NAVY SERVICE A
A-C NON-REVERSING LINESTARTERS
CLASS 6850—SIZES 0, 1, 2, 3, 4 AND 5
FOR A-C SQUIRREL-CAGE MOTORS • DRIP-PROOF and WATER-TIGHT ENCLOSURES

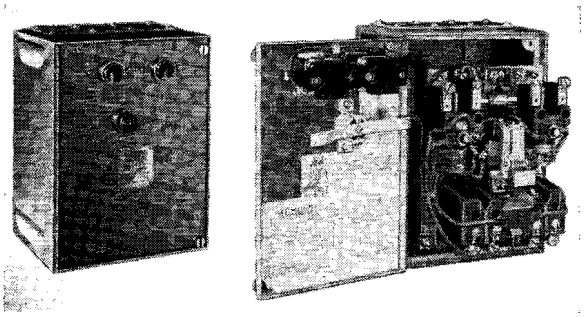

Fig. 1—Typical Size 1 Three Phase Linestarter in a Drip-proof Cabinet

APPLICATION

The Class 6850 Linestarters are magnetically operated non-reversing across-the-line (full voltage) starters for a-c squirrel-cage induction motors. These Linestarters have been specifically designed in accordance with Navy Specification MIL-C-2212B for Navy Service A (Class HI shock) applications.

RATING

These Linestarters are suitable for full voltage starting of motors and have maximum hp and voltage ratings as shown in Fig. 2.

SIZE	8-HR. OPEN RATING OF LINE CONTACTOR IN AMPERES	MAXIMUM HORSEPOWER					
		110 V. THREE PHASE	115 V. SINGLE PHASE	220 V. THREE PHASE	230 V. SINGLE PHASE	440 V. THREE PHASE	440 V. SINGLE PHASE
0	20	2	1	3	2	5	3
1	30	3	2	7½	3	10	5
2	50	7½	3	15	7½	25	10
3	100	15	7½	30	15	50	25
4	150	25	....	50	....	100	..
5	300	....	....	100	....	200	..

Fig. 2—Rating Table

The Linestarters are suitable for continuous duty at rated voltage. The line contactors will operate satisfactorily from 80% to 110% of the rated voltage at rated frequency.

CONSTRUCTION

The Class 6850 Linestarters usually consist of a main line contactor, two overload relays, a mounting panel, a control circuit fuse, an enclosure with an overload relay reset mechanism, and a master switch. Additional control apparatus (relays, terminals, terminal blocks, hardware, etc.) is supplied where necessary. The apparatus on a small Linestarter is mounted on a steel base plate; on the larger Linestarters the apparatus is mounted on an insulation panel. A typical Size 5 Linestarter is shown in Fig. 3.

These Linestarters can be manufactured with drip-proof, water-tight, or explosion-proof enclosures. The standard drip-proof and water-tight enclosures are normally equipped with removable steel lead plates which are located at the top and bottom of the cabinet. Explosion-proof enclosures

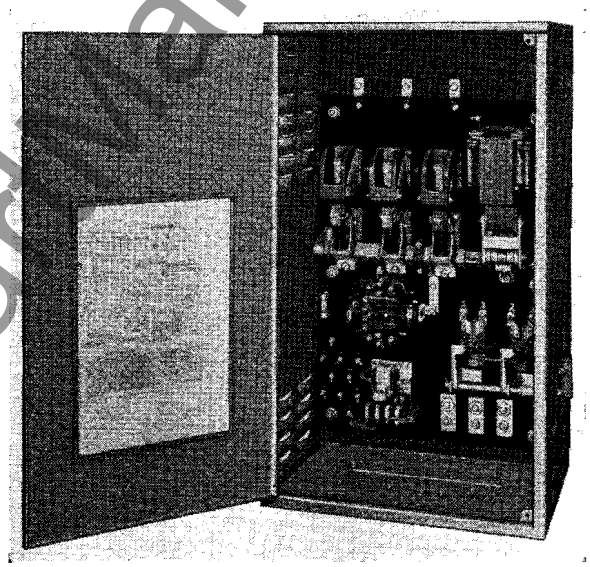

Fig. 3—Typical Size 5 Three Phase Linestarter in Drip-proof Cabinet

are provided with welded steel lead plates. For local control, master switch units are usually mounted on the enclosure door as shown in Fig. 1.

All Linestarters have terminals or connection studs for front connection. All terminals are marked and a diagram and description of operation are fastened to the inside of the enclosure door. The Linestarters may be operated by either local or remote pushbutton stations or master switches.

STORAGE AND INSTALLATION

General instructions for storage and installation can be found in Instruction Leaflet 6000-1.

Linestarters that are stored prior to installation on board ship should be kept dry to prevent

corrosion. When it is necessary to store Linestarters outside, the use of heaters is recommended to avoid condensation and dampness.

If overload relay heaters are supplied separately, they should be mounted on the relays. Note the rating stamped on the overload relay heater. This rating should be approximately 115% to 125% of the motor full load current when applied to continuous duty motors. On intermittent duty motors the heater rating may be chosen somewhat smaller, depending upon the duty cycle.

OPERATION

1. NORMAL

a. Low-Voltage-Protection Control Circuit—A typical low-voltage-protection control scheme for a Linestarter is shown in Fig. 4.

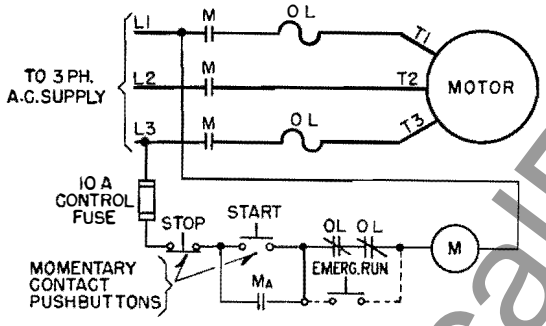

Fig. 4—Typical Low-Voltage-Protection Circuit for a Non-Reversing Linestarter (Dwg. 13-D-6535)

The motor is started by depressing the "Start" pushbutton which completes the circuit to and energizes the line contactor coil "M". Energization of the coil "M" closes the line contactor armature and the line contacts "M" which apply full line voltage to motor. The line contactor auxiliary contact "M_A" also closes and completes a holding circuit for energizing the coil circuit even after the "Start" pushbutton has been released. The motor will continue to run until the contactor coil "M" is de-energized due to operation of the "Stop" pushbutton, failure of line voltage, or tripping of an overload relay "OL".

This circuit provides low-voltage protection (L.V.P.) by the use of momentary contact pushbuttons. If coil "M" is de-energized due to failure of line voltage, or tripping of an overload relay, the contactor will not reclose and start the motor when voltage is restored, or when the overload relays are reset, until the "Start" pushbutton is again depressed. The overload relays "OL" are reset by means of a "Reset–Emerg. Run" button on the outside of the Linestarter.

b. Low-Voltage-Release Control Circuit—A typical low-voltage-release control scheme for a Linestarter is shown in Fig. 5.

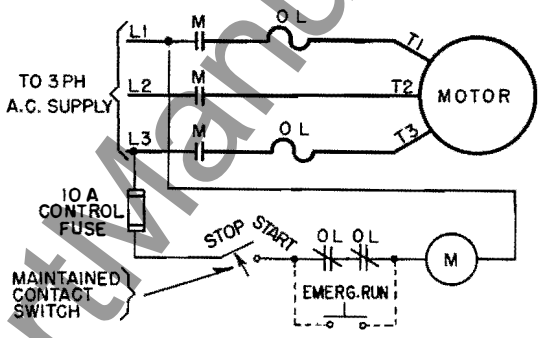

Fig. 5—Typical Low-Voltage-Release Circuit for a Non-Reversing Linestarter (Dwg. 13-D-6536)

When the contactor coil "M" is energized by turning the maintained contact master switch to the "Start" position, the contacts "M" close and apply power to the motor. The motor will continue to run until the coil "M" is de-energized because of loss of voltage, tripping of the overload relay, or turning the master switch to the "Stop" position.

This circuit provides low-voltage release (L.V.R.) by the use of a maintained contact master switch. If the operating coil "M" is de-energized due to failure of line voltage, or tripping of an overload relay, the contactor will reclose and restart the motor when voltage is restored, or when the overload relays "OL" are reset by means of the reset button on the outside of the Linestarter.

2. EMERGENCY RUN—When an emergency justifies the risk of damaging the motor by operating it overloaded, hold down the "Reset–Emerg. Run" button on the Linestarter and start in the usual manner. This mechanically holds the overload relays in the "Reset" position. If a remote master switch is used, an emergency run pushbutton (shown dotted in Figs. 4 and 5) is added. Holding down this "Emerg. Run" pushbutton shorts out the overload relay contacts "OL". If the overload condition has not

been corrected, the motor will operate only as long as the "Reset–Emerg. Run" or "Emerg. Run" button is held depressed.

3. UNDER SHOCK—Size 0, 1, 2 and 3 Line-starter contactors and relays have an inertia latching device which operates only on high impact shock to hold the contactor armature in the same position during and after a shock that it was in prior to the shock. This prevents the unexpected and hazardous starting of a motor when a shock occurs; or, if a motor is operating, it keeps the motor in operation.

An auxiliary relay which is both mechanically and electrically shock-proof is employed on the Sizes 4 and 5 Linestarters to mechanically latch the contactor in the open position when de-energized. If a shock occurs when the line contactor is in the closed position, the contactor may open the circuit momentarily. However, this is of no consequence as the opening time is very short and the auxiliary relay contact circuit energizes the line contactor operating coil continuously.

TESTS AND ADJUSTMENTS

1. PRELIMINARY STARTER TEST—The operation sequence of the Linestarter should be checked with the motor leads disconnected. The operation should correspond to that described on the instruction leaflet mounted on the enclosure door.

2. AUXILIARY CONTROL DEVICES—All pushbuttons, master switches, pressure switches, limit switches, etc., should be operated to make certain that they function correctly.

3. DIRECTION OF MOTOR ROTATION—The motor direction of rotation should be checked. If it is incorrect, the direction can be changed by interchanging any two line leads.

4. PERMANENT CONNECTIONS — After the preliminary tests have been made, the leads should be securely fastened and properly insulated to make a permanent installation.

5. CONTROL CIRCUIT FUSE—If the control circuit fuse blows, check the Linestarter for short-circuited coils, damaged wiring, or incorrect external control connections.

6. OVERLOAD RELAY — An improperly applied heater, an incorrect calibration or setting of the overload relay adjusting lever, or an intermittent or continuous motor overload will cause the overload relay to trip.

The trip rating of the heater should be approximately 115% to 125% of the ampere rating stamped on the motor name plate. The number stamped on the heater terminal is the ultimate trip rating of the heater in amperes. The calibration of the overload relay can be adjusted in a range of ± 10% by means of the adjusting lever. On an intermittently rated motor the heater is sometimes selected with a rating less than that indicated in the heater table. If it is suspected that a motor overload is causing the relay to trip, the motor current should be checked by inserting an ammeter in a motor line. The current value that is measured should be compared with the one stamped on the motor name plate. It should also be determined whether the overload conditions are intermittent or continuous. In the case of intermittent overloads, the relay setting or heater rating can sometimes be judiciously increased without danger of damaging the motor. If the overload condition is continuous, the application should be carefully checked and if it exceeds the rating of the motor, steps should be taken to correct the situation.

In general, a relatively long accelerating period is required for starting high inertia loads. Because of the longer starting period, it may be necessary to use an inductive shunt (reactor) connected in parallel with the heater to prevent the overload relay from tripping during the starting period. For currents up to full load, this inductive shunt carries very little current and has a negligible effect on the overload relay operation. However, currents considerably in excess of the motor full load value will saturate the inductive shunt and reduce its impedance. This in turn will shunt more of the starting current through the shunt and away from the heater, thereby avoiding tripping during normal starting.

REPLACEMENT OF PARTS—MAINTENANCE

1. GENERAL—General instructions for replacement of parts and maintenance can be found in Instruction Leaflet 6000-1. Data for individual contactors, relays, etc., may be found on the specific instruction sheets for each device.

A periodic inspection should be made to insure that the equipment is clean and all parts are in good operating condition. All connections should be kept as tight as possible.

2. **CONTACTS**—Contacts which become badly burned or worn should be replaced before the contact pressure decreases to an unsafe value. The proper contact gaps, overtravels, and pressures are given in the data sheets for the individual pieces of apparatus. Do not use emery cloth to clean contacts. If it becomes necessary to dress the contact surfaces, a fine file should be used.

3. **WARNING**—The incoming circuit should always be dead before any inspection or maintenance work is done on the Linestarter.

SPARE PARTS

Any parts that are removed from the spare parts box should be noted and reordered at the earliest opportunity. When a part is ordered, state the name of the part, style number, and the type of relay, contactor, etc., on which it is used. The ordering information can usually be found for these parts on the "List of Spare Parts" which is furnished and fastened to the spare parts box.

In addition to the above information, also give the complete Linestarter name plate reading as it helps to identify the proper replacement parts. If the Linestarter drawing number is known, this information should be included with the order.

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