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# BECKWITH BELECTRIC

# **Replacement Panel** M-2326

**Replaces Westinghouse Type SJS Transformer Control Panel** 



- Replaces Westinghouse Type SJS voltage regulating relay and thermal time delay relay
- Wiring harness quickly connects to existing terminal block
- Fully transient-protected
- Will operate properly over a temperature range from -40° to +80° C





M-0169A Auxiliary Current Transformer

Approximate Weight: 11 lbs (4.98 kg)Approximate Shipping Weight: 16 lbs (7.25 kg)Specification subject to change without notice.

#### **BECKWITH ELECTRIC**

6190 118th Avenue North • Largo, Florida 33773-3724 U.S.A. PHONE (727) 544-2326 beckwithelectricsupport@hubbell.com www.beckwithelectric.com ISO 9001:2015



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DANGEROUS VOLTAGES, capable of causing death or serious injury, are present on the external terminals and inside the equipment. Use extreme caution and follow all safety rules when handling, testing or adjusting the equipment. However, these internal voltage levels are no greater than the voltages applied to the external terminals.

## DANGER! HIGH VOLTAGE



This sign warns that the area is connected to a dangerous high voltage, and you must never touch it.

## PERSONNEL SAFETY PRECAUTIONS

The following general rules and other specific warnings throughout the manual must be followed during application, test or repair of this equipment. Failure to do so will violate standards for safety in the design, manufacture, and intended use of the product. Qualified personnel should be the only ones who operate and maintain this equipment. Beckwith Electric assumes no liability for the customer's failure to comply with these requirements.



This sign means that you should refer to the corresponding section of the operation manual for important information before proceeding.

## Always Ground the Equipment

To avoid possible shock hazard, the chassis must be connected to an electrical ground. When servicing equipment in a test area, the Protective Earth Terminal must be attached to a separate ground securely by use of a tool, since it is not grounded by external connectors.

#### Do NOT operate in an explosive environment

Do not operate this equipment in the presence of flammable or explosive gases or fumes. To do so would risk a possible fire or explosion.

#### Keep away from live circuits

Operating personnel must not remove the cover or expose the printed circuit board while power is applied. In no case may components be replaced with power applied. In some instances, dangerous voltages may exist even when power is disconnected. To avoid electrical shock, always disconnect power and discharge circuits before working on the unit.

## Exercise care during installation, operation, & maintenance procedures

The equipment described in this manual contains voltages high enough to cause serious injury or death. Only qualified personnel should install, operate, test, and maintain this equipment. Be sure that all personnel safety procedures are carefully followed. Exercise due care when operating or servicing alone.

#### Do not modify equipment

Do not perform any unauthorized modifications on this instrument. Return of the unit to a Beckwith Electric repair facility is preferred. If authorized modifications are to be attempted, be sure to follow replacement procedures carefully to assure that safety features are maintained.

## **PRODUCT CAUTIONS**

Before attempting any test, calibration, or maintenance procedure, personnel must be completely familiar with the particular circuitry of this unit, and have an adequate understanding of field effect devices. If a component is found to be defective, always follow replacement procedures carefully to that assure safety features are maintained. Always replace components with those of equal or better quality as shown in the Parts List of the Instruction Book.

#### **Avoid static charge**

This unit contains MOS circuitry, which can be damaged by improper test or rework procedures. Care should be taken to avoid static charge on work surfaces and service personnel.

#### Use caution when measuring resistances

Any attempt to measure resistances between points on the printed circuit board, unless otherwise noted in the Instruction Book, is likely to cause damage to the unit.

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In our efforts to provide accurate and informative technical literature, suggestions to improve the clarity or to correct errors will receive immediate attention. Please contact the Marketing Services Department, specifying the publication and page number.

### INTRODUCTION

The M-2326 Replacement Panel is a modern, solid-state replacement for the Westinghouse Type SJS Transformer Control Panel and replaces the Voltage Regulating Relay and Thermal Time Delay Relay. The control consists of a Beckwith Electric M-2001 Digital Tapchanger Control, an M-0169 Auxiliary Current Transformer and two auxiliary relays, all mounted in a panel. Once the SJS Voltage Regulating relay and Time Delay Relay have been removed from the Westinghouse panel, the M-2326 Replacement Panel mounts in the existing cutouts after they have been lengthened. A wiring harness allows for easy connection to the existing terminal block.

An Auxiliary Current Transformer is installed on the rear of the replacement panel to provide the appropriate load current input for the tapchanger control.

A pair of auxiliary relays with interposing contacts are also mounted on the rear of the replacement panel to energize the motor control relays located at the existing control panel.

## **INSTALLATION**



1. Front panel of the Westinghouse SJS Voltage Regulating Relay.



2. Disconnect the connector and shorting plugs from the SJS relay. Remove the wiring harness from the Time Delay Relay.

3. Mark the wires to the male end of the 4-position shorting plug, then clip it from the SJS relay. Mount the shorting plug to the flange on the M-0326 using the existing four screws. Solder the shorting plug to the matching marked wires in the M-0326 harness.





4. Clip off the Time Delay Relay wiring harness lugs and securely wrap the ends with electrical tape.



5. Remove the mounting bolts that hold the SJS relay to the panel, and remove the relay. Save the bolts to use in Step 10.



6. Remove the screws and washers holding the Time Delay Relay to the panel. Save the hardware to use in Step 10.



7. Remove the Time Delay Relay from the panel.

8. Use a hacksaw to remove the metal between the two existing cutouts in the panel.



9. The Westinghouse panel should look like the photo when the metal work has been completed.

10. Mount the M-2326 into the panel by screwing the four mounting bolts into the existing nuts welded to the rear of the panel. Use the two screws to complete the mounting, securing them with the washers and nuts.







- 11. Attach the female end of the 4-position shorting plug to the male end that is mounted on the M-2326 flange. Using a cable tie, secure the 8-position shorting plug to the wiring harness.
- 12. Attach the M-2326 wiring harness to the existing terminal block. The M-2326 cable harness has wire markers that match the numbers on the terminal block.

## **TEST PROCEDURE**

#### **EQUIPMENT REQUIRED**

- 1. Regulated 60 Hz source with variable amplitude from 60 V to 140 V rms.
- 2. A 5 A, 60 Hz current source with a phase angle setting of  $0^{\circ}$  and  $+90^{\circ}$ .
- 3. A fixed 60 Hz, 120 Vac source as motor supply.
- 4. High impedance, true rms digital voltmeter with accuracy on ac of at least ±0.1% of reading.
- 5. An ammeter for the current test.

#### TEST PROCEDURE FOR TESTING THE M-0326 BEFORE BEING INSTALLED IN THE CONTROL PANEL

Refer to Figure 1 for Test Setup and Schematic X-2326.

- 1. For the sensing input, apply a variable 120 V rms voltage source to A (Hot) and B (Neutral) of the wires reserved for the 4-pin receptacle.
- 2. Connect a current source to C (Polarity) and D (Return). Set the current level to 0 A.
- 3. Connect a voltmeter to the meter out terminals to monitor the P.T. voltage level.
- 4. Connect a fixed 120 Vac source to wire #E10 (Neutral) and wire #E22 for motor power and return.
- 5. Jumper E22 to E23.
- 6. With 0 A current, set the M-2001 **VOLTAGE CENTER OF BAND** to 120 V and the **TOTAL BANDWIDTH** to 2 V.
- 7. Set the **R** and **X LINE DROP COMPENSATOR** to 0, and the **TIME** to 0.
- 8. Adjust the sensing input to 118 V, and verify that the Raise relay "AR" is energized and the **RAISE** light comes on.
- 9. Return the sensing input to 120 V, and verify that the "AR" relay drops out and the RAISE light turns off.
- 10. Adjust the sensing input to 122 V, and verify that the Lower Relay "AL" is energized and the **LOWER** light comes on.
- 11. Return the sensing input to 120 V, and verify that the "AL" relay drops out and the LOWER light turns off.
- 12. Adjust the sensing input to 120 V ac.
- 13. Set the **R LINE DROP COMPENSATOR** to 24 V and the **X LINE DROP COMPENSATOR** to 0.
- 14. Adjust the current input to 2.5 A and the phase angle to 0°.
- 15. Verify that the Raise relay "AR" is energized and the bandcenter now is 132 V ±2 V (bandcenter increases 12 V).
- 16. Return the current input to 0 A and verify that the "AR" relay drops out and bandcenter returns to 120 V.



Figure 1 Test Setup

## PARTS LIST

#### M-2326 Regulator Control

This list includes all electrical and mechanical parts which could conceivably either require replacement or be lost. The COMPONENT DESIGNATION is the same as that appearing on schematics or referred to in Instruction Books.

The BECO NUMBER refers to an index maintained by the company. This lists the currently available device which may be substituted even though the device originally supplied is obsolete and no longer available. Parts marked by an asterisk\* are not available from other sources. Either the original component or a current substitute will be carried in stock by Beckwith Electric.

Parts not marked with an asterisk are normally available from an electronics components house. Those parts or a current substitute will normally be available from Beckwith Electric stock.

In either case, when parts are ordered from Beckwith Electric, we will be responsible for supplying the current replacement in the shortest possible time.

Sufficient detailed description is also given to permit purchasing from an electronics parts house, providing the part is of equal or better quality to insure reliable operation. This may require some interpretation of specifications which may be avoided by direct purchase from Beckwith Electric using the BECO NUMBER.

Note that in a few instances, components are selected in final test. Procedures described in the **TEST PROCEDURES** Section must be followed in replacing these components.

All resistors are 1/2 W unless noted.

COMPONENT DESIGNATION	BECO NUMBER	DESCRIPTION
	M-2001	Digital Tapchanger Control
	M-0169A	Current Transformer
	441–40598	P-1520, Replacement Panel
	430–00114	Octal Plug Socket, Potter & Brumfield 27E122
AL,AR	430–00155	Relay, DPDT, 120 V, Struthers Dunn A314xBx48P

REVA

# Legal Information

## Patent

The units described in this manual are covered by U.S. Patents, with other patents pending.

Buyer shall hold harmless and indemnify the Seller, its directors, officers, agents, and employees from any and all costs and expense, damage or loss, resulting from any alleged infringement of United States Letters Patent or rights accruing therefrom or trademarks, whether federal, state, or common law, arising from the Seller's compliance with Buyer's designs, specifications, or instructions.

## Warranty

Seller hereby warrants that the goods which are the subject matter of this contract will be manufactured in a good workmanlike manner and all materials used herein will be new and reasonably suitable for the equipment. Seller warrants that if, during a period of five years from date of shipment of the equipment, the equipment rendered shall be found by the Buyer to be faulty or shall fail to perform in accordance with Seller's specifications of the product, Seller shall at his expense correct the same, provided, however, that Buyers shall ship the equipment prepaid to Seller's facility. The Seller's responsibility hereunder shall be limited to replacement value of the equipment furnished under this contract.

Seller makes no warranties expressed or implied other than those set out above. Seller specifically excludes the implied warranties of merchantability and fitness for a particular purpose. There are no warranties which extend beyond the description contained herein. In no event shall Seller be liable for consequential, exemplary, or punitive damages of whatever nature.

Any equipment returned for repair must be sent with transportation charges prepaid. The equipment must remain the property of the Buyer. The aforementioned warranties are void if the value of the unit is invoiced to the Seller at the time of return.

## Indemnification

The Seller shall not be liable for any property damages whatsoever or for any loss or damage arising out of, connected with, or resulting from this contract, or from the performance or breach thereof, or from all services covered by or furnished under this contract.

In no event shall the Seller be liable for special, incidental, exemplary, or consequential damages, including but not limited to, loss of profits or revenue, loss of use of the equipment or any associated equipment, cost of capital, cost of purchased power, cost of substitute equipment, facilities or services, downtime costs, or claims or damages of customers or employees of the Buyer for such damages, regardless of whether said claim or damages is based on contract, warranty, tort including negligence, or otherwise.

Under no circumstances shall the Seller be liable for any personal injury whatsoever.

It is agreed that when the equipment furnished hereunder are to be used or performed in connection with any nuclear installation, facility, or activity, Seller shall have no liability for any nuclear damage, personal injury, property damage, or nuclear contamination to any property located at or near the site of the nuclear facility. Buyer agrees to indemnify and hold harmless the Seller against any and all liability associated therewith whatsoever whether based on contract, tort, or otherwise. Nuclear installation or facility means any nuclear reactor and includes the site on which any of the foregoing is located, all operations conducted on such site, and all premises used for such operations.

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6190 118th Avenue North • Largo, Florida 33773-3724 U.S.A. PHONE (727) 544-2326 beckwithelectricsupport@hubbell.com www.beckwithelectric.com ISO 9001:2015