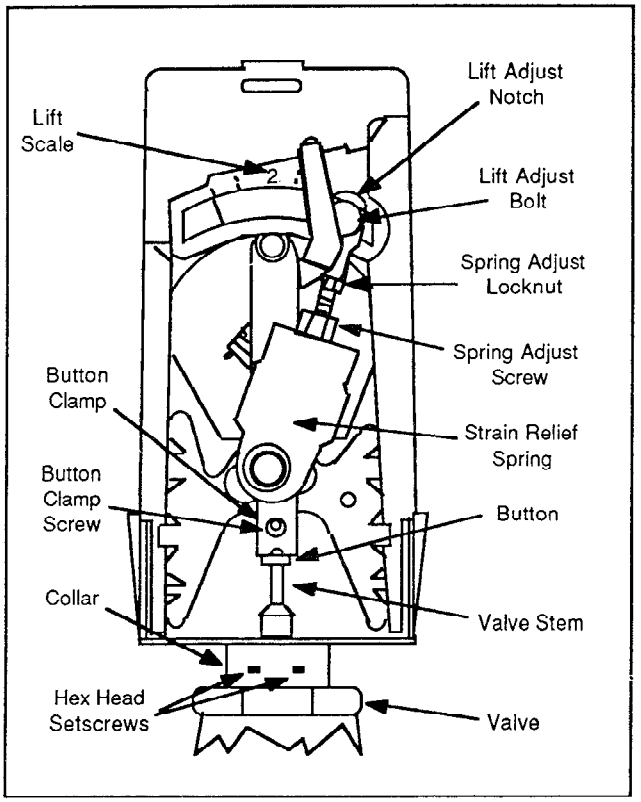


Figure 16. Item Identification

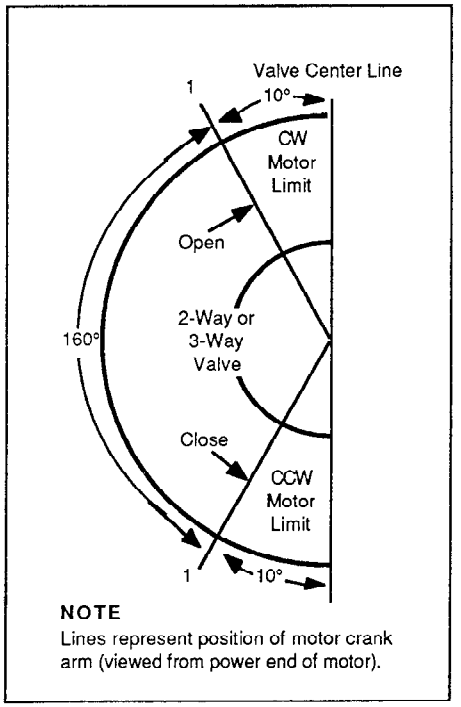


Figure 19. Q601E 160° Stroke Operation

SECTION III
REPLACEMENT OF A JOHNSON MOTOR

TABLE 9.JOHNSON MOTOR CROSS REFERENCE

Use the following table to confirm that the proper MMR motor, MMC control module, and other required accessories have been selected

Descriptive Data of Motor (Actuator) Being Replaced								Required Replacement Items				Wiring Termination Conversion MMR Motor (Actuator) and MMC Control Module Versus the Motor (Actuator) Being Replaced														Replacement	NOTES
Part Number	Torque Lb.-In.	Voltage (Hertz)	Spring Return	Stroke Degrees	Timing Sec.	Auxiliary Switches	Input Signals	Motor (Actuator)	Plug-In Control Module	AM-231 Cover Trans.	AM-233 W859 Mtg. Kit	TR1	TR2	3	4	5	9	16	17	C1	NO1	NC1	C2	NO2	NC2		
M40AAA-1	35	120 (50/60)	None	90 to 270	34 / 90°	0	SPDT	MMR-400	MMC-468	Req.	Not Req.	@	@	1	3	2										Functional	1, 4
M40AAC-1	35	120 (50/60)	None	90 to 270	34 / 90°	2 SPDT	SPDT	MMR-400-002	MMC-468	Req.	Not Req.	@	@	1	3	2				Red	Yel	Blue	BlRed	BlYel	BlBlue	Functional	1, 2, 3, 4
M40AGA-1	35	24 (50/60)	None	90 to 270	34 / 90°	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	6	7	1	3	2										Functional	1, 4
M40AGC-1	35	24 (50/60)	None	90 to 270	34 / 90°	2 SPDT	SPDT	MMR-400-002	MMC-468	Not Req.	Not Req.	6	7	1	3	2				Red	Yel	Blue	BlRed	BlYel	BlBlue	Functional	1, 2, 3, 4
M40BAA-4	35	120 (50/60)	None	90 or 160	34 or 60	0	135 Ω ONLY	MMR-400	MMC-90	Req.	Not Req.	@	@	1	3	2										See Comments	1, 4
M40BAC-2	35	120 (50/60)	None	90 or 160	34 or 60	2 SPDT	SEE	MMR-400-002	MMC-90	Req.	Not Req.	@	@	1	3	2				Red	Yel	Blue	BlRed	BlYel	BlBlue	See Comments	1, 2, 3, 4
M40BGA-2	35	24 (50/60)	None	90 or 160	34 or 60	0	NOTE 5	MMR-400	MMC-90	Not Req.	Not Req.	6	7	1	3	2										See Comments	1, 4
M40BGC-2	35	24 (50/60)	None	90 or 160	34 or 60	2 SPDT		MMR-400-002	MMC-90	Not Req.	Not Req.	6	7	1	3	2				Red	Yel	Blue	BlRed	BlYel	BlBlue	See Comments	1, 2, 3, 4
M110AGA-1	25	24 (50/60)	N.C.	45 to 270	60 / 160°	0	SPDT	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2										Functional	1, 4
M110AGB-1	25	24 (50/60)	N.C.	45 to 270	60 / 160°	1 SPDT	SPDT	MMR-500-002	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2				Red	Yel	Blue				Functional	1, 2, 3, 4
M110AAB-1	25	120 (50/60)	N.C.	45 to 270	60 / 160°	1 SPDT	SPDT	MMR-500-002	MMC-468	Req.	Not Req.	@	@	1	3	2				Red	Yel	Blue				Functional	1, 2, 3, 4
M130AGA-1	50	24 (50/60)	N.C.	45 to 270	60 / 160°	0	SPDT	MMR-500	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2										Functional	1, 4
M130AGB-1	50	24 (50/60)	N.C.	45 to 270	60 / 160°	1 SPDT	SPDT	MMR-500-002	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2				Red	Yel	Blue				Functional	1, 2, 3, 4
M130AAB-1	50	120 (50/60)	N.C.	45 to 270	60 / 160°	1 SPDT	SPDT	MMR-500-002	MMC-468	Req.	Not Req.	@	@	1	3	2				Red	Yel	Blue				Functional	1, 2, 3, 4
M120AAA-1	35	120 (50/60)	None	45 to 270	60 / 160°	0	SPDT	MMR-400	MMC-468	Req.	Not Req.	@	@	1	3	2										Functional	1, 4
M120AAC-1	35	120 (50/60)	None	45 to 270	60 / 160°	2 SPDT	SPDT	MMR-400-002	MMC-468	Req.	Not Req.	@	@	1	3	2				Red	Yel	Blue	BlRed	BlYel	BlBlue	Functional	1, 2, 3, 4
M120AGA-1	35	24 (50/60)	None	45 to 270	60 / 160°	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2										Functional	1, 4
M140AAA-1	75	120 (50/60)	None	45 to 270	60 / 160°	0	SPDT	MMR-400	MMC-468	Req.	Not Req.	@	@	1	3	2										Functional	1, 4
M140AGA-1	75	24 (50/60)	None	45 to 270	60 / 160°	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2										Functional	1, 4
M150AGA-1	150	24 (50/60)	None	45 to 270	60 / 160°	0	SPDT	MMR-400	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2										Functional	1, 4
M150AGB-1	150	24 (50/60)	None	45 to 270	60 / 160°	1 SPDT	SPDT	MMR-400-002	MMC-468	Not Req.	Not Req.	T1	T2	1	3	2				Red	Yel	Blue				Functional	1, 2, 3, 4
M110JGA-1	25	24 (50/60)	N.C.	65 to 270	60 / 160°	0	135 Ω ONLY	MMR-500	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9							See Comments	1, 4
M110JGB-1	25	24 (50/60)	N.C.	65 to 270	60 / 160°	1 SPDT	SEE	MMR-500-002	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9	Red	Yel	Blue				See Comments	1, 2, 3, 4
M130JGA-1	50	24 (50/60)	N.C.	65 to 270	60 / 160°	0	NOTE 5	MMR-500	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9							See Comments	1, 4
M130JGB-1	50	24 (50/60)	N.C.	65 to 270	60 / 160°	1 SPDT		MMR-500-002	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9	Red	Yel	Blue				See Comments	1, 2, 3, 4
M120JAA-1	35	120 (50/60)	None	65 to 270	60 / 160°	0		MMR-400	MMC-90	Req.	Not Req.	@	@	8				10	9							See Comments	1, 4
M120JAC-1	35	120 (50/60)	None	65 to 270	60 / 160°	2 SPDT		MMR-400-002	MMC-90	Req.	Not Req.	@	@	8				10	9	Red	Yel	Blue	BlRed	BlYel	BlBlue	See Comments	1, 2, 3, 4
M120JGA-1	35	24 (50/60)	None	65 to 270	60 / 160°	0	135 Ω ONLY	MMR-400	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9							See Comments	1, 4
M140JAA-1	75	120 (50/60)	None	65 to 270	60 / 160°	0	SEE	MMR-400	MMC-90	Req.	Not Req.	@	@	8				10	9							See Comments	1, 4
M140JGA-1	75	24 (50/60)	None	65 to 270	60 / 160°	0	NOTE 5	MMR-400	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9							See Comments	1, 4
M150JGA-1	150	24 (50/60)	None	65 to 270	60 / 160°	0		MMR-400	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9							See Comments	1, 4
M150JGB-1	150	24 (50/60)	None	65 to 270	60 / 160°	1 SPDT		MMR-400-002	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9	Red	Yel	Blue				See Comments	1, 2, 3, 4
M150JGC-1	150	24 (50/60)	None	65 to 270	60 / 160°	2 SPDT		MMR-400-002	MMC-90	Not Req.	Not Req.	T1	T2	8				10	9	Red	Yel	Blue	BlRed	BlYel	BlBlue	See Comments	1, 2, 3, 4
M110GGA-1	25	24 (50/60)	N.C.	65 to 270	60 / 160°	0	0 to 24 VDC or	MMR-500	MMC-8000	Not Req.	Not Req.	T1	T2													See Comments	1, 4, 6
M130GGA-1	50	24 (50/60)	N.C.	65 to 270	60 / 160°	0	mA with Adj.	MMR-500	MMC-8000	Not Req.	Not Req.	T1	T2													See Comments	1, 4, 6
M120GGA-1	35	24 (50/60)	None	65 to 270	60 / 160°	0	Start .25 to 22	MMR-400	MMC-8000	Not Req.	Not Req.	T1	T2													See Comments	1, 4, 6
M140GGA-1	75	24 (50/60)	None	65 to 270	60 / 160°	0	and Adj. Span	MMR-400	MMC-8000	Not Req.	Not Req.	T1	T2													See Comments	1, 4, 6
M150GGA-1	150	24 (50/60)	None	65 to 270	60 / 160°	0	2 to 18	MMR-400	MMC-8000	Not Req.	Not Req.	T1	T2													See Comments	1, 4, 6

NOTES:

@ Attach AM-231 transformer leads as follows: Brown leads to TR1 and TR2 of actuator and appropriate two leads to power source, Black = common, White = 120 VAC, Red/Yellow = 208 VAC and Orange = 240 VAC.

1. Set actuator stroke to match the actuator being replaced. Check the closed position of the actuator shaft. Adjust damper linkage as required.
2. Adjust the auxiliary switch(s) to match the differential and switch point of the actuator being replaced.
3. Replacement actuator's auxillary switches have 2° or 10° differential. If adjustable differential is required order AM-242 seperately.
4. The replacement actuator mounts the same but is larger. The stroke of replacement actuator is limited to 160° maximum, which means when used with Johnson Y20EBD linkages and valves that the maximum valve lift is limited to 3/4". The replacement actuator can be used with the existing valve linkage and the following valves: V90AA series 1-1/2" to 4"; V90AD series 1/2" to 1"; V90CA series 1/2" to 3" and V90DB series 1-1/2" to 2-1/2" (See Page 8)
5. The replacement can only replace 135Ω slidewire applications.
6. Can not be used if there is a master and slave arrangement. Can only be used for replacement when a single actuator is being controlled.

SECTION III REPLACEMENT OF A JOHNSON MOTOR

DAMPER APPLICATIONS:

Use existing damper linkage if possible. If existing linkage is unusable, replace with appropriate Barber-Colman components. Refer to Other Barber-Colman Components - page 1.
If additional damper linking instructions are required - see AM-230 Series General Instructions (F-23377) for specific installation instructions.

Use the following table to confirm that the MMR motor selected can be used on the Johnson valve in the system.

TABLE 10 JOHNSON VALVE AND LINKAGE CROSS REFERENCE

Descriptive Data of Valve Body Being Replaced					Valve Linkage / Required Motor			
					Y20EBD-1 /	Y20EBD-2 /	Y20EBD-3 /	Y20EBD-5 /
Part Number	Size	Cv	Dimension "A"	Dimension "B"	All MMR	MMR-400	MMR-400	All MMR
					Maximum Close-Off Pressure For Water (PSI)			
2-Way; Stem Down to Close, 250 PSIG Static for 1/2" to 1" and 125 PSIG for 1-1/2" & 2". Equal Percentage Characteristics, Screwed Ends FNPT								
V90AD-1	1/2"	1.2	3-3/8"	---	266	345	345	135
V90AD-2	1/2"	2.2	3-3/8"	---	266	345	345	135
V90AD-3	1/2"	4.4	3-3/8"	---	266	345	345	135
V90AD-4	3/4"	8.6	3-5/8"	---	107	221	345	55
V90AD-5	1"	13.9	4-7/8"	---	73	151	277	37
V90AA-25	1-1/2"	20.0	4-7/8"	---	45	91	165	25
V90AA-26	2"	26.0	5-1/8"	---	31	63	115	17
2-Way; Stem Down to Close, 125 PSIG Static, Equal Percentage Flow Characteristics, 125 LB. Flanged								
V90AA-7	2-1/2"	51.0	7-1/4"	---	20	---	74	Do Not Use
3-Way Mixing; 250 PSIG Static for 1/2" to 1" and 125 PSIG for 1-1/2" & 2". Screwed Ends FNPT								
V90DD-1	1/2"	1.2	3-3/8"	2-3/16"	25	25	25	25
V90DD-2	1/2"	2.2	3-3/8"	2-3/16"	25	25	25	25
V90DD-3	1/2"	4.4	3-3/8"	2-3/16"	25	25	25	25
V90DD-4	3/4"	8.6	3-5/8"	2-3/16"	25	25	25	25
V90DD-5	1"	13.9	4-7/8"	2-5/8"	25	25	25	25
V90DB-19	1-1/2"	21.0	4-7/8"	4-1/4"	25	25	25	25
V90DB-20	2"	30.0	5-1/8"	4-7/16"	25	25	25	25
3-Way Mixing; 125 PSIG Static, 125 Flanged Ends								
V90DB-7	2-1/2"	54.0	7-1/4"	6-13/16"	25	---	25	Do Not Use
3-Way Diverting; 150 PSIG Static, Union End on Side Ports (FNPT) and Screwed (FNPT) on Bottom Port								
V90CA-1	1/2"	5.5	4-7/8"	2"	50	75	100	27
V90CA-2	3/4"	9.0	5-1/4"	2-3/16"	50	75	100	27
V90CA-3	1"	18.0	5-1/2"	2-5/16"	50	75	100	27
V90CA-4	1-1/4"	27.0	6-3/4"	2-5/8"	50	75	100	27
V90CA-5	1-1/2"	32.0	7-7/16"	3-1/8"	50	75	100	27
V90CA-6	2"	50.0	8-7/16"	3-3/16"	50	75	100	27
3-Way Diverting; 125 PSIG Static, 125 Flanged Ends								
V90CA-7	2-1/2"	75.0	9"	7-1/16"	50	60	75	Do Not Use
V90CA-8	3"	95.0	10"	7-15/16"	50	60	75	Do Not Use

Dimension "A" = The face to face dimension on the valve.
Dimension "B" = The dimension from the centerline of the pipe to the bottom of the lower ("B") port.

Mounting to Johnson Y20EBD Valve Linkages (See Figures 20 thru 23):

A Barber-Colman modular motor can be mounted to Johnson Y20EBD valve linkage by using mounting bracket, two (2) #8-32 x 7/16" panhead screws with integral lock washers and four (4) 1/4"-20 x 7/8" hexhead bolts, lockwashers and nuts.

The following step by step instructions define the procedure for removal of Johnson M100 Series Motors from Y20 linkage on 2-Way and 3-Way Globe Valves and replacement with the appropriate Barber-Colman Modular Motor.

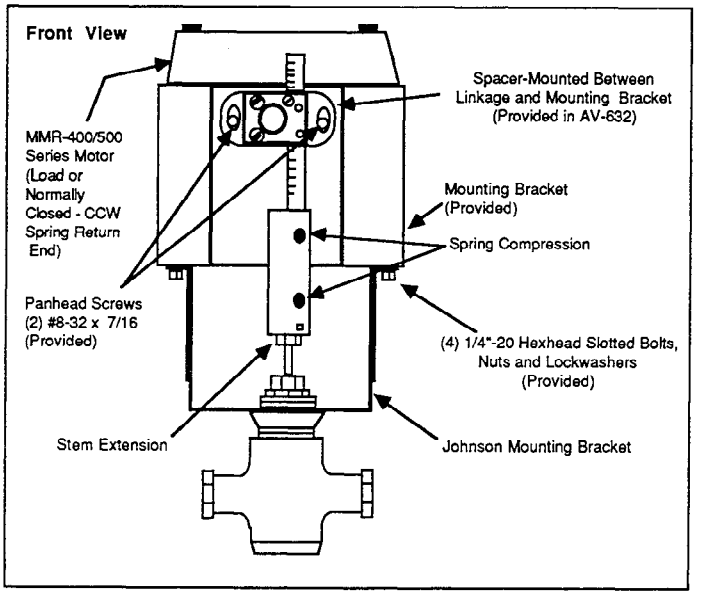


Figure 20. Johnson Valve Linkage CCW Stem Up

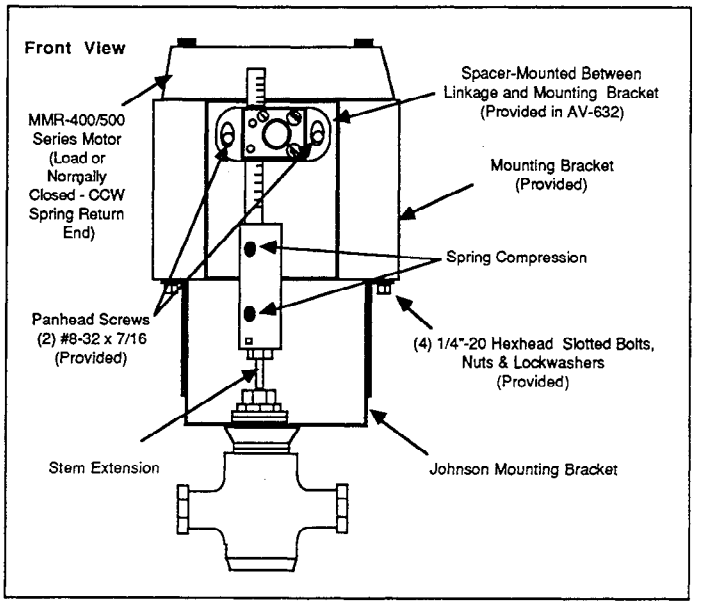


Figure 21. Johnson Valve Linkage CCW Stem Down

SECTION III REPLACEMENT OF A JOHNSON MOTOR

REMOVING JOHNSON MOTOR

1. Disconnect power.
2. Remove top cover of motor.
3. Label leads by terminal designation (Eg. R, W, B, TR1, TR2 etc.) and remove wiring from switch. Be sure and include wire for auxiliary switches or devices.
4. Remove any auxiliary equipment attached to the auxiliary end or motor housing.
5. Remove conduit connection.
6. Remove the 4 (four) 1/4" yoke mounting bolts holding motor to mounting yoke.
7. Remove 2 (two) gear housing screws so gear housing can be removed from motor and gear housing then from rack.
8. Remove gear cover by loosening the two gear cover screws, do not remove screws, rotate cover and remove gear.

INSTALLING BARBER-COLMAN MMR MODULAR MOTOR

1. Select the appropriate modular motor, plug-in control module and accessories

NOTE

Mechanical travel on motor is factory set at 160° and no field adjustment is required. The MMC-468 requires no adjustment. The MMC-90 and MMC-8000 cards should be set at 160° travel. Connect appropriate colored wire leads to tabs.

2. Select "load" end of modular motor (see figures 3 &4).
3. Take the mounting bracket (See Figure 23) and mount the Johnson gear housing on the formed side of the mounting bracket . Do Not Tighten.

NOTE

Make sure gear housing rack opening is in the same location as on the original installation.and rack is inserted into gear housing.

4. Place "Normally Closed - CCW Spring Retrun" end of spring return motor or "Load" end of non-spring return motor so shaft goes through gear housing hole.
5. Pull rack attached to valve stem all the way up. Then slowly push rack down with square end of drive gear lined up with motor shaft. Press gear on to shaft (See Figure 22). On a CW stem-up application, first rotate shaft to full CW position.

NOTE

This should occur before rack has moved the distance of one (1) tooth on the rack; if not, realign the square hole of gear on motor shaft.

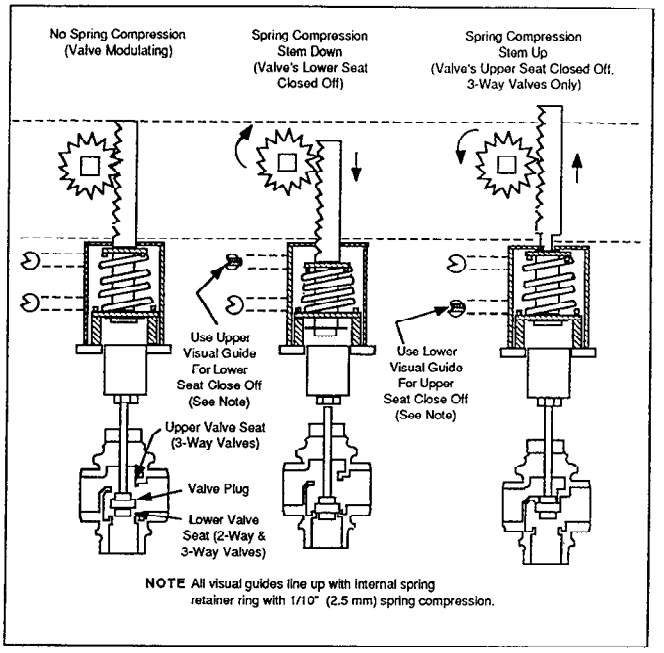


Figure 22. Operation of the Y20EBD Valve Linkage (CW - Stem Down, CCW - Stem Up)

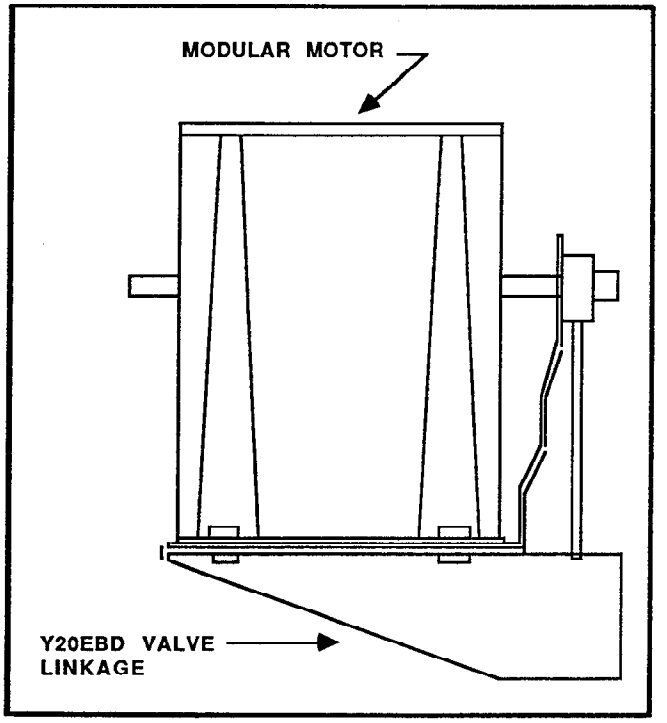


FIGURE 23. MOUNTING MMR TO JOHNSON Y20EBD VALVE LINKAGE

6. Bolt the motor down by loosely putting all 4 (four) 1/4" bolts through base of motor and mounting yoke.
7. Tighten the two screws holding the gear housing assembly and replace gear cover plate and tighten these two (2) screws.(see figures 20 or 21).
8. *With a slight force applied to gear housing,* make sure motor assembly is back away from rack gear.
9. Tighten all four (4) 1/4" bolts in motor at base yoke.

10. Reconnect appropriate control and power wiring.(See Table 8 - Wiring Termination).

NOTE

On MMC-90 and MMC-8000 cards the travel adjustment should be made according to the GI sheets for these cards.

11. On three way valves, the new motor must be rotated 15° from the shipped position (CW on MMR-400 or MMR-500) for proper spring compression on the valve stem.

12. Checkout:
    a. Motor should run freely through complete stroke.
    b. Linkage should operate without binding.
    c. Valve must close off tightly at bottom of stroke for 2-Way application (both ends of stroke on 3-Way application). If not achieving full travel or close-off with MMC-90 card recheck travel adjust potentiometer

NOTE

Check plunger compression. The length of the valve stem should be adjusted so that the valve disc seats before the motor reaches the end of the closing stroke. Balance of motor travel is taken up in linkage spring compression and should be approximately 1/10" (2.5 mm). This provides pressure on the disc in closed position and also compensates for disc and seat wear. Three-way valve spring compression must be provided on both upper and lower seats.

13. Replace cover on modular motor.

F-23348-5 BK

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