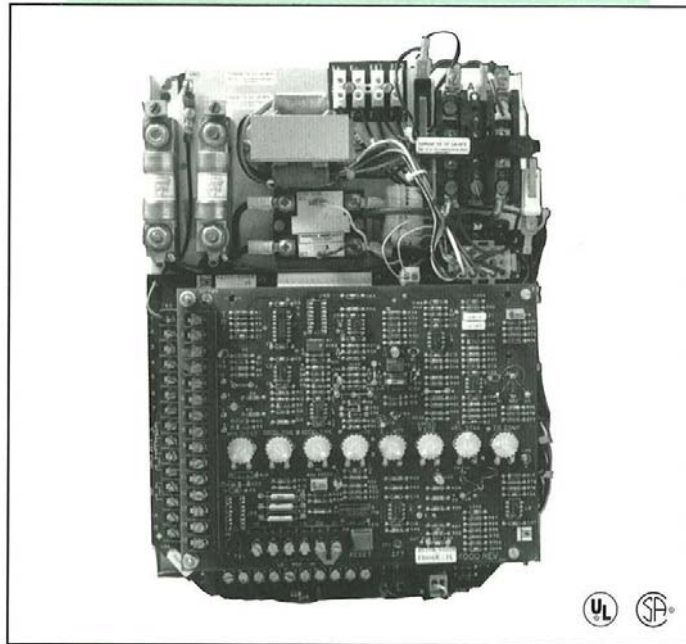




ES-2700

NON-REGENERATIVE DC DRIVE CONTROL 1/4 HP- 5 HP



High Performance 1/4 to 5 HP in just
Two Models Programmable for:

- Input Voltage and Frequency
 - Torque or Speed Regulation
 - Tach or Armature Voltage Feedback
 - Horsepower (Maximum Current)
-

ES2700

NON-REGENERATIVE DC DRIVE CONTROL 1/4 to 5 HP

GENERAL DESCRIPTION

The ES-2700 is a high performance, non-regenerative DC motor control. It includes many standard features that are available only as options on other single phase drives. Terminals are provided on the controller to access all important internal regulator points. This allows the ES-2700 to be used in custom engineered applications as well as standard speed regulated applications.

The ES-2700 was designed to handle most single phase drive applications without the addition of external hardware and without the need for costly, time consuming engineering. Two control models handle the entire 1/4 to 5 HP range of applications. Drive current limit and inverse time overload protective circuits for ratings within this range are calibrated by means of a jumper change on the main printed circuit board.

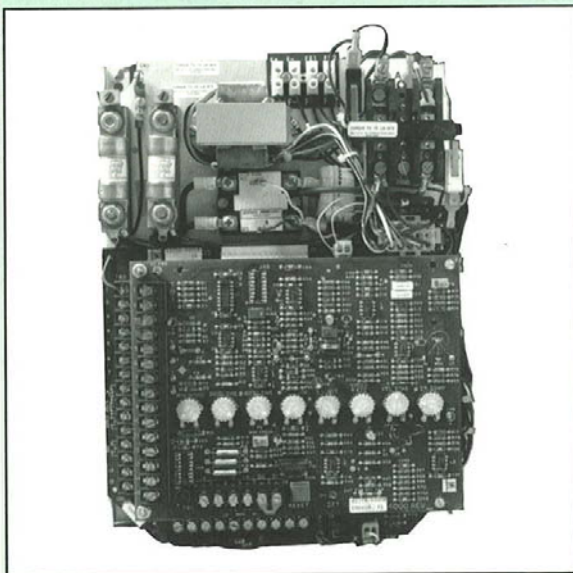
Simple jumper programming allows the ES-2700 to operate from either 120 or 240 Volt AC input power at 50 or 60 Hz. Additional jumpers program the controller to operate as either a speed regulator with armature voltage or tachometer feedback or as a torque regulator with armature current feedback.

The ES-2700 controls a DC motor's speed or torque by varying the DC voltage applied to the motor's armature. Single phase AC input power is converted to variable voltage DC output power by the ES-2700 controller. In speed regulated applications, the DC output voltage varies as a function of an input reference voltage (typically the input reference voltage is provided by an operator adjustable potentiometer). Changing the potentiometer setting (reference) results in a motor speed

change. In torque regulated applications, the DC output current varies as a function of an input reference voltage. Changing the torque reference changes the current supplied to the motor and results in a change in motor torque output.

The basic ES-2700 controller is a chassis mounted controller, which includes AC line fuses and a double break DC loop contactor for complete fault protection. LED indicators provide complete fault monitoring and status indication, and a digital test meter with multiposition selector switch is available as an option.

The ES-2700 control includes many built-in features not available on competitive units. Field economy and separately adjustable rates of acceleration and deceleration are included as standard. If desired, the built-in accel/decel control ramps can be bypassed completely without any change to the controller, and current compounding can be added to the speed regulator by changing the position of a jumper. Current limit is normally set by a potentiometer located on the main printed circuit board but if desired, it can be adjusted using a remote mounted potentiometer or a customer supplied voltage signal. The ES-2700 also includes an ammeter output for use with one of the ES-2700 ammeter kits. No additional ammeter shunt is required.



CUSTOMER PROGRAMMABLE

- Input voltage 120 or 240 V
- Current range
- Armature voltage feedback (90 or 180 VDC)
- Tach feedback
- IR Compensation (negative or positive)
- Two quadrant operation (forward or reverse)
- 10% reverse operation
- 50 or 60 Hz
- Accel/decel time range .2-4/2-30 seconds
- Ammeter full scale reading(150% or 200%)

STANDARD FEATURES

- **Solid State Full Wave Power Bridge** — Uses generously rated power semiconductors for maximum reliability and long life.
- **Inner Current Loop Regulator** — Inherent high band width capability for fast response.
- **Separately Adjustable Linear Accel/Decel Control** — Two ranges: 0.2-4 seconds and 2-30 seconds.
- **Speed Regulator** — Two percent accuracy using armature voltage feedback with IR compensation or 1% accuracy with tachometer feedback. Regulation may be improved by selecting the proper motor mounted tachometer.
- **Current (Torque) Regulator** — One percent accuracy armature current regulator allows the operator to control motor torque instead of speed.
- **Negative IR Compensation** — Available by jumper connection. Allows use of control in load sharing applications.
- **Remote Current Limit** — Available by the simple addition of a potentiometer or DC voltage input.
- **Double Break DC Armature Loop Contactor** — Full rated and fully sequenced contactor assures positive disconnect of DC motor when the stop pushbutton is pressed or whenever an undervoltage condition occurs.
- **Field Economy** — Insures longer life for wound field DC motors. May be easily bypassed or time delayed to meet specific application requirements.
- **Ammeter Output** — Motor current can be indicated with the simple addition of a remote meter.
- **Circuit Board Indicators** — Light emitting diodes (LED's) are provided to indicate:
 - DC Overload
 - Field Loss
 - Instantaneous Overcurrent Trip
 - DC Power on
 - Run Mode
 - Jog Mode
 - SCR's Being Gated
- **Fault Trip Circuit** — Protective circuits are designed to quickly shut the drive down and provide a visual indication whenever a DC overload, field loss, or instantaneous overcurrent condition occurs. This fault trip circuit prevents restart. It must be reset before the drive can run again.
- **Isolated Control Circuitry** — Provides complete isolation of the control and regulator circuitry from the AC power bus for protection in the event of a ground fault. The ammeter, speed potentiometer, and tachometer are not at line potential. Complete system compatibility is also possible without additional isolation accessories.
- **Instantaneous Overcurrent Protection** — Senses armature fault currents quickly to protect both semiconductors and motors against damaging current levels.
- **High Speed Current Limiting SCR Semiconductor Fuses** — Provide the utmost in fuse coordination and protection of the SCR's and motor with positive circuit clearing on both AC and DC faults.
- **Field Loss Protection** — Provides protection against runaway due to loss of motor field by shutting down the drive.
- **DC Overload (Armature)** — Senses overcurrent conditions with inverse time shutdown.
- **Common Control Circuit Board** — All ES-2700 controls utilize the same PC boards regardless of HP, voltage, frequency, or control mode.
- **Exclusive Static Adjustable Current Limit** — Allows static setting of the desired current limit value without applying DC power and without a connected output load whenever the optional test meter is connected.
- **Dual Frequency Operation** — Controls may be operated from 50 to 60 Hz power supplies by simple jumper change.
- **Jog at Preset Speed** — Separately adjustable from zero to plus or minus 30% of base speed.
- **Standard Adjustments** — Maximum speed, minimum speed, acceleration time, deceleration time, IR compensation, current limit, jog speed, velocity stability, and speed rate.
- **SCR Trigger Circuits** — Pulse transformer isolated, hard firing, high frequency "burst" type pulse train output from individually gated oscillators insures SCR conduction regardless of the effects of line notching or incoming AC power line.
- **Reactors, Snubber Networks** — Prevent SCR DV/DT failures due to line spikes and transients. Provide DI/DT protection during SCR turn-on and aids in SCR turn-off during SCR commutation, minimizing the effects of AC power line notching.
- **AC Line Filter and Transient Voltage Suppressor Network** — Eliminates interaction between other drives or AC equipment.
- **Power Supplies** — Each ES-2700 contains an internal 115V AC power supply to power the DC loop contactor and drive logic relays. Internal $\pm 24V$ DC, $\pm 15V$ DC, and a regulated $\pm 10V$ DC power supply are also included.
- **UL/CSA** — All ES-2700 controls are UL listed and CSA approved.

OPTIONS

TEST METER

This modification consists of a digital panel meter and multi-position selector switch. It provides the capability to monitor nine critical drive parameters. The test meter kit plugs into the regulator PC Board on the ES-2700. It is an ideal addition to the control as an aid in troubleshooting and startup.

AMMETER KIT

The ES-2700 control includes circuitry to drive an external ammeter without the addition of an ammeter shunt. This external meter can be calibrated in either percent load or in amperes.

ENCLOSURES

The basic ES-2700 Control is a chassis mount unit. Wall mounted enclosures are available to protect the ES-2700

controller from a wide variety of industrial environments.

ADDITIONAL OPTIONS

Many additional options are available to meet specific drive application requirements including:

- Reversing
- Dynamic Braking
- Process Signal Follower
- Specific Logic
- Auxiliary Control
- Field Weakening
- Isolation Transformers
- Many Others

Contact Emerson for Details.

SPECIFICATIONS

Service Conditions:

- Rated Voltage Input: 120 or 240 volts (-10%, +10%) AC Single Phase
- Rated Voltage Output: 90 or 180 VDC
- Frequency: 50/60 Hz (± 2 Hz)
- Ambient Temperature: 0-40°C (32°F to 104°F)
- Altitude: Sea Level to 3300 Feet
- Efficiency at Rated Output: Power unit 98% or better depending on selected rating. Drive system 82% or better depending on selected rating.
- Load Inertia: Not more than motor inertia when referred to motor shaft.
- Power Factor Corrected AC Lines: Drive installation on power factor corrected AC lines should be avoided where possible. When power factor correction capacitors are installed, they should be located as far away from SCR drive as is practical. Contact Emerson prior to drive energization.

Performance Specifications:

- Controlled Speed Range: 20:1 for basic control. May be extended to 200:1 by modification.
- Speed Regulation:
 - For a 95% Load Change:
 - Voltage Regulated: 2-5% of maximum speed.
 - Speed Regulated: 1% of maximum speed (AC or DC tachometer).
 - For All Other Variables:
 - Voltage Regulated: Changes up to 15% of top speed can result from temperature variations, voltage, and frequency variations and drift.

Speed Regulated (any AC tachometer): 2% of maximum speed.

Speed Regulated (any DC tachometer): 1% of maximum speed.

May be Modified to Achieve: 0.1% due to 95% load change and 0.15% due to all other variables.

- Overload Capacity: 150% of rated current for 1 min.
- Service Factor: 1.0

Adjustment Ranges (Typical):

- Maximum Speed: 70 to 130% rated speed
- Minimum Speed: 0 to 30% rated speed
- Acceleration Time: 0.2 to 30 seconds (linear)
- Deceleration Time: 0.2 to 30 seconds (linear)
- Jog Speed: 0 to 30% rated speed
- IR Compensation: 0 to 15% rated voltage
- Current Limit: 0 to 150% of selected range

Control Power:

- Voltage (Relay Logic): 115V AC
- Spare Capacity: 5 VA

Input Signal Requirements:

- 10V DC at 1 mA (nominal) for maximum output

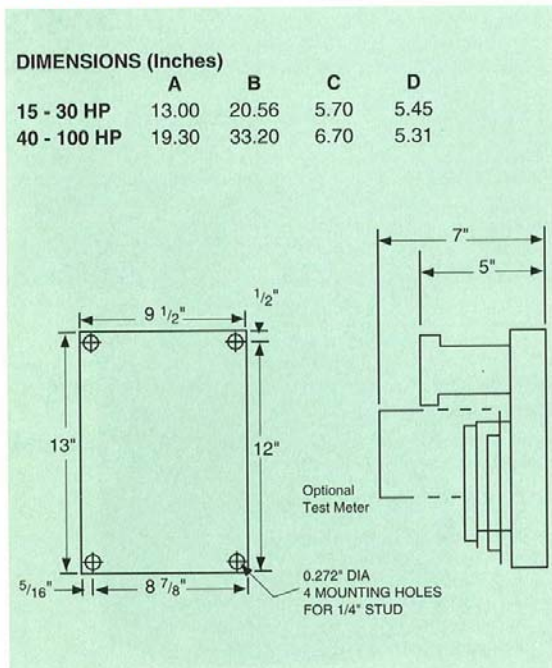
Field Data:

- Voltage: 100V DC with 120V AC input
200V DC with 240V AC input
- Current: 3 amperes maximum

Speed Potentiometer:

- 500 Ohms, 2 Watt

DIMENSIONS



RATINGS

Control Part No.	Horsepower		InputAmps @ Full Load	DC Armature Amps@ Full Load
	120VAC	240VAC		
2710-8000	1/4	1/2	4.2	3
	1/3	—	5.6	4
	—	3/4	5.6	4
	1/2	1	8.5	6
	3/4	1 1/2	11	8
2710-8001	1	2	14	10
	1 1/2	3	21	15
	2	—	28	20
	—	5	35	25



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