Electric Power / Controls

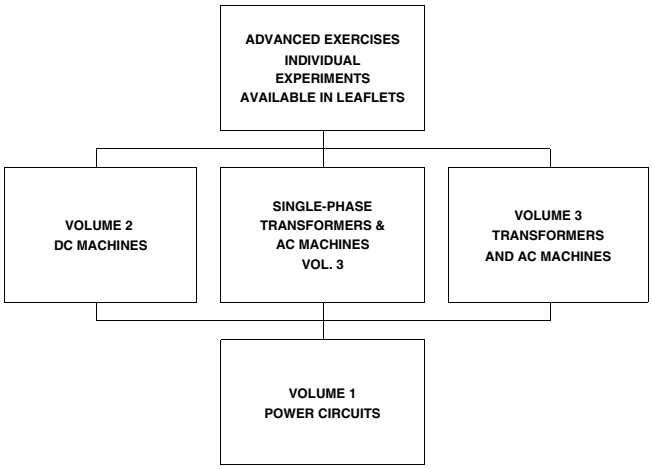
2 kW

2-kW ELECTROMECHANICAL TRAINING SYSTEM, MODEL 8013

GENERAL DESCRIPTION

The Lab-Volt 2-kW Electromechanical Training System, Model 8013, is a modular program in electric power technology. The system consists of several modules, which can be grouped to form four subsystems which deal with the different techniques associated with the generation and use of electrical energy.

All modules can be inserted into a standard Mobile Workstation, Model 8110. The modules are constructed from heavy-gauge steel, finished in baked enamel. There are two standard module sizes: full size, 308 mm (12.1 in) high, and half size,154 mm (6.0 in) high. Symbols and diagrams specific to each module are clearly silk-screened on the faceplates. Standard color-coded safety 4-mm jacks are used to interconnect all system components.



(732) 938-2000 / 800-LAB-VOLT, FAX: (732) 774-8573, E-MAIL: us@labvolt.com
(418) 849-1000 / 800-LAB-VOLT, FAX: (418) 849-1666, E-MAIL: ca@labvolt.com
INTERNET: http://www.labvolt.com

Each Lab-Volt 2-kW machine is permanently mounted on a mobile cart, and includes a double-extension shaft terminated with geared-type flanges. Different machines may be joined with a hard rubber coupling device and patented locking fastener designed to eliminate vibrations. Any combination of machines may be studied simultaneously.

The machines have a specifically high inertia to simulate large-power machines. The frames of the machines are equipped with transparent shatter-proof shields for inspection of the interior. The insulation class of the machines is B (80° temperature rise), the service factor is continuous, and the construction is of the open type. In addition, all machines are equipped with search coils through which the magnetic flux distribution at various locations in the machine can be observed on an oscilloscope.

All machine windings are brought out to the faceplate of a connection module through a 3-m (10-ft) long, heavy-duty, interconnecting cable fitted with a keyed connector: therefore, a particular machine can only be connected to its associated connection module. All windings are individually accessible on the faceplate of the connection module associated with that machine. Power windings are terminated on 4-mm color-coded safety jacks and search coils on 2-mm banana jacks. The different size jacks prevent accidental connections between power windings and search coils. The connection modules are fitted into half-size modules, and they must be placed at the bottom of a full height section in a workstation to allow connection.

Loads

Resistance, inductance, and capacitance load components are designed to provide equal load impedances for all three types of loads. Current increments and increment number are also the same for all modules. These characteristics simplify the calculation required in the learning process. The load impedance is set using switches mounted on the faceplate of the half-size modules.

Metering

The metering modules are designed to cover the complete range of measurements required with a minimum number of meters. The AC ammeter and voltmeter modules contain three meters, each for simultaneously measuring all three currents and voltages on a three-phase system. All meters are designed to sustain starting currents even when used on a low range. Wattmeters are internally connected to read power directly when the input is connected to the source and the output to the load. Protection of vulnerable meter components is accomplished without fuses.

Courseware

The 2-kW Electromechanical Training System courseware consists of student manuals that guide the students through the experiments and provide the necessary theoretical background to successfully complete the educational objectives. The instructor can select the experiments that will satisfy the objectives of technical courses or university programs. The flexibility of this system allows the student to use his or her own initiative during laboratory sessions.

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TABLE OF CONTENTS OF THE STUDENT MANUALS

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5 Ohm's Law
6 Circuit Solution – Part 1
7 Circuit Solution – Part 2
8 Power in DC Circuits - Part 1
9 Power in DC Circuits - Part 2
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11 AC Voltage and Current
12 AC Voltage and Current Measurement
13 The Wattmeter
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15 Capacitive Reactance
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17 Watt, Var, Volt-Ampere and Power Factor
18 Vectors and Phasors – Series Circuits
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20 Impedance
21 Three-Phase Circuits
22 Active, Reactive, and Apparent Power in Three-Phase Circuits
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8 The Self-Excited DC Shunt Generator
9 The DC Compound Generator
10 The DC Motor Starter

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3 Transformer Regulation
4 The Autotransformer
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6 The Distribution Transformer
7 Three-Phase Transformer Connections
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18 Alternator Synchronization
19 Alternator Power
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21 Frequency Conversion
22 Reactance and Frequency
23 Selsyn Control

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Exercise 2 Braking of a DC Motor (26663-0X)
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Exercise 6 DC Braking of an Induction Motor (26667-0X)
Exercise 7 Synchronous Impedance of a Three-Phase Alternator (26668-0X)
Exercise 8 Direct and Quadrature Axis Reactance of a Synchronous Machine (26669-0X)
Exercise 9 Transient and Subtransient Reactance of a Synchronous Alternator (26670-0X)

[1] The exercises are described in another datasheet which can be obtained from your Lab-Volt representative.

SYSTEM CONFIGURATIONS

To suit the different training levels and objectives, Lab-Volt offers four training systems. The list of equipment for each system is shown in the List of Equipment section.

DESCRIPTION	SYSTEM
2-kW EMS - Modularized Supported by student manuals 26184-00, 26185-00, and 26186-00	8013-10
2-kW EMS - Power Circuits Supported by student manual 26184-00	8013-20
2-kW EMS - DC Machines Supported by student manual 26185-00	8013-30
2-kW EMS - Transformers and AC Machines Supported by student manual 26186-00	8013-40

LIST OF EQUIPMENT

		SYSTEM			
		8013-10	8013-20	8013-30	8013-40
DESCRIPTION	**ORDERING NUMBER[2]**	**QTY**			
Mobile Workstation[3]	8110-20	1	1	1	1
Storage Cabinet[3]	8150-10	1	1	1	1
AC Voltmeter[3]	8426-00	1	1	1	1
DC Motor/Generator	8501-00	1		1	1
Wiring Module for DC Motor/Generator	8502-00	1		1	1
Four-Pole Squirrel-Cage Induction Motor	8503-00	1			1
Wiring Module for Squirrel-Cage Induction Motor	8504-00	1			1
Three-Phase Wound-Rotor Induction Motor	8505-00	1			1
Wiring Module for Wound-Rotor Induction Motor	8506-00	1			1
Three-Phase Synchronous Motor/Generator	8507-00	1		1	1
Wiring Module for Synchronous Motor/Generator	8508-00	1		1	1
Resistive Load	8509-00	3	3	3	3
Inductive Load	8510-00	3	3		3
Capacitive Load	8511-00	3	3		3
Single-Phase Transformer	8512-00	3			3
DC Voltmeter/Ammeter	8513-00	1	1	1	1
AC Ammeter	8514-00	1	1	1	1
Three-Phase Wattmeter/Varmeter	8515-20	1	1		1
DC Breaker	8517-00	1			1

[2] The model numbers shown apply to the English 120-V version. Other versions are available. Refer to the Ordering Numbers section.

[3] This module is described in another datasheet which can be obtained from your Lab-Volt representative.

LIST OF EQUIPMENT (cont'd)

		SYSTEM			
		8013-10	8013-20	8013-30	8013-40
DESCRIPTION	**ORDERING NUMBER**	**QTY**			
Synchronizing Module	8518-00	1	1		1
Manual DC Motor Starter	8519-00	1		1	
Synchronous Motor Starter	8520-00	1		1	1
Three-Phase Full-Voltage Starter	8521-00	1			1
Three-Phase Rheostat	8522-00	1			1
Three-Phase Power-Factor Meter	8523-20	1			1
Field Rheostat	8524-00	2		2	2
Power Supply	8525-20	1	1	1	1
Automatic DC Motor Starter	8526-00	1		1	
Digital Tachometer[4]	8920-40	1		1	1
Speed Sensor / Tachometer	8930-00	1		1	1
Coupler	8943-00	2		1	2
Analog Multimeter[4]	8946-00	1	1		1
Connection Leads	8952-00	1	1	1	1
Power Circuits (student manual)	26184-00	1	1		
DC Machines (student manual)	26185-00	1		1	
Transformers and AC Machines (student manual)	26186-00	1			1

OPTIONAL EQUIPMENT

DESCRIPTION	ORDERING NUMBER
Workstation[4]	8134-20
Full-Size Blank Module[4]	8160-00
Half-Size Blank Module[4]	8161-00
DC Voltmeter/Ammeter[4]	8513-10
Star (Wye)/Delta Starter[4]	8527-00
Rotor Positioner	8905-00
Phase-Shift Indicator	8906-00
Stroboscope[4]	8922-10
Digital Multimeter[4]	8946-10

[4] This module is described in another datasheet which can be obtained from your Lab-Volt representative.

MODULE DESCRIPTION

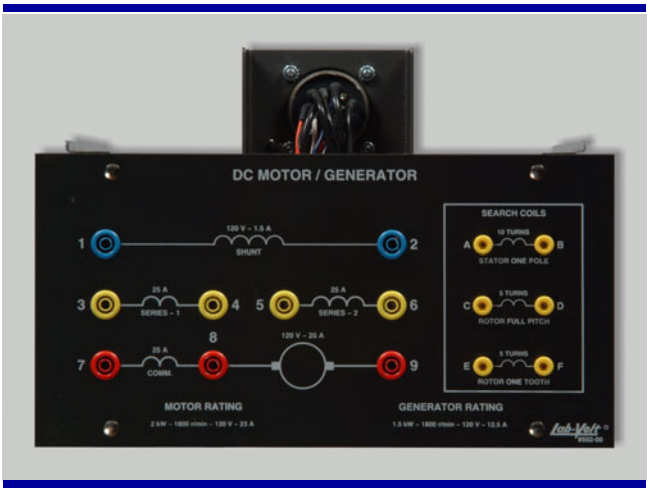
Model 8501 – DC Motor/Generator

The DC Motor/Generator consists of a 4-pole machine rated at 2 kW. It has one shunt field winding, two series field windings, and one inter-pole winding. The winding dimensions permit the study of DC machine operation as a shunt machine, a series machine, a cumulative compound machine, and a different compound machine.

The DC Motor/Generator may also be operated as a dynamometer. It is equipped with a hydraulic torque measuring device calibrated from 0 to 30 N·m (0 to 266 lbf·in).

A handle permits easy displacement of the brushes to study the effect of armature reaction and commutation. Three search coils permit observation of the flux distribution at one pole of the stator, at one tooth, and at full pitch of the rotor through slip rings.

Model 8502 – Wiring Module for DC Motor/ Generator



The Wiring Module for DC Motor/Generator consists of a connection module. It provides connection access to the DC Motor/Generator from the Mobile Workstation through a flexible connecting cable. The module has nine 4-mm color-coded safety jacks for the power windings and six 2-mm jacks for the search coils. Jacks of different sizes prevent accidental connections between power windings and search coils.

Model 8503 – Four-Pole Squirrel-Cage Induction Motor

The Four-Pole Squirrel-Cage Induction Motor consists of a 3-phase machine rated at 2 kW. Each phase of the stator winding is accessible via the connection module to allow wye or delta connections. The machine is equipped with a standard cast-aluminum squirrel cage rotor.

The winding dimensions permit the study of machine operation as a squirrel-cage induction motor or as an asynchronous generator when driven by a prime mover.

The machine has a 5-turn, full-pitch stator search coil to allow the observation of the instantaneous flux distribution.

Model 8504 – Wiring Module for Squirrel-Cage Induction Motor

The Wiring Module for Squirrel-Cage Induction Motor consists of a connection module. It provides connection access to the Four-Pole Squirrel-Cage Induction Motor from the Mobile Workstation through a flexible connecting cable. The module has six 4-mm color-coded safety jacks for the power windings and two 2-mm jacks for the stator search coils. Jacks of different sizes prevent accidental connections between power windings and search coils.

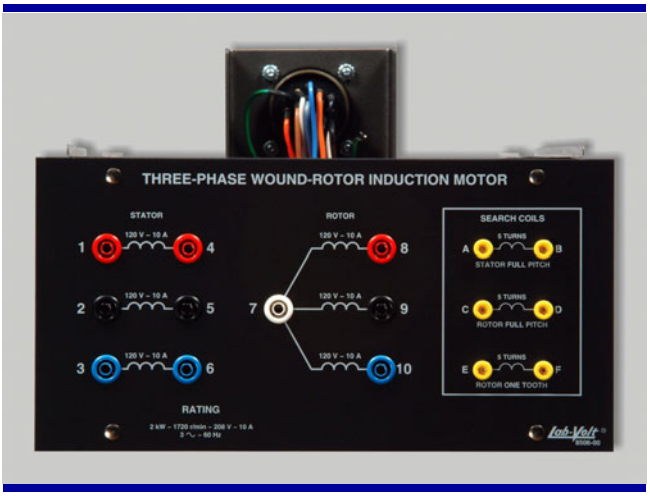
Model 8505 – Three-Phase Wound-Rotor Induction Motor

The Three-Phase Wound-Rotor Induction Motor consists of a 4-pole machine rated at 2 kW. Each phase of the stator winding is accessible via the connection module to allow wye or delta connections. The rotor is wye connected to four slip rings to give access to all windings, including neutral.

The winding dimensions permit the study of operation as a wound-rotor induction motor, a frequency converter, a phase-shifter, a position controller, a variable-coupling single-phase transformer, a three-phase transformer, and an asynchronous induction generator.

The machine also has three search coils permitting observation of the flux distribution at one pole of the stator, at one tooth, and at the full-pitch of the rotor.

Model 8506 – Wiring Module for Wound-Rotor Induction Motor



The Wiring Module for Wound-Rotor Induction Motor consists of a connection module. It provides connection access to the Three-Phase Wound-Rotor Induction Motor from the Mobile Workstation through a flexible connecting cable. The module has ten 4-mm color-coded safety jacks for the power windings and six 2-mm jacks for the search coils. Jacks of different sizes prevent accidental connections between power windings and search coils.

Model 8507 – Three-Phase Synchronous Motor/ Generator

The Three-Phase Synchronous Motor/Generator consists of a 4-pole machine rated at 2 kW. Each phase of the stator winding is accessible via the connection module to allow wye or delta connections. The rotor winding is connected to two slip rings for external connection to a DC source. A squirrel cage damper winding is inserted in the salient-pole rotor to produce induction-motor action, making the synchronous motor self-starting.

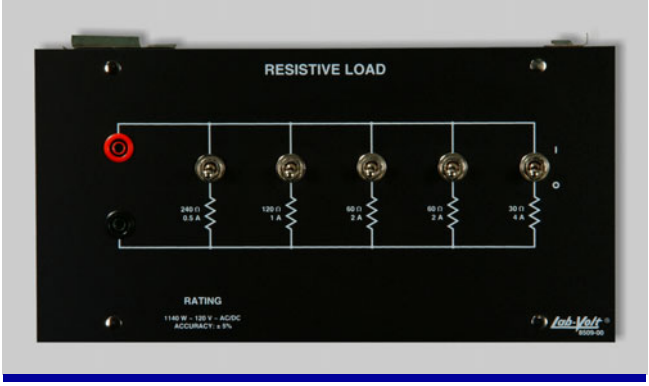
Features of the Three-Phase Synchronous Motor/ Generator used with the Wiring Module for Synchronous Motor/Generator, Model 8508, include:

- A damping resistor connected across the rotor winding to limit induced voltage and increase the torque during motor start-up.
- A toggle switch connected in series with the rotor winding, to isolate the winding from the DC source during motor start-up.
- A normally-closed push-button connected in series with the damping resistor, which enables students to measure the true exciting current.
- A full-pitch stator pole and a rotor-pole search coil to allow observation of the flux distribution.

Model 8508 – Wiring Module for Synchronous Motor/Generator

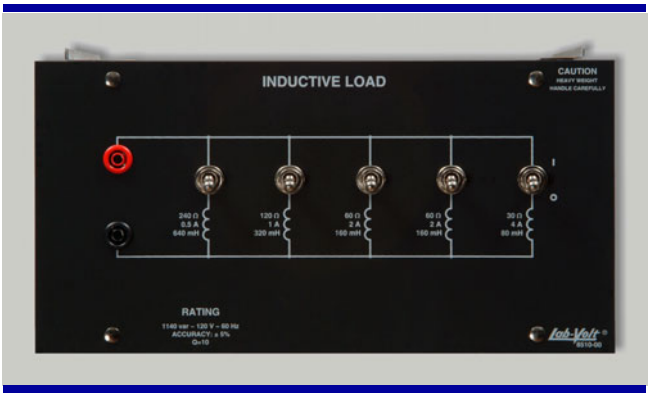
The Wiring Module for Synchronous Motor/Generator consists of a connection module. It provides connection access to the Three-Phase Synchronous Motor/ Generator from the Mobile Workstation, Model 8110, through a flexible connecting cable. The module has eight 4-mm color-coded safety jacks for the power windings and four 2-mm jacks for the search coils. Jacks of different sizes prevent accidental connections between power windings and search coils.

Model 8509 – Resistive Load



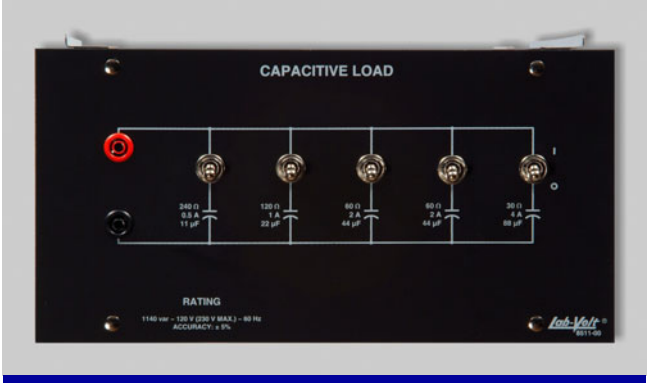
The Resistive Load module consists in five wire-round power resistors placed in parallel. Each resistor can be added to the circuit by means of a toggle switch. It is possible to vary the equivalent resistance to obtain nineteen steps of equal current increment. Each resistor is identified by a schematic symbol, the resistance value in ohms, and the current that will flow through the resistor when connected to a nominal voltage power source. Connections are made through 4-mm color-coded jacks.

Model 8510 – Inductive Load



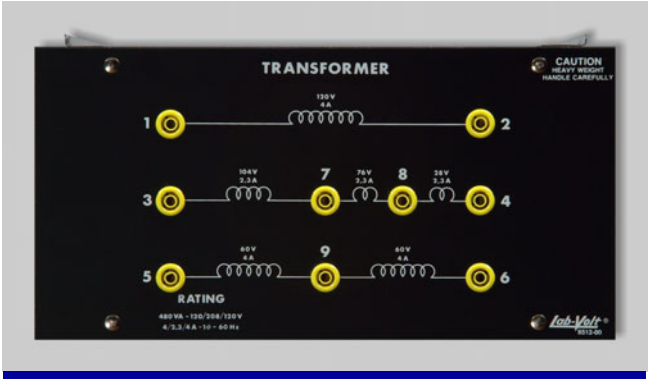
The Inductive Load module consists in five iron-core power inductors placed in parallel. Each inductor is identified by a schematic symbol, the inductance value in henrys, the inductive reactance in ohms, and the current that will flow through the inductor when connected to a nominal voltage power source. Each inductor is switchable by means of a toggle switch. Connections are made through 4-mm color-coded jacks.

Model 8511 – Capacitive Load



The Capacitive Load module consists in five capacitors placed in parallel. Each capacitor is identified by a schematic symbol, the capacitance value in microfarads, the capacitive reactance in ohms, and the current that will flow through the capacitor when connected to a nominal voltage power source. A permanently connected discharge resistor reduces the voltage across each terminal to 5% of the applied voltage within 15 s after the load is disconnected from the supply. Each capacitor is switchable by means of a toggle switch. Connections are made through 4-mm color-coded jacks.

Model 8512 – Single-Phase Transformer



The Single-Phase Transformer module consists in three discrete windings. Each of them can be used as either a primary or a secondary which increases the number of laboratory applications. Its various taps allow it to be used with many different input and output voltages. Consequently, the single-phase transformer can be used for impedance matching and auto-transformer experimentation. By using multiple modules, students explore transformer phasing, distribution transformers, open and closed delta transformer configurations, delta-wye, wye-delta, wye-wye, and delta-delta connections. Other specialized transformer connections such as Scott (3-phase to 2-phase), 3-phase to 6-phase, and zigzag connections are also possible.

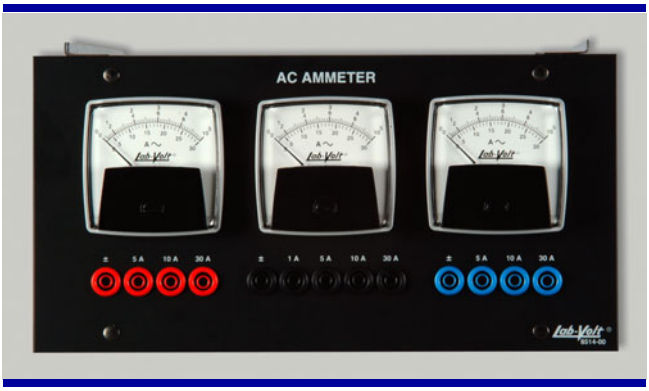
Careful engineering detail has been given to these transformers so that the regulation curves produced by resistive, inductive, and capacitive loads are readily distinguishable. Connections are made through 4-mm jacks.

Model 8513 – DC Voltmeter/Ammeter

The DC Voltmeter/Ammeter consists of one voltmeter, one milliammeter, and one ammeter. Ranges have been selected to facilitate the simultaneous measurement of the voltage, the shunt field current, and the armature current of the DC Motor/Generator, Model 8501. Connections are made through 4-mm color-coded jacks.

An optional version of the DC Voltmeter/Ammeter (Model 8513-1) is provided with a zero-center voltmeter scale for application in the 2-kW Electromechanical Training System.

Model 8514 – AC Ammeter

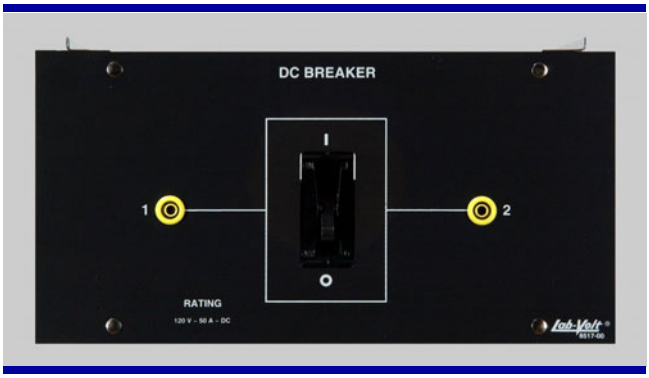


The AC Ammeter consists of three separate multi-range AC ammeters for simultaneous measurement of three-phase currents. Two of the three meters have identical ranges while the third instrument has one additional lower range. Connections are made through 4-mm color-coded jacks.

Model 8515 – Three-Phase Wattmeter/Varmeter

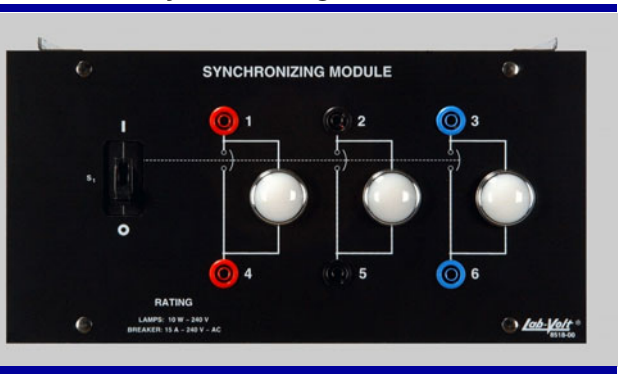
The Three-Phase Wattmeter/Varmeter consists of one wattmeter and one varmeter. It is designed to indicate direct measurement of active and reactive power in balanced three-phase circuits. Each meter has a zero-center scale to show the direction of power flow. Its electronic design uses voltage and current sensors to sample line voltage and current. Voltage and current circuits of both meters are internally connected so that students only have to connect the line and load terminals of the module. Connections are made through 4-mm color-coded jacks. A 24 V ac power source (available from the Power Supply, Model 8525-2) is required to operate the unit.

Model 8517 – DC Breaker



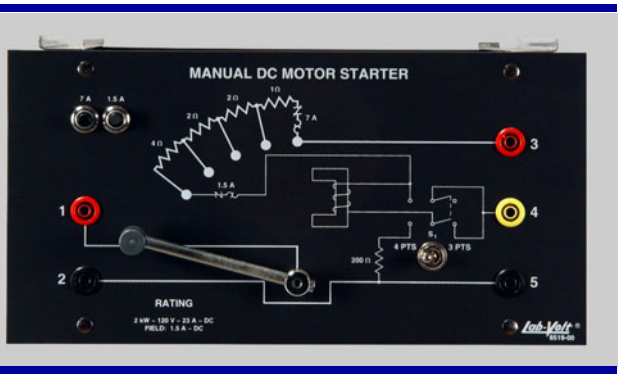
The DC Breaker module consists of a one-pole thermal-magnetic circuit breaker specially designed to interrupt high DC currents. A typical application of this module is in the paralleling of two DC generators. Connections are made through 4-mm color-coded jacks.

Model 8518 – Synchronizing Module



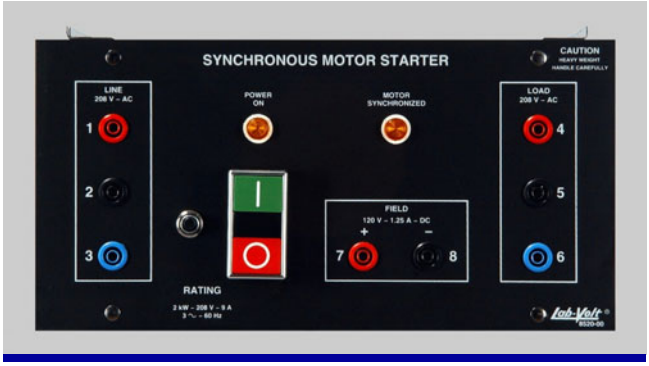
The Synchronizing Module consists of three indicator lamps and a three-pole circuit breaker-switch fitted to the module faceplate. The main function of this module is to indicate synchronism between two AC generators and to electrically interconnect the generators by closing the three-phase breaker-switch. Each phase leg of this module is then protected from over-current conditions. This module is also used to determine the phase sequence of a three-phase circuit and to show the relative power level in AC and DC circuits. Connections are made through 4-mm color-coded jacks.

Model 8519 – Manual DC Motor Starter



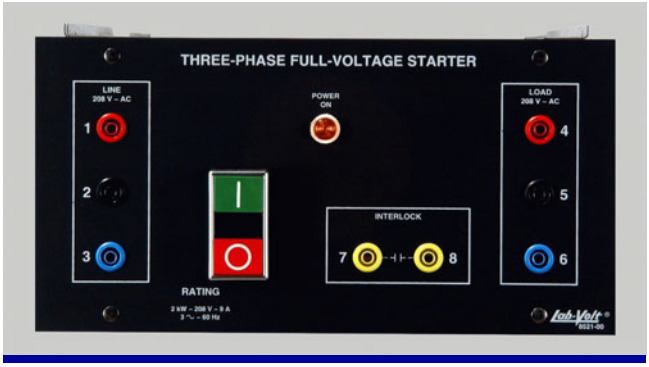
The Manual DC Motor Starter module is designed to start the DC Motor/Generator, Model 8501, from a DC source. The module consists of a manually operated handle, variable-resistance starter. It can be wired as either a 3- or 4-point DC motor starter. When the motor starter is in the full run position, an electromagnet holds the handle in place. If loss of field occurs while the starter is connected in 3-point mode, the holding electromagnet is de-energized and a spring returns the starting handle to the off position. Connections are made through 4-mm color-coded jacks.

Model 8520 – Synchronous Motor Starter



The Synchronous Motor Starter module is designed to start the Three-Phase Synchronous Motor/Generator, Model 8507, directly from the power line. The module consists of a 3-pole magnetic contactor and a built-in DC power source which supplies DC voltage to the field winding when the rotor achieves approximately 90% of synchronous speed. A pilot lamp indicates that the motor is synchronized with the power line when DC voltage is applied to the machine. Industrial push-button controls are mounted on the starter faceplate. Students must depress and hold the I button until the MOTOR SYNCHRONIZED indicator is illuminated (releasing the I push-button before the machine is synchronized will deny 3-phase power to the synchronous machine). Connections are made through 4-mm color-coded jacks.

Model 8521 – Three-Phase Full-Voltage Starter



The Three-Phase Full-Voltage Starter is designed to start the Four-Pole Squirrel-Cage Induction Motor, Model 8503, and Three-Phase Wound-Rotor Induction Motor, Model 8505, directly from the power line. The module consists of a 3-pole magnetic contactor with a variable overload relay. The components are interconnected to the line and load terminals. A power-on pilot lamp and I and O pushbuttons are also mounted on the module faceplate. The auxiliary contacts of the main contactor can be accessed for use as an interlock in control circuits. Connections are made through 4-mm color-coded jacks.

Model 8522 – Three-Phase Rheostat

The Three-Phase Rheostat module consists of three rheostats mounted on a common shaft directly controlled by a single knob on the module faceplate. The rheostats are electrically interconnected in a four-wire wye configuration and each leg is protected from over-current conditions by a thermal-magnetic circuit breaker.

This module is mainly used for speed control of a Three-Phase Wound-Rotor Induction Motor, Model 8505. A limit switch is actuated when the knob of the rheostat is turned fully clockwise, corresponding to maximum resistance. This switch can then be used as an interlock with the Three-Phase Full-Voltage Starter, Model 8521, to make sure that the motor starts with a rotor resistance which provides maximum starting torque.

This module can also be used for other applications where a variable power resistor is needed.

Model 8523 – Three-Phase Power-Factor Meter

The Three-Phase Power-Factor Meter consists of one meter providing a direct measurement of lagging or leading power factor in three-phase balanced circuits. Its electronic design uses voltage and current sensors to sample line voltage and current. Voltage and current circuits are internally connected so that students only have to connect the line and load terminals of the module. Connections are made through 4-mm color-coded jacks. A 24 V ac power source (available from the Power Supply, Model 8525-2) is required to operate the unit.

Model 8524 – Field Rheostat

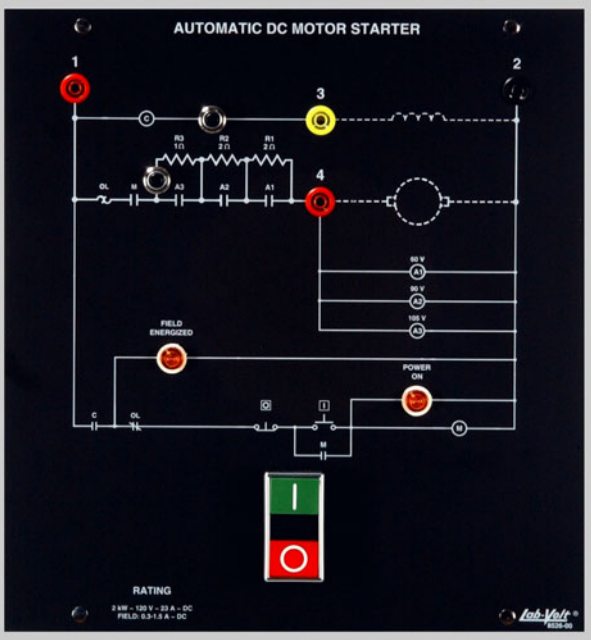
The Field Rheostat module is designed to be used with the DC Motor/Generator, Model 8501, and Three-Phase Synchronous Motor/Generator, Model 8507. The module consists of a variable power resistor, directly controlled by a knob on the module faceplate. It is protected from over-current conditions by a thermal-magnetic circuit breaker. This module is designed to vary the shunt field current of the DC Motor/Generator, Model 8501, and the exciter current of the Three-Phase Synchronous Motor/Generator, Model 8507. Connections are made through 4-mm color-coded jacks.

Model 8525 – Power Supply

The Power Supply module is the primary component of the system. All associated equipment is powered by this power supply. A flexible, 5-wire power cord, terminated with a 5-prong, twist-lock plug and line cap, feeds the module. A mechanical interlock on the line cap prevents the removal of an energized Power Supply from its locked position in the workstation. The Power Supply requires a 3-phase, wye-connected, 5-wire service installation. An appropriate wall outlet is shipped with each Power Supply so that site power can be properly terminated to receive the power cord. In addition to the 3-phase legs and the neutral, a separate copper ground provides proper grounding for the Power Supply chassis and workstation cabinets, thus ensuring added safety for students using the equipment.

The Power Supply provides fixed and variable AC and DC voltage sources all terminated with 4-mm safety jacks. They can be used simultaneously, up to a total load current equal to the rating of the fixed 3-phase output. Independent circuit breakers, reset at the front panel, protect the Power Supply input and outputs. Indicator lamps monitor the presence of input voltage in each phase. When a phase leg of the site power service is out, the lamp goes off to reflect this condition. A voltmeter, connected through a selector switch, monitors the outputs.

Model 8526 – Automatic DC Motor Starter



The Automatic DC Motor Starter is designed to allow the automatic starting of the DC Motor/Generator, Model 8501, by sensing the motor counter electromagnetic force (CEMF) to control the armature current. In the event of loss of field, the control circuit protects the motor against overspeed by removing power from the armature. Thermal/magnetic circuit breakers completely protect the starter. Connections are made through 4-mm color-coded jacks.

Model 8527 – Star (Wye)/Delta Starter

The Star (Wye)/Delta Starter is designed to start the Four-Pole Squirrel-Cage Induction Motor, Model 8503, or Three-Phase Wound-Rotor Induction Motor, Model 8505, directly from the power line via the star (wye)/delta connection. It includes two magnetic contactors, a variable overload relay, a time-delay relay, and push-buttons that start and stop the motor. The control circuit connects the windings of the motor in a star (wye) configuration to start the motor. A short time lag follows the starting instant, while the windings are connected in a delta configuration to run the motor. Pilot lamps indicate power and starting conditions. A circuit breaker protects the control circuit and automatically stops the machine in the event of an overload.

Model 8905 – Rotor Positioner

The Rotor Positioner is a gear box which allows the rotor of a 2-kW machine to accurately lock in any given position. The rotator is mounted on a steel support that is connected to the carriage of the 2-kW machine. The coupling between the machine shaft and the rotator is accomplished by the Coupler, Model 8943. The zero indicator can be adjusted to any position by turning the slip-fit coarse and fine dials.

Model 8906 – Phase-Shift Indicator

The Phase-Shift Indicator is designed to measure the rotor phase angle of the Three-Phase Synchronous Motor/Generator, Model 8507. It consists of a transparent plastic disc, calibrated in electrical degrees, and a metal mounting bracket. It attaches to the end of the machine carriage with slide fasteners. The rotor phase angle can be read by illuminating the end of the machine shaft, through the calibrated disc, with a strobe light (Stroboscope, Model 8922). The reading corresponding to the phase angle, in electrical degrees, of a 4-pole AC machine.

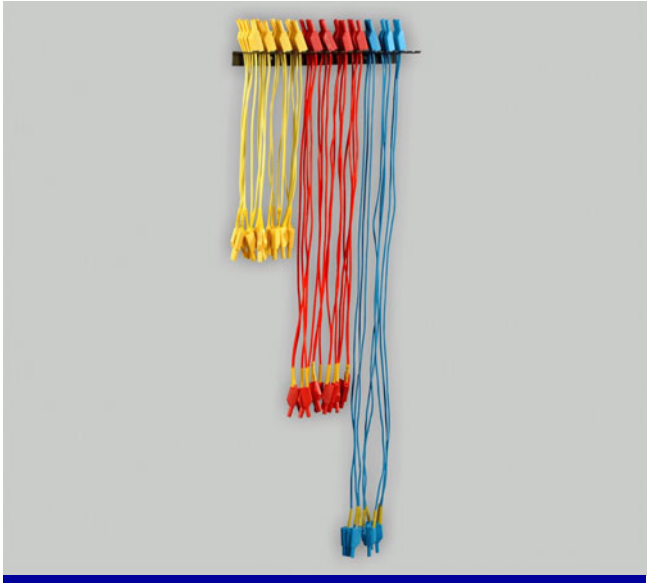
Model 8930 – Speed Sensor / Tachometer

The Speed Sensor / Tachometer is designed to measure the speed of rotation of the Lab-Volt 2-kW machines. It consists of a permanent magnet generator connected to a calibrated meter. It is housed in a metal case assembled on a bracket which can be attached to the machine carriage with slide fasteners. A switch selects clockwise or counterclockwise rotation. The generator output, brought out to two 2-mm jacks, allows the use of the tachometer in servomechanism circuits.

Model 8943 – Coupler

The Coupler consists of a rubber ring for in-line coupling of two 2-kW machines without slip. It also minimizes the vibrations created by the machines when they are not perfectly aligned.

Model 8952 – Connection Leads



The Connection Leads consist of PVC-covered, extra-flexible leads terminated with stacking 4-mm safety banana plugs. The leads are supplied in three different lengths, according to model variations, and are color-coded according to length. The leads are supplied with a lead holder that can be mounted to the side of any EMS Workstation, providing easy access and orderly storage of the leads.

SPECIFICATIONS

Model 8013 – 2-kW Electromechanical Training System				
Power Requirement		Refer to the specifications of the Power Supply, Model 8525		
Physical Characteristics	Dimensions (H x W x D)	855 x 440 x 775 mm (33.7 x 17.3 x 30.5 in)		
	Net Weight: System 8013-1	963 kg (2119 lb)		
	System 8013-2	351 kg (772 lb)		
	System 8013-3	532 kg (1070 lb)		
	System 8013-4	948 kg (2086 lb)		
Model 8501 – DC Motor/Generator		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Motor (Full Load / Shunt)	Power	2 kW		
	Armature Voltage	120 V – DC	220 V – DC	240 V – DC
	Shunt-Field Voltage	120 V – DC	220 V – DC	240 V – DC
	Speed	1800 r/min	1500 r/min	
	Current	23 A	12.1 A	11.4 A
	Torque	10.6 N·m (93.8 lbf·in)	12.7 N·m (112.4 lbf·in)	
	Efficiency	70%	73%	70%
	Nominal Shunt-Field Current	0.81 A	0.44 A	0.43 A
	Friction and Windage Losses	130 W	110 W	
	Iron Losses	55 W	40 W	
Generator (Full Load / Shunt)	Power	1.5 kW		
	Speed	1800 r/min	1500 r/min	
	Current	12.5 A	6.8 A	6.2 A
	Efficiency	83%	85%	81%
	Nominal Shunt-Field Current	1.12 A	0.60 A	0.56 A
	Friction and Windage Losses	130 W	110 W	
	Iron Losses	90 W	70 W	
Resistances at 25° C	Shunt (1-2)	69 Ω	255 Ω	278 Ω
	Short-Series (3-4)	0.14 Ω	0.33 Ω	0.36 Ω
	Long-Series (5-6)	0.24 Ω	0.70 Ω	0.77 Ω
	Interpoles (7-8)	0.32 Ω	1.23 Ω	
	Armature and Brushes (8-9)	0.35 Ω	1.15 Ω	
Inductances	Shunt Field (1-2)	4.4 H	12.4 H	14.8 H
	Armature (8-9)	8.7 mH	45.6 mH	
Search Coils	Stator - One Pole	10 turns		
	Armature - Full Pitch	5 turns		
	Armature One - Tooth	5 turns		
Torque Indicator		0 to 30 N·m (0 to 266 lbf·in)		
Physical Characteristics	Moment of Inertia	0.14 kg·m^2 (478 lb·in^2)		
	Dimensions (H x W x D)	855 x 440 x 775 mm (33.7 x 17.3 x 30.5 in)		
	Net Weight	129 kg (283.8 lb)		
Model 8502 – Wiring Module for DC Motor/Generator				
Physical Characteristics	Dimensions (H x W x D)	212 x 287 x 496 mm (8.3 x 11.3 x 19.5 in)		
	Net Weight	4.1 kg (9.0 lb)		

SPECIFICATIONS (cont'd)

Model 8503 – Four-Pole Squirrel-Cage Induction Motor		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Motor (Full Load)	Connection	3 ~, wye connected		
	Line Voltage	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
	Power	2 kW		
	Speed	1770 r/min	1465 r/min	1455 r/min
	Current	8.8 A	4.6 A	4.2 A
	Torque	10.8 N·m (95.6 lbf·in)	13.0 N·m (115.1 lbf·in)	13.1 N·m (115.9 lbf·in)
	Efficiency	80%	80%	77%
	Power Factor	0.77	0.83	0.85
	Friction and Windage Losses	130 W	100 W	
	Iron Losses	70 W	70 W	
Motor (Starting)	Current	55 A	25.6 A	23.5 A
	Torque	12.3 N·m (108.9 lbf·in)	17.7 N·m (156.7 lbf·in)	16.2 N·m (143.4 lbf·in)
Stator Resistance (per phase at 25° C)		0.6 Ω	2.2 Ω	2.3 Ω
Search Coil	Stator - Full Pitch	5 turns		
Physical Characteristics	Moment of Inertia	0.107 kg·m^2 (365.7 lb·in^2)		
	Dimensions (H x W x D)	830 x 400 x 605 mm (32.7 x 15.7 x 23.8 in)		
	Net Weight	88 kg (193.6 lb)		
Model 8504 – Wiring Module for Squirrel-Cage Induction Motor				
Physical Characteristics	Dimensions (H x W x D)	212 x 287 x 496 mm (8.3 #x 11.3 x 19.5 in)		
	Net Weight	4.1 kg (9.0 lb)		
Model 8505 – Three-Phase Wound-Rotor Induction Motor		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Motor (Full Load)	Connection	3 ~, wye connected		
	Line Voltage	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
	Power	2 kW		
	Speed	1720 r/min	1440 r/min	1435 r/min
	Current	10.0 A	4.8 A	4.4 A
	Torque	11.1 N·m (98.2 lbf·in)	13.3 N·m (117.7 lbf·in)	
	Efficiency	77%	76%	
	Power Factor	0.72	0.8	
	Friction and Windage Losses	230 W	190 W	
	Iron Losses	70 W	65 W	
Motor (Starting)	Current	43 A	19 A	17.5 A
	Torque	12.0 N·m (106.2 lbf·in)	16.0 N·m (141.6 lbf·in)	
Resistances (per phase at 25° C)	Stator	0.6 Ω	2.2 Ω	2.3 Ω
	Rotor	0.7 Ω	2.2 Ω	2.3 Ω
Search Coils	Stator - Full Pitch	5 turns		
	Rotor - Full Pitch	5 turns		
	Rotor - One Tooth	5 turns		
Physical Characteristics	Dimensions (H x W x D)	830 x 400 x 605 mm (32.7 x 15.7 x 23.8 in)		
	Net Weight	92 kg (202.4 lb)		

Model 8506 – Wiring Module for Wound-Rotor Induction Motor				
Physical Characteristics	Dimensions (H x W x D)	212 x 287 x 496 mm (8.3 x 11.3 x 19.5 in)		
	Net Weight	4.1 kg (9.0 lb)		
Model 8507 – Three-Phase Synchronous Motor/Generator		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Motor (Full Load)	Connection	3 ~, wye connected		
	Line Voltage	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
	Power	2 kW		
	Speed	1800 r/min	1500 r/min	
	Current	6.8 A	3.6 A	3.3 A
	Excitor Current	1 A – DC	0.55 A – DC	
	Torque	10.6 N·m (93.8 lbf·in)	12.7 N·m (112.4 lbf·in)	
	Efficiency	80%	80%	83%
	Friction and Windage Losses	150 W	110 W	
	Iron Losses	125 W	80 W	
Motor (Starting)	Current	34 A	18 A	16.5 A
	Torque	24.0 N·m (212.4 lbf·in)	30.0 N·m (265.5 lbf·in)	
Generator	Connection	3 ~, wye connected		
	Power	1.5 kVA		
	Current	4.2 A – AC	2.3 A – AC	2.1 A – AC
	Excitor Current	0.9 A – DC	0.53 A – DC	0.5 A – DC
	Efficiency	79%	81%	
Resistance (per phase at 25° C)	Stator	0.6 Ω	2.2 Ω	2.3 Ω
	Rotor	81 Ω	236 Ω	246 Ω
Synchronous Reactance		18.5 Ω	77 Ω	96 Ω
Excitor Inductance		6 H	21.9 H	26 H
Search Coils	Stator - One Pole - Full Pitch	5 turns		
	Rotor - One Pole	5 turns		
Physical Characteristics	Moment of Inertia	0.097 kg·m^2 (331.5 lb·in^2)		
	Dimensions (H x W x D)	830 x 400 x 605 mm (32.7 x 15.7 x 23.8 in)		
	Net Weight	89 kg (195.8 lb)		
Model 8508 – Wiring Module for Synchronous Motor/Generator				
Physical Characteristics	Dimensions (H x W x D)	212 x 287 x 496 mm (8.3 x 11.3 x 19.5 in)		
	Net Weight	4.1 kg (9.0 lb)		
Model 8509 – Resistive Load		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Resistors	Number	5		
	Resistance	240/120/60/60/30 Ω	880/440/220/220/110 Ω	960/480/240/240/120 Ω
	Nominal Voltage	120 V – AC/DC	220 V – AC/DC	240 V – AC/DC
	Accuracy	5%		
Toggle Switch	Number	5 - connected in series with each resistor		
Load at Nominal Voltage	Power	60 to 1170 W	55 to 1045 W	60 to 1040 W
	Current	0.5 to 9.5 A	0.25 to 4.75 A	
	Number of Steps	19 of equal increment		
	Current Increment	0.5 A	0.25 A	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	6.3 kg (13.9 lb)		

Model 8510 – Inductive Load		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Inductors	Number	5		
	Reactance	240/120/60/60/30 Ω	880/440/220/220/110 Ω	960/480/240/240/120 Ω
	Nominal Voltage	120 V – 60 Hz	220 V – 50 Hz	240 V – 50 Hz
	Accuracy	5%		
Toggle Switch	Number	5 - connected in series with each resistor		
Load at Nominal Voltage	Reactive Power	60 to 1170 vars	55 to 1045 vars	60 to 1040 vars
	Current	0.5 to 9.5 A	0.25 to 4.75 A	
	Number of Steps	19 of equal increment		
	Current Increment	0.5 A	0.25 A	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	17.1 kg (37.6 lb)		
Model 8511 – Capacitive Load		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Capacitors	Number	5		
	Reactance	240/120/60/60/30 Ω	880/440/220/220/110 Ω	960/480/240/240/120 Ω
	Nominal Voltage	120 V – 60 Hz	220 V – 50 Hz	240 V – 50 Hz
	Accuracy	5%		
Toggle Switch	Number	5 - connected in series with each resistor		
Load at Nominal Voltage	Reactive Power	60 to 1170 vars	55 to 1045 vars	60 to 1040 vars
	Current	0.5 to 9.5 A	0.25 to 4.75 A	
	Number of Steps	19 of equal increment		
	Current Increment	0.5 A	0.25 A	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	7.0 kg (15.4 lb)		
Model 8512 – Single-Phase Transformer		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Capacity		480 VA		
Coil 1	Voltage	120 V – 60 Hz	220 V – 50 Hz	240 V – 50 Hz
	Current	4 A	2 A	
Coil 2	Voltage	208 V – 60 Hz	380 V – 50 Hz	415 V – 50 Hz
	Current	2.3 A	1.15 A	
	Taps	50 and 80%		
Coil 3	Voltage	120 V – 60 Hz	220 V – 50 Hz	240 V – 50 Hz
	Current	4 A	2 A	
	Tap	50%		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	13.4 kg (29.5 lb)		
Model 8513 – DC Voltmeter/Ammeter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Scales	Voltmeter	0 to 20/200 V – DC	0 to 40/400 V – DC	
	Center Ammeter	0 to 2 A – DC	0 to 1 A – DC	
	Right Ammeter	0 to 15/30 A – DC	0 to 10/15 A – DC	
Accuracy		2%		
Type of Movement		Arsonval		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	3.8 kg (8.4 lb)		

Model 8514 – AC Ammeter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Scales	Left and Right Ammeters	0 to 5/10/30 A – 60 Hz	0 to 0.25/5/15 A – 50 Hz	
	Center Ammeter	0 to 1/5/10/30 A – 60 Hz	0 to 0.5/2.5/5/15 A – 50 Hz	
Accuracy		2%		
Type of Movement		Moving vane and current transformer		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	4.7 kg (10.3 lb)		
Model 8515 – Three-Phase Wattmeter/Varmeter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Scales	Wattmeter	4000 to 0 to 4000 W		
	Varmeter	4000 to 0 to 4000 vars		
Maximum Voltage		250 V – 60 Hz	450 V – 50 Hz	
Maximum Current		15 A	8 A	
Power Input		24 V – 50/60 Hz		
Accuracy		1.5%		
Type of Movement		Arsonval with Electronic Transducer		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	5.3 kg (11.7 lb)		
Model 8517 – DC Breaker		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Voltage		120 V – DC	220 V – DC	240 V – DC
Current		50 A	30 A	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	3.9 kg (8.6 lb)		
Model 8518 – Synchronizing Module		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Indicator Lamps		10 W – 240 V	10 W – 380 V	10 W – 440 V
Breaker Switch		15 A – 240 V	10 A – 380 V	10 A – 440 V
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	3.9 kg (8.6 lb)		
Model 8519 – Manual DC Motor Starter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Power		Optimized for 2 kW motor		
Line Voltage		120 V – DC	220 V – DC	240 V – DC
Limiting Resistors		9/5/3/1/0 Ω	15/7.5/7.5/3.75/0 Ω	
Full Load Current		23 A	12 A	
Starting Current Breaker		7 A	3 A	
Field Current Breaker		1.5 A	0.8 A	
Number of Steps		5		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	5.6 kg (12.3 lb)		
Model 8520 – Synchronous Motor Starter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Power		Optimized for 2 kW motor		
Line Voltage		120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
Current Overload		6 to 10 A	4 to 6 A	
DC Output Voltage		120 V – DC	220 V – DC	240 V – DC
Field Current		1.25 A	0.7 A	

Model 8520 – Synchronous Motor Starter (cont'd)				
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	8.8 kg (19.4 lb)		
Model 8521 Three-Phase Full-Voltage Starter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Power		Optimized for 2 kW motor		
Line Voltage		120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
Current Overload		6 to 10 A	4 to 6 A	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	4.8 kg (10.6 lb)		
Model 8522 – Three-Phase Rheostat		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Variable Resistance (3)	Range	0 to 4 Ω	0 to 15 Ω	
	Power	145 W	135 W	
	Current	6 A	3 A	
Limit Switch (Interlock)		3 A – 480 V – AC		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 460 mm (6.1 x 11.3 x 18.1 in)		
	Net Weight	6 kg (13.2 lb)		
Model 8523 – Three-Phase Power-Factor Meter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Scale		0.5 (lag) to1 to 0.5 (lead)		
Maximum Voltage		250 V – 3 ~ – 60 Hz	450 V – 3 ~ – 50 Hz	
Current		15 A	8 A	
Accuracy		1.5%		
Type of Load		3 ~, balanced		
Type of Movement		Arsonval with electronic transducer		
Power Input		24 V – 50/60 Hz		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	5.5 kg (12.1 lb)		
Model 8524 – Field Rheostat		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Resistance	Range	0 to 200 Ω	0 to 600 Ω	
	Power	225 W	225 W	
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 460 mm (6.1 x 11.3 x 18.1 in)		
	Net Weight	4.8 kg (10.6 lb)		
Model 8525 – Power Supply		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Input	Line Voltage	120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
	Line Current	15 A	10 A	
	Service Installation	3-phase, 5-wire, wye-connected including neutral and ground		
Outputs	Fixed AC, 3 Phases	120/208 V – 15 A	220/380 V – 10 A	240/415 V – 10 A
	Fixed AC, 1 Phase	120 V – 15 A	220 V – 10 A	240 V – 10 A
	Variable AC, 3 Phases	0 to 120/208 V – 15 A	0 to 220/380 V – 7 A	0 to 240/415 V – 7 A
	Fixed DC	120 V – 5 A	220 V – 3 A	240 V – 3 A
	Variable DC	0 to 120 V – 25 A	0 to 220 V – 12 A	0 to 240 V – 12 A
Power Cord	Length	3 m (10 ft)		
	Connector	120/208 V – 15 A NEMA L21 - 20	277/480 V – 15 A, NEMA L22 - 20	

Model 8525 – Power Supply (cont'd)				
Physical Characteristics	Dimensions (H x W x D)	308 x 287 x 500 mm (12.1 x 11.3 x 19.7 in)		
	Net Weight	32.6 kg (71.9 lb)		
Model 8526 – Automatic DC Motor Starter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Power		2 kW		
Line Voltage		120 V – DC	220 V – DC	240 V – DC
Limiting Resistors		5/4/2 Ω	18.75/15/7.5 Ω	
Current Overload		16 to 24 A	10 to 16 A	
Field Current Breaker		1.5 A	0.8 A	
Physical Characteristics	Dimensions (H x W x D)	308 x 287 x 440 mm (12.1 x 11.3 x 17.3 in)		
	Net Weight	9.5 kg (20.9 lb)		
Model 8527 – Star (Wye)/Delta Starter		**120/208 V – 60 Hz**	**220/380 V – 50 Hz**	**240/415 V – 50 Hz**
Power		2 kW		
Line Voltage		120/208 V – 60 Hz	220/380 V – 50 Hz	240/415 V – 50 Hz
Current Overload		15 A	8.3 A	7.6 A
Wye (Star) Starting Time		20 s		
Physical Characteristics	Dimensions (H x W x D)	154 x 287 x 440 mm (6.1 x 11.3 x 17.3 in)		
	Net Weight	5.9 kg (13 lb)		
Model 8905 – Rotor Positioner				
Ranges/Precision	Coarse	0 to 360° (6.0° increments)		
	Fine	0 to 6° (0.5° increments)		
Zero Indicator		Adjustable		
Physical Characteristics	Dimensions (H x W x D)	385 x 160 x 155 mm (15.2 x 6.3 x 6.1 in)		
	Net Weight	5.0 kg (11.0 lb)		
Model 8906 – Phase-Shift Indicator				
Range		180 to 0 to 180° (electrical degrees for a 4-pole machine)		
Physical Characteristics	Dimensions (H x W x D)	408 x 150 x 25 mm (16.1 x 5.9 x 1.0 in)		
	Net Weight	1.5 kg (3.3 lb)		
Model 8930 – Speed Sensor / Tachometer				
Range		0 to 2500 r/min		
Direction of Rotation		Clockwise and counterclockwise		
Output Signal		1 V – DC / 1000 r/min		
Output Impedance		2000 Ω		
Physical Characteristics	Dimensions (H x W x D)	150 x 190 x 440 mm (5.9 x 7.5 x 17.3 in)		
	Net Weight	3.0 kg (6.6 lb)		
Model 8943 – Coupler				
Material		Rubber		
Physical Characteristics	Dimensions (H x W x D)	105 x 105 x 55 mm (4.1 x 4.1 x 2.2 in)		
	Net Weight	0.2 kg (0.4 lb)		

Model 8952 – Connection Leads		
Lead Characteristics	Cross Section	2.5 mm^2 (3875 mil^2)
	Strands per Lead	651
	Rated Current	32 A
	Rated Voltage	1000 V
	Contact Resistance	< 0.3 Ω
Number of 4-mm Leads	Yellow, 30 cm (12 in)	17
	Red, 60 cm (24 in)	15
	Blue, 90 cm (36 in)	8
Lead Holder		
Physical Characteristics	Dimensions (H x W x D)	90 x 315 x 80 mm (3.5 x 12.4 x 3.1 in)
	Net Weight	1.5 kg (3.3 lb)

ORDERING NUMBERS

120/208 V – 60 Hz			220/380 V – 50 Hz			240/415 V – 50 Hz
ENGLISH	FRENCH*	SPANISH	ENGLISH	FRENCH	SPANISH	ENGLISH
8013-10	8013-11	8013-12*	8013-15	8013-16	8013-17*	8013-1A*
8013-20	8013-21*	8013-22	8013-25	8013-26	8013-27*	8013-2A*
8013-30	8013-31*	8013-32	8013-35	8013-36	8013-37*	8013-3A*
8013-40	8013-41*	8013-42*	8013-45	8013-46	8013-47*	8013-4A*
8110-20	8110-20	8110-20	8110-20	8110-20	8110-20	8110-20
8134-20	8134-20	8134-20	8134-20	8134-20	8134-20	8134-20
8150-10	8150-10	8150-10	8150-10	8150-10	8150-10	8150-10
8160-00	8160-00	8160-00	8160-00	8160-00	8160-00	8160-00
8161-00	8161-00	8161-00	8161-00	8161-00	8161-00	8161-00
8426-00	8426-01	8426-02	8426-05	8426-06	8426-07	8426-0A
8501-00	8501-00	8501-00	8501-05	8501-05	8501-05	8501-0A
8502-00	8502-01	8502-02	8502-05	8502-06	8502-07	8502-0A
8503-00	8503-00	8503-00	8503-05	8503-05	8503-05	8503-0A
8504-00	8504-01	8504-02	8504-05	8504-06	8504-07	8504-0A
8505-00	8505-00	8505-00	8505-05	8505-05	8505-05	8505-0A
8506-00	8506-01	8506-02	8506-05	8506-06	8506-07	8506-0A
8507-00	8507-00	8507-00	8507-05	8507-05	8507-05	8507-0A
8508-00	8508-01	8508-02	8508-05	8508-06	8508-07	8508-0A
8509-00	8509-01	8509-02	8509-05	8509-06	8509-07	8509-0A
8510-00	8510-01	8510-02	8510-05	8510-06	8510-07	8510-0A
8511-00	8511-01	8511-02	8511-05	8511-06	8511-07	8511-0A
8512-00	8512-01	8512-02	8512-05	8512-06	8512-07	8512-0A
8513-00	8513-01	8513-02	8513-05	8513-06	8513-07	8513-05
8513-10	8513-11	8513-12	8513-15	8513-16	8513-17	8513-15
8514-00	8514-01	8514-02	8514-05	8514-06	8514-07	8514-0A
8515-20	8515-21	8515-22	8515-25	8515-26	8515-27	8515-2A
8517-00	8517-01	8517-02	8517-05	8517-06	8517-07	8517-0A
8518-00	8518-01	8518-02	8518-05	8518-06	8518-07	8518-0A
8519-00	8519-01	8519-02	8519-05	8519-06	8519-07	8519-05
8520-00	8520-01	8520-02	8520-05	8520-06	8520-07	8520-0A
8521-00	8521-01	8521-02	8521-05	8521-06	8521-07	8521-0A
8522-00	8522-01	8522-02	8522-05	8522-06	8522-07	8522-0A
8523-20	8523-21	8523-22	8523-25	8523-26	8523-27	8523-2A
8524-00	8524-01	8524-02	8524-05	8524-06	8524-07	8524-05
8525-20	8525-21	8525-22	8525-25	8525-26	8525-27	8525-2A
8526-00	8526-01	8526-02	8526-05	8526-06	8526-07	8526-05
8527-00	8527-01	8527-02	8527-05	8527-06	8527-07	8527-0A
8905-00	8905-00	8905-00	8905-00	8905-00	8905-00	8905-00
8906-00	8906-00	8906-00	8906-00	8906-00	8906-00	8906-00
8920-40	8920-40	8920-40	8920-40	8920-40	8920-40	8920-40
8930-00	8930-01	8930-02	8930-00	8930-01	8930-02	8930-00
8943-00	8943-00	8943-00	8943-00	8943-00	8943-00	8943-00
8946-00	8946-00	8946-00	8946-00	8946-00	8946-00	8946-00
8946-10	8946-10	8946-10	8946-10	8946-10	8946-10	8946-10
8952-00	8952-00	8952-00	8952-00	8952-00	8952-00	8952-00
26184-00	TBE[5]	26184-02	26184-05	26184-06	TBE	TBE
26185-00	TBE	26185-02	26185-05	26185-06	TBE	TBE
26186-00	TBE	TBE	26186-05	26186-06	TBE	TBE

Table 1. Equipment Ordering Numbers

* The manuals included with these systems do not correspond to the correct language or power line voltage.

[5] TBE = To be established

Reflecting Lab-Volt's commitment to high quality standards in product, design, development, production, installation, and service, our manufacturing and distribution facility has received the ISO 9001 certification.

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