CUTLER-HAMMER AUTOMATIC DC MOTOR STARTER INSTALLATION AND MAINTENANCE REQUIREMENTS

1. GENERAL

1.1 This section covers the engineering requirements for the testing and maintenance of the Cutler-Hammer Manufacturing Company's automatic DC motor starters. Descriptive information relative to these starters will be found in Section 026-390-101.

1.2 Section 2 gives requirements for both operating tests and the inspection of the mechanical adjustments which shall be used to determine whether the starter is in proper condition for delivery to the customer and for service. These are called ***"Test Requirements"***.

1.3 Section 3 is intended for maintenance purposes only. This section gives approved maintenance methods and materials for use in making adjustments to meet the ***"Test Requirements"*** and will be called ***"Adjustments"***. The ***"Test Requirements"*** must be met not only at the time of delivery to the customer but at all times when operating in service.

1.4 The following is a list of the meters, tools and materials specified in Section 3 for use in inspecting and adjusting the motor starter.

CODE OR SPEC NO.	DESCRIPTION
METERS	
R-2500	Voltmeter, Weston DC, Model #1, 0-75 and 0-300 volts
TOOLS	
R-1051	File, Pillar, #2 cut, 6"
R-2760	Screwdriver, 3-1/2"
R-1103	Screwdriver, 4"
R-1324	Screwdriver, 8"
R-81388	Wrench, open-end flat, 3/8" opening
R-81372	Wrench, open-end flat, 7/16" opening
R-1536	Wrench, open-end flat, 1/2" opening
—	Wrench, open-end flat, 9/16" opening
R-81358	Wrench, double-end flat, 1/4" and 5/8" openings
MATERIALS	
—	Petroleum Spirits
—	Cheesecloth or the equivalent
—	Cutler-Hammer Dash-Pot Oil
—	Emery Cloth #00
—	Neatsfoot Oil
—	Wire, Fine Copper

1.5 The following figure is attached to and forms a part of this section.

Figure 1 – Cutler-Hammer Automatic DC Motor Starter Details

2. TEST REQUIREMENTS

2.1 ***Nuts, Screws and Cotters:*** All nuts and screws except the needle valve adjusting screw shall be tight. All cotters shall be spread enough to prevent their falling out of place.

Note: Pin #9 shall be removed at the time of installation.

2.2 ***Freedom of Moving Parts:*** The moving parts of the starter shall move freely without binding.

2.3 ***Contacts:*** All contacts shall be clean and smooth.

2.4 ***Operating Tests***

2.41 ***Dash-Pot:*** The plunger of the motor starter shall pull up smoothly against the action of the dash-pot, and close the contact

fingers in their proper sequence when the rated nameplate voltage is applied to the operating coil.

If the voltage is removed from the operating coil all contact fingers shall return to the unoperated position with no delay in action.

2.42 ***Associated Relay:*** The relay shall operate, closing its contacts positively when the rated voltage (for which the relay is designed) is applied to the operating coil by the closing of the automatic control switch.

The relay shall open its contacts when the operating voltage is removed from the coil or the coil shunted.

2.5 ***Dash-Pot Assembly and Oil***

2.51 ***Dash-Pot:*** The dash-pot shall be clean, free from grit, lint or other foreign matter.

2.52 ***By-Pass:*** The by-pass and connecting passages shall be clean and free from thick or gummed oil, lint, or other foreign matter.

2.53 ***Piston:*** The poppet valve of the oil piston shall not be defective, and shall seat positively.

The leather diaphragms of the air piston shall be kept pliable by adding two or three drops of oil every two months or more often if necessary.

2.54 ***Dash-Pot Oil:*** The oil dash-pot (when furnished) shall be filled to the level indicated by the painted mark with clear ungummed oil free from dirt or other foreign matter likely to clog the by-pass.

2.6 ***Setting of Needle Valve:*** The needle valve shall be adjusted so that the time required for the closing of the contact fingers shall not exceed 15 seconds, and shall be sufficient to prevent the starting current blowing the associated fuses.

3. ADJUSTMENTS

3.0 ***General:*** It is recommended that routine maintenance adjustments be made in the sequence presented in this section to prevent interference of one adjustment with another. Voltage shall be removed from the starter before making any adjustments.

3.1 ***Nuts, Screws and Cotters:*** Loose nuts or screws shall be tightened with a wrench or screwdriver. Cotters shall be spread by inserting the blade of a screwdriver and using this as a lever to spread the parts.

3.2 ***Freedom of Moving Parts:*** If the moving parts of the starter bind, examine for and replace any bent parts, and see that the oil is not gummed or the by-pass blocked as outlined in paragraph 3.5.

3.3 ***Contacts:*** Dirty contacts shall be cleaned by wiping with clean cheesecloth moistened with petroleum spirits.

Pitted contacts shall have the burrs removed with a fine file and smoothed with emery cloth, care being taken to remove as little copper as possible.

3.4 ***Operating Tests***

3.41 ***Dash-Pot:*** If the starter fails to operate when voltage is impressed upon its coil, check for trouble in the following manner.

Test for "Open" by connecting a voltmeter in multiple with the closing coil. If the voltmeter shows no reading when voltage is applied the circuit is open. Having determined that the circuit is not open, connect the voltmeter in series with the coil. No reading on the voltmeter indicates that the coil is open.

Defective coils may be removed by the following method (referring to Figure 1). Remove the coil leads, remove cotter and top plunger pin, loosen screws (1) (holding dash-pot to frame) and remove the dash-pot (18), plunger (5) and piston (15 or 31). Loosen screws (4), remove plug (22), plunger tube (32) and slip coil (2) and insulating washer (21) from the frame (3). The coil can now be replaced and the starter reassembled in the reverse order.

Check wiring of starter for loose connections.

3.42 ***Associated Relay:*** If the relay fails to operate when voltage is impressed upon its coil, check for trouble in the following manner.

Test the coil for an "Open" in the same way as described in paragraph 3.41. If coil is "Open" replace the relay.

If the relay does not revert to its normal position when the potential is removed from its coil or the coil shunted, examine all moving parts for binding and the tension spring for weakness. Remove the cause of binding or replace the relay if it does not open.

3.5 *Dash-Pot Assembly and Oil*

3.51 ***Dash-Pot:*** When cleaning is required remove the dash-pot (18), empty the oil (if of the oil type) and clean the piston (15 or 31) and dash-pot with clean cheesecloth moistened with petroleum spirits. Dry the parts with clean cheesecloth and remove any lint or foreign matter.

3.52 ***By-Pass:*** When cleaning is required, remove the needle valve (17) from the by-pass connecting into the piston chamber and flush thoroughly with petroleum spirits to remove all gummed oil (if of the oil type) or grit and let dry before assembling. Lint should be removed with a fine copper wire having a hooked end.

3.53 ***Piston:*** If the poppet valve (30) is found to be defective (when cleaning dash-pot) replace the piston assembly. Remove any lint or grit from the valve seat.

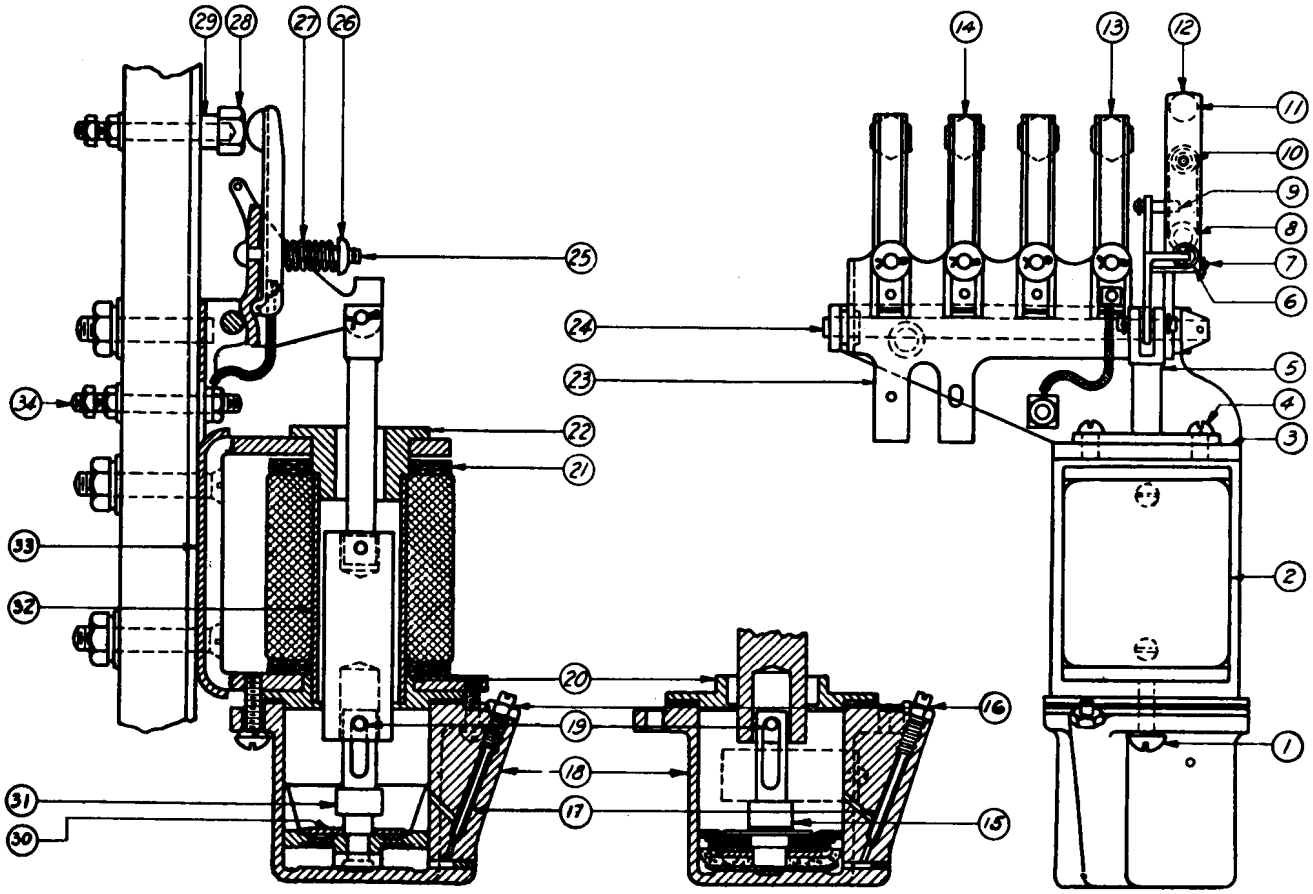
The leather diaphragm of an air dash-pot piston can be kept pliable by applying the specified amount of Neatsfoot oil at the required interval through the small hole in the side of the dash-pot.

3.54 ***Dash-Pot Oil:*** Refill the dash-pot (if of the oil type) to the specified level with fresh Cutler-Hammer Dash-Pot oil after cleaning the dash-pot and by-pass.

3.6 ***Setting of Needle Valve:*** The time required for the closing of the contact fingers may be changed by loosening the lock nut and changing the setting of the needle valve (17) by turning the associated adjusting screw (16). (See Figure 1.) Turning clockwise increases the period of time required for starting, turning counterclockwise decreases it. After the valve is set, tighten the lock nut, taking care not to change the adjustment of the needle valve.

If the desired adjustment cannot be obtained with the needle valve (17), remove the dash-pot and clean the piston, making sure that the poppet valve (30) on a piston of the oil type seats positively. In cleaning care should be taken not to damage this valve. If damaged replace the piston.

3.7 ***Spare Parts:*** Where required, orders for spare parts shall include a description of the part, the number required and the complete nameplate data on the starter.



NO.	DESCRIPTION	NO.	DESCRIPTION
1	DASH-POT RETAINING SCREW	19	PINS FOR PLUNGER
2	COIL	20	FLANGE FOR PLUNGER TUBE
3	FRAME FOR COIL	21	INSULATING WASHER FOR COIL
4	COIL RETAINING SCREW	22	PLUG FOR PLUNGER TUBE
5	PLUNGER	23	FINGER SUPPORT
6	SPRING	24	SHAFT & COTTER PIN
7	SHAFT	25	ROUND HEAD PIN AND COTTER PIN
8	CONTACT POST	26	CUPPED WASHER
9	STOP FOR PILOT CONTACT	27	TENSION SPRING
10	NUT AND WASHER FOR CONTROL OF AUXILIARY FINGER	28	CONTACT BUTTONS
11	CONTACT	29	STUD, NUT & WASHER FOR CONTACT BUTTON
12	FINGER FOR PILOT SWITCH	30	POPPET VALVE
13	CONTACT FINGER WITH FLEXIBLE LEAD	31	OIL PISTON
14	CONTACT FINGER	32	PLUNGER TUBE
15	AIR PISTON	33	BASE FRAME
16	SCREW & LOCKNUT FOR NEEDLE VALVE	34	STUD, NUT & WASHER FOR FLEXIBLE LEAD
17	NEEDLE VALVE		
18	OIL & AIR DASHPOT		

Fig. 1 – Cutler-Hammer Automatic DC Motor Starter Details