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Model 330-5 DC Relay Slide Instruction Manual Revised 12-31-12 PR

- **COMPACT**
- **EASY-TO-USE**
- **SIMULTANEOUS READOUT VOLTAGE AND CURRENT**
- **RUGGED WILL OPERATE INTO A DEAD SHORT**
- **CHARGE BUTTON ALLOWS SATURATION OF RELAY COIL**
- **POWER SOURCE OPTIONS – LOCAL, PACK BATTERY, OR USE OF 120VAC ADAPTER.**

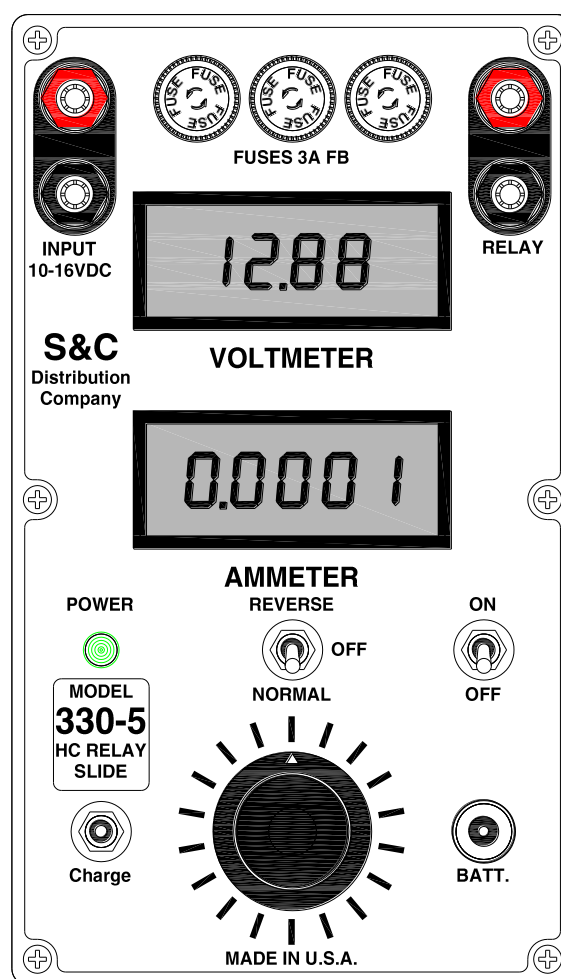


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CHAPTER 1

GENERAL

S&C Distribution Company's solid state, Model 330-5 DC Relay Slide is the smallest comprehensive unit on the market. Compact and easy to handle, simultaneous voltage and current readings can be taken with this tester. Also includes polarity reversing switch and external power-on indicator LED. New in the 330-5 is the ability to saturate relay coils with the "Charge" button which puts maximum current through the coil.

The unit comes in a padded, zippered case with relay leads(8 ft. long) and battery leads (5 ft. long) in the lead pouch attached.

Optionally a 1.2AH gel cell will fit in the padded case allowing very portable use of the slide (330-28).

Optional equipment includes three different battery options with associated charger, AC to DC power supply; plug-in relay adapter for use with GRS and Safetran plug-in relays; Searchlight Signal Tip/Rock Battery Adapter; and Shoulder Harness.

An effort has been made to correlate these instructions to Federal Railroad Administration (FRA) requirements for such testing. However, keep in mind that many railroads have specific instructions for testing relays and FRA requirements change from time to time.

CALIBRATION CERTIFICATION

S&C Distribution Company hereby certifies that this product was calibrated with instruments meeting United States National Institute of Standards and Technology (NIST) standards. Further, the manufacturing procedures employed are designed and controlled to assure that the Slide will meet it's published specifications. S&C Distribution Company further certifies that, annually, our instruments are calibrated to NIST standards. This document is not a certificate of calibration or traceability. To have your Slide formally calibrated and sealed, and thus obtain a certificate of calibration and traceability, contact S&C Distribution company (1-708-444-4908) for a Return Goods Authorization. A nominal fee is charged for this service.

CHAPTER 1, CONTINUED

LIMITED AND EXCLUSIVE WARRANTY

THIS LIMITED AND EXCLUSIVE WARRANTY IS GIVEN TO THE PURCHASER BY S & C DISTRIBUTION COMPANY AND IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN IN CONNECTION WITH THE MODEL 330-5 RELAY SLIDE. ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED ARE EXCLUDED TO THE FULL EXTENT PROVIDED BY LAW.

S&C Distribution Company hereby warrants the Model 330-5 Relay Slide, exclusive of batteries, to be free from defects in material and workmanship for a period of one year following the date of shipment. Any manufacturing defects arising during this warranty period shall be corrected at the Manufacturer's expense (except inbound shipping and handling charges).

1. To obtain warranty services, a claim by the purchaser in writing must be made to S&C Distribution Company at the address shown on the front of this Instruction Manual. Such claim must be accompanied by the S & C Distribution Company sales order number, or other proof of purchase.
2. This Limited and Exclusive Warranty only covers repairs of Manufacturer's defects and requires that in-bound freight charges be prepaid.
3. S & C Distribution Company shall not be responsible for any injury to persons or damage to property or any of its contents or for any other consequential damages or losses whether arising out of breach of contract, breach of warranty, or otherwise. Some states do not allow this exclusion or limitation of incidental or consequential damage so this limitation or exclusion may not apply to you.
4. This Limited and Exclusive Warranty may give you specific legal rights according to the law of your state.
5. The Warranty contained in this Agreement shall not apply to any Model 330-5 Relay Slide which shall have been repaired or altered outside of the Manufacturer's facilities or tampered with in any way, or in the Manufacturer's sole judgment has been subject to misuse, negligence or accident not attributable to the Manufacturer.
6. This Warranty is issued to the original purchaser only and is non-transferable.
7. This Warranty replaces and supersedes any and all previous issued warranties.

CHAPTER 2

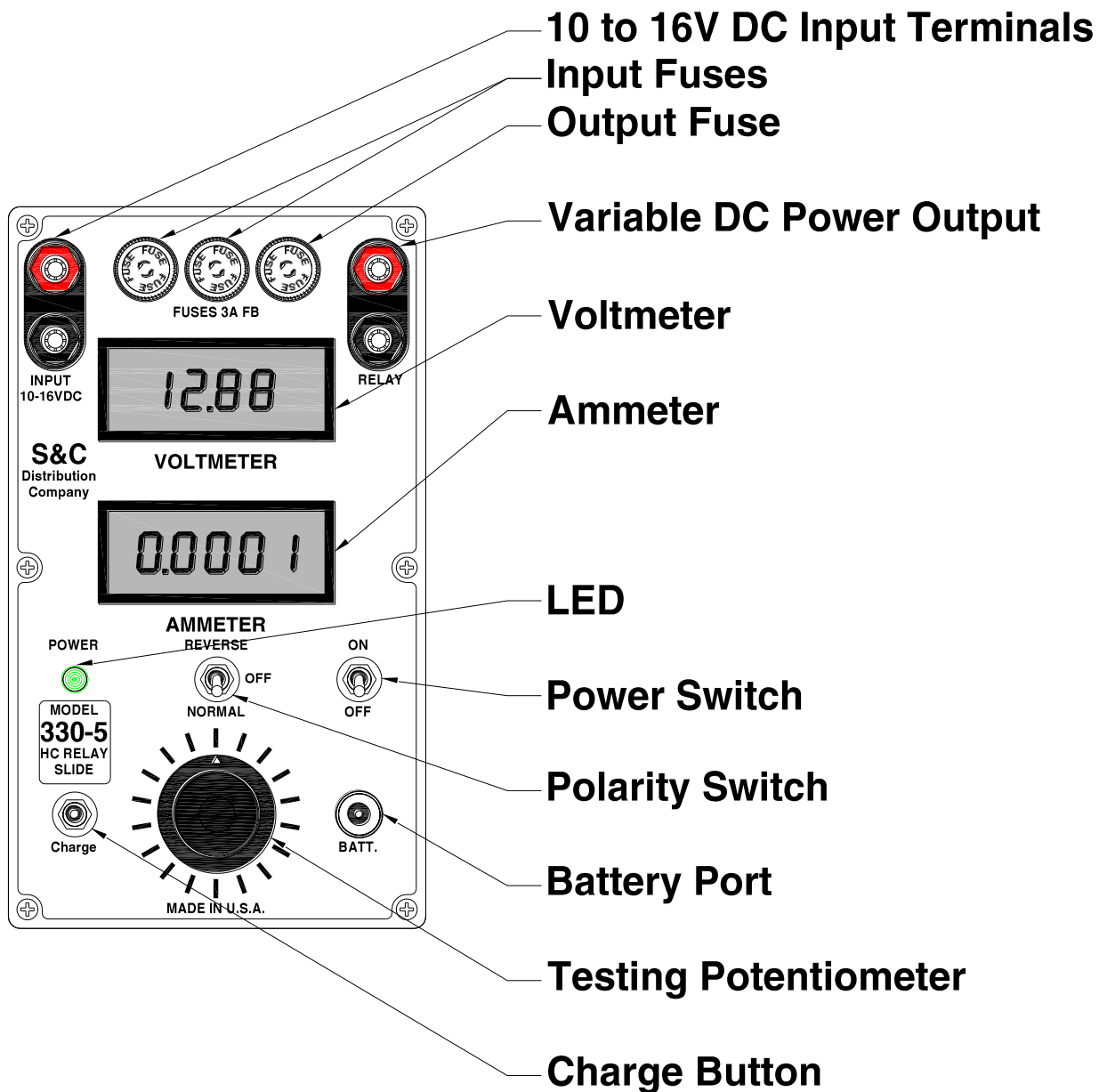
Specifications

1. Input Voltage: 10 to 16 Volts DC.
2. Output Voltage: Varied with the Slide from 0.6V to 8V less than the input voltage depending on coil resistance. For instance a 500 Ohm coil might have .6V less than the input voltage, where a 1 ohm coil might have 8 Volts less because of the internal ballast resistor.
3. Output Current: Unit will measure up to 1.9999ADC into the coil.
4. Sensitivity: Voltmeter: Reads down to .01 Volts DC
Ammeter: Reads down to .0001 Amps DC
5. Input Impedance: Voltmeter: 10 Megohms
6. Ranges: Voltmeter: 0 to 19.99 VDC with 3.5 digit display.
Ammeter: 0A to 1.9999ADC with 4.5 digit display.
7. Accuracy: $\pm 0.5\%$ of full scale, both meters.
8. External Power Indicator: LED (See Chapter 3, Section G for performance details)
9. Testing Potentiometer: Standard 10 turn, optional 3 turn is available. (Choice of Option will have been made at the time of purchase.)
10. Over Current and Reverse Polarity Protection: Three 3A Fast Acting Fuses.
11. Temperature: 15 °F to 158 °F.
12. Dimensions: 8.75 In. H X 4.6 in. W X 3 In. D.
13. Weight: 3.5 Pounds including internal battery (330-28), case, and two sets of leads.

CHAPTER 3

Functions

(See following page for descriptions)



CHAPTER 3, CONTINUED

Functions:

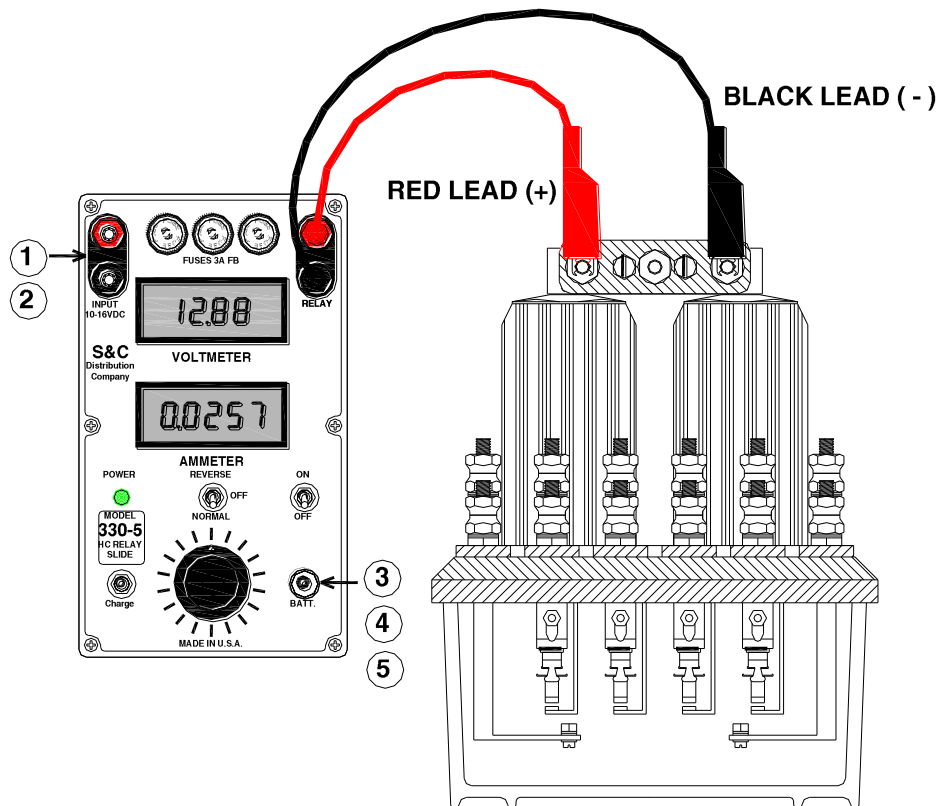
Refer to the drawing of the Slide on Page 6

- A. "10 to 16 VDC Input Terminals" – Input for providing testing power from local battery in the signal case or house. **MUST BE 10-16VDC**. Use the 5 ft. leads with the claw type clips. May also be used to connect 1.3AH Gel Cell in the soft case (Kit PN330-28). **DO NOT CONNECT CASE AND GELL CELL AT THE SAME TIME.**
- B. "Input Fuses" – Over-Current and Reverse Polarity Protection Fuses 3.0A, 3AG, Fast Acting. One in each leg of the external power input circuit.
- C. "Output Fuse" – 3.0 A fast acting fuse in the + output line for surge protection. If this fuse is blown, there will be no current delivered to the device under test, and no reading will be present on the "Voltmeter".
- D. "Variable DC Power Output" – (Marked "Relay" on Label) for testing signal devices. Use the 8 ft. leads with alligator-type clips.
- E. "Voltmeter" – 3.5 Digit Voltmeter: Provides voltage readings. In addition to it's use as an indicator in a test of a signal device, the 330-5 voltmeter can be used as a stand-alone voltmeter. See Instructions (Page 23) later in this manual for details of this application.
- F. "Ammeter" – 4.5 Digit Ammeter: measures the current provided by the slide to the "Relay Output"
- G. "LED" – signifies that power is present and that the internal +5V in the slide is present. If an "input fuse" is blown, the LED will not light.
- H. "Power Switch" — Controls external power being fed into the Slide from any source. Slide must be powered to provide LCD Voltmeter operation.
- I. "Polarity Switch" – "Normal", "Off", and "Reverse" Polarity Switch: For testing "Normal" and "Reverse" polarity characteristics of signal mechanisms and relays. "Off" position allows Slide user to momentarily remove all voltage and current from the device under test.
- J. "Battery Port" – allows charging of portable battery attached to the "Input Voltage" terminals, or use of a power adapter to slide relays.
- K. "Testing Potentiometer" – Electronically varies voltage and current to the relay or other signal device under test.
- L. "Charge Button" – used to provide maximum current to the relay coil for coil saturation.

CHAPTER 3, CONTINUED

Functions:

Typical hookup of 330-5 DC Relay Slide



Note: Remove at least one (Positive) power wire from relay. To preclude accidental reverse voltage surges is recommended that both power wires be removed from the relay.

Power input options

1. 10-16 VDC from case battery or hook up
2. 1.2AH Gel Cell in soft case (Kit PN330-28).
3. 330-10 Battery Pack.
4. 330-11 110VAC - 12VDC Power Supply.
5. 324-40 Charger for 330-28 (Kit)

CHAPTER 4

SET-UP AND USE

A. SAFETY. The following safety considerations must be kept in mind when conducting signal device tests.

1. Know where any trains are and how your tests will affect their operation or the safety of the public.
2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.

NOTE: The Model 330-5 DC Relay Slide should not be used to test the operating characteristics of relays that are powered by AC voltages. This cautionary note applies to power-off and power transfer relays as well as to other specialized AC-powered, signal relays. A separate Slide (PN: 331-1) is available for such purposes that permits the testing of either AC or DC Relays. Please consult the factory for details. Slides manufactured by S&C Distribution Company cannot be used to test DC Switch overload relays and semaphore signal mechanisms.

B. IMPORTANT INFORMATION concerning unique operating characteristics of the Model 330-5 DC Relay Slide.

1. Due to the type of components used, a very low reading (static charge) may show on either or both LCD meters. These readings should be ignored and will not influence the accuracy of the slide.
2. Due to the sensitivity of the testing pot, when first using the Slide it may be necessary to turn the pot slowly until you become accustomed to how it operates.
3. Observe the contacts or armature of the relay or signal under test. Stop turning the Testing Potentiometer as soon as the change you are looking for occurs. Wait 1-2 seconds for the meter readings to stabilize before recording them.

CHAPTER 4, CONTINUED

SET-UP AND USE

C. Hook-Up For Testing Signal Devices:

1. Connect Slide to power source. Use one of the following four options:
 - i. Case or house battery. Use leads (5 ft., with claw type clips) provided, insuring that the proper polarity is observed. Battery voltage should not exceed 16 VDC.
 - ii. Battery Pack. Use accordion-corded connector and plug into "BATT" port on face of Slide.
 - iii. AC to DC Power Supply. Connect to case or house commercial power and plug into "Batt" port on face of Slide.
 - iv. 1.2AH Gel Cell in soft case (Kit PN330-28): Fused wire from Positive lead of battery is hooked to the Red 10-16 V DC input terminal. Wire from negative lead of battery is hooked to Black 10-16 V DC input terminal. (Battery can then be recharged through the "BATT" port using the 324-40 Charger.
2. Unless otherwise instructed in the Test Procedure you are using, connect the Red Relay Test Lead to the positive control terminal of the relay or signal you are testing, and the Black Relay Test Lead to the negative control terminal. **Make absolutely certain that at least the positive lead of the power feed to the relay or signal coil under test is removed. Otherwise, damage will result to the Slide.**

PROPER INSPECTION

Any test of railroad signal devices should include careful visual inspection of the device, along with the electrical tests. Issues to be considered during visual inspection include:

- A. With searchlight signals, if movement of the vane shows any sign of friction or does not move smoothly when energy is increased or decreased, the signal mechanism should be removed from service immediately and repaired.
- B. With relays, visual inspection should include:
 1. During drop-away tests, observe the movement of the armature away from it's stop pin. The armature should move slowly. A sudden movement may indicate that something sticky is affecting armature performance.
 2. Verification that all contact openings are adequate and that all fixed and moving parts have sufficient clearance.

CHAPTER 4, CONTINUED

SIX MONTH TEST OF SEARCHLIGHT SIGNAL MECHANISMS

A. SAFETY. The following safety considerations must be kept in mind when conducting signal device tests.

1. Know where any trains are and how your tests will affect their operation or the safety of the public.
2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.

B. Purpose. Test to determine that a searchlight signal mechanism operates smoothly, without sticking in any position.

Note: During any of the below listed tests, if movement of the vane shows any sign of friction or does not move smoothly when energy is increased or decreased, the signal mechanism should be removed from service and repaired.

C. Procedure For Six Month Test of Searchlight Signal Mechanisms:

1. Disconnect either control wire or plug coupler.
2. Using the 330-5 Slide with the Plug-in Battery Pack, or 1.2AH Gel Cell in the Soft Case (Kit PN330-28), energize the coils of the mechanism with full operating voltage. Complete the test as follows:
 - i. Energize the mechanism center to right by rotating the Slide Testing Potentiometer clockwise, with the "Polarity Switch" in "NORMAL" position, until the operating current level is reached.
 - ii. De-energize the mechanism (by switching the "Polarity Switch" to "OFF"). When mechanism is de-energized, **make sure** the mechanism returns to the center (red) position smoothly and without any delay.
 - iii. Energize the mechanism center to left by rotating the Slide Testing Potentiometer clockwise, with the "Polarity Switch" in "REVERSE" position, until the operating current level is reached.
 - iv. De-energize the mechanism (by switching the "Polarity Switch" to "OFF"). When mechanism is de-energized, **make sure** the mechanism returns to the center (red) position smoothly and without any delay.

D. Replace any disconnected wiring or plug couplers.

CHAPTER 4, CONTINUED

TWO YEAR TEST OF H-2, H-5, AND SA SEARCHLIGHT SIGNAL MECHANISMS

A. SAFETY. The following safety considerations must be kept in mind when conducting signal device tests.

1. Know where any trains are and how your tests will affect their operation or the safety of the public.
2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.

B. Purpose. Insure that signal mechanism operating characteristics are within tolerance. Consult labels on the signal mechanisms or manufacturer's publications for these values.

Note: During any of the below listed tests, if movement of the vane shows any sign of friction or does not move smoothly when energy is increased or decreased, the signal mechanism should be removed from service and repaired.

C. Procedure For Two Year Test of H-2, H-5, and SA Searchlight Signal Mechanisms:

1. Disconnect either control wire or plug coupler. Remove the mechanism reflector to view the spectacles.
2. Using the 330-5 Slide with the plug in battery, or the 1.2AH gel cell in the soft case (Kit PN330-28), complete the tests as follows:
 - i. Proper motion tests:
 - a. With normal operating voltage (Polarity Switch "NORMAL"), turn the testing potentiometer clockwise until the mechanism is energized to full stroke (center to right) then de-energize (by switching Polarity Switch to "OFF"). When mechanism is de-energized, **make sure** the mechanism returns to the center (red) position smoothly and without any delay, and does not over travel to show reverse position color.
 - b. With reverse operating voltage (Polarity Switch "REVERSE"), turn the testing potentiometer clockwise until the mechanism is energized to full stroke (center to left) then de-energize (by switching Polarity Switch to "OFF"). When mechanism is de-energized, **make sure** the mechanism returns to the center (red) position smoothly and without any delay, and does not over travel to show reverse position color.

CHAPTER 4, CONTINUED

TWO YEAR TEST OF H-2, H-5, AND SA SEARCHLIGHT SIGNAL MECHANISMS **CONTINUED**

- ii. To determine pick-up and drop-away values, conduct tests as follows:
 - a. Attach the red lead of the 330-5 Slide to the negative post of the signal mechanism and the black lead to the positive post. With the polarity switch in the "NORMAL" position, by turning the Testing Potentiometer clockwise, apply the full output power of the Slide for center to right movement.
 - b. Slowly turn the Testing Potentiometer counterclockwise, reducing the energy until the moveable contact is made with the fixed back contact. Voltage and current values indicated on the 330-5 Slide meters are the drop away values. They must be within manufacturers specifications. Record voltage and current readings. Observe that the red spectacle is partially displayed.
 - c. Continue turning the Testing Potentiometer counterclockwise until voltage and current to the signal mechanism is zero. The red spectacle must now be fully displayed.
 - d. Open the circuit for one second by moving the power switch to "OFF", then returning it to "ON".
 - e. Slowly rotate the Testing Potentiometer clockwise until the movable contact is made with the front contact. Voltage and current values indicated on the 330-5 slide are the pick-up values. They must be within manufacturer's specifications. Record voltage and current readings. At least half of the spectacle must be displayed and rotating with the correct polarity.
 - f. Continue turning the Testing Potentiometer clockwise until the full aspect (yellow or green) spectacle is observed. Voltage and current values indicated on the 330-5 meter are the working values. They must be within manufacturer's specifications and should be recorded.
 - g. Set the Polarity Switch to the "OFF" position and observe the signal mechanism rock back to the center position.
 - h. Set the Polarity Switch to "REVERSE" and repeat steps "a" through "g" above, for the center to left test.
- 3. Replace any disconnected wiring or plug couplers and the mechanism reflector.

CHAPTER 4, CONTINUED

TWO YEAR TEST OF SC SEARCHLIGHT SIGNAL MECHANISMS

A. SAFETY. The following safety considerations must be kept in mind when conducting signal device tests.

1. Know where any trains are and how your tests will affect their operation or the safety of the public.
2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.

B. Purpose. Insure that signal mechanism operating characteristics are within tolerance. Consult labels on the signal mechanisms or manufacturer's publications for these values.

Note: During any of the below listed tests, if movement of the vane shows any sign of friction or does not move smoothly when energy is increased or decreased, the signal mechanism should be removed from service and repaired.

C. Procedure For Two Year Test of SC Searchlight Signal Mechanisms:

1. Disconnect either control wire or plug coupler. Remove the mechanism reflector.
2. Using the 330-5 Slide with the plug in battery, or the 1.2AH gel cell in the soft case (Kit PN330-28), complete the tests as follows:
 - i. Normal Polarity Test:
 - a. With the 330-5 Slide Polarity Switch in the "NORMAL" position, rotate the Testing Potentiometer clockwise until the mechanism is energized at three times the working value stated on the tag. The vane must move full-stroke in a clockwise direction displaying the spectacle farthest to the left.
 - b. Slowly rotate the Testing Potentiometer in a counterclockwise direction, decreasing the current and observing the value at which the left armature drops out and the contacts open. Record the values shown on the 330-5 meters. These are the drop-away values and they must be within manufacturer's tolerances.
 - c. Move the polarity switch to the "OFF" position for one second.
 - d. Move the polarity switch back to the "NORMAL" position.

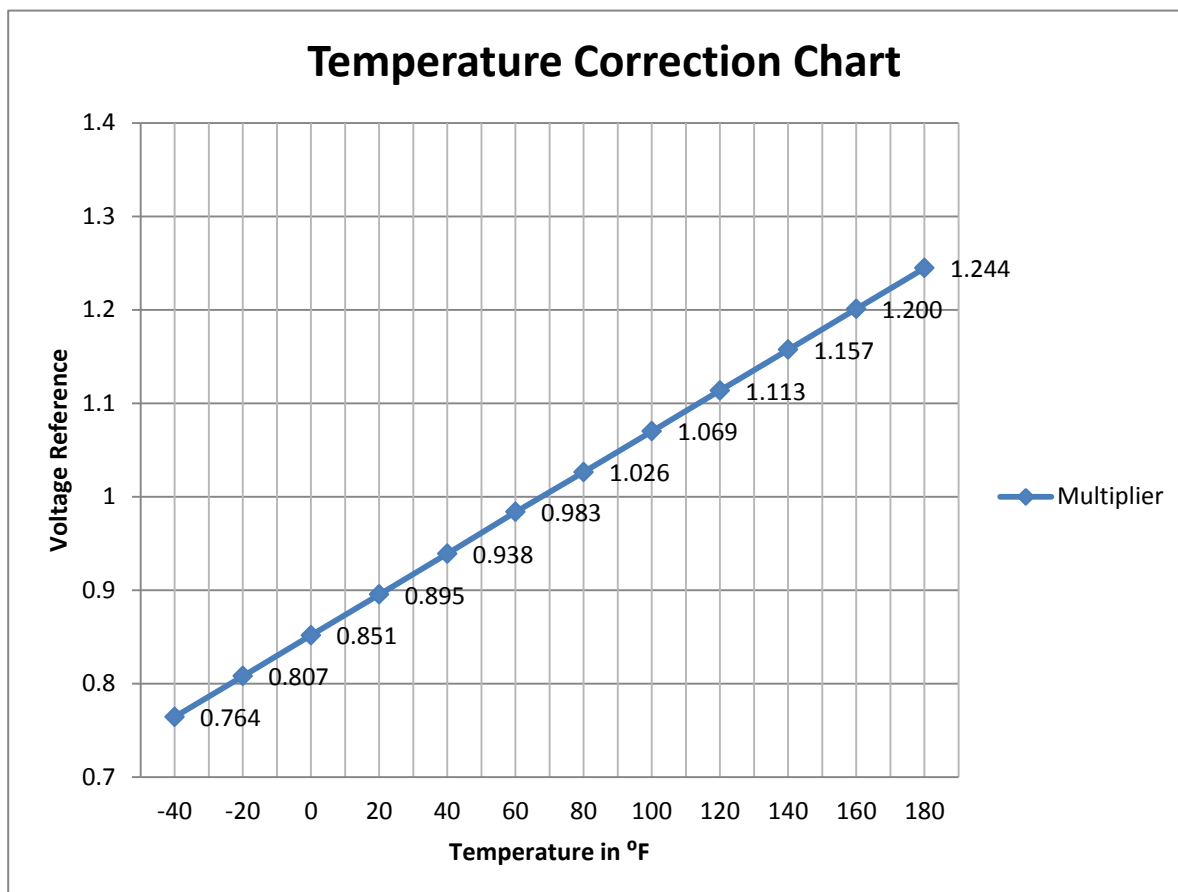
CHAPTER 4, CONTINUED

TWO YEAR TEST OF SC SEARCHLIGHT SIGNAL MECHANISMS, CONTINUED

- e. Slowly rotate the Testing Potentiometer clockwise, increasing the current until the left contacts close, and the left armature picks up. Record the values shown on the 330-5 meters. These are the normal pick-up and working values and they must be within manufacturer's tolerances.
- ii. Reverse Polarity Test:
 - a. With the 330-5 Slide Polarity Switch in the "REVERSE" position, rotate the Testing Potentiometer clockwise until the mechanism is energized at three times the working value stated on the tag. The vane must move full-stroke in a clockwise direction displaying the appropriate spectacle.
 - b. Slowly rotate the Testing Potentiometer in a counterclockwise direction, decreasing the current and observing the values at which the right armature drops out and the contacts open. Record the values shown on the 330-5 meters. These are the reverse drop-away values and they must be within the manufacturer's tolerances.
 - c. Move the Polarity Switch to the "OFF" position for one second.
 - d. Move the Polarity Switch back to the "REVERSE" position.
 - e. Slowly rotate the Testing Potentiometer in a clockwise direction, increasing the current until the right contacts close and the right armature picks up. Record the values shown on the 330-5 Slide meters. These are the reverse pick up and working values and they must be within manufacturer's tolerances.
- 3. Replace any disconnected wiring or plug couplers and the mechanism reflector.

CHAPTER 4, CONTINUED

TEMPERATURE CORRECTION



1. Relays are marked with operating voltages at 68 degrees Fahrenheit when they are initially tested. Field readings must be corrected for existing coil temperature using this graph.
2. For example: if the coil temperature was 120 degrees Fahrenheit and the actual slide value was 5V, the corrected voltage to be compared to the manufacturer's specification would be 1.113×5 volts, which would be 5.58 Volts.

CHAPTER 4, CONTINUED

FOUR YEAR TEST OF DC NEUTRAL RELAYS

- A. SAFETY.** The following safety considerations must be kept in mind when conducting signal device tests.
1. Know where any trains are and how your tests will affect their operation or the safety of the public.
 2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
 3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.
- B. Purpose.** Insure that DC Neutral Relay operating characteristics are within manufacturer's tolerance.
- C. Procedure for Four Year Test of DC Neutral Relays:**
1. Preliminary Measures.
 - i. All circuit wires must be removed from the positive control terminal of the relay before testing it.
 - ii. Plug-in relays must be unplugged before testing, or if a test nut can remove all the positive control voltages, loosen the test nut.
 - iii. If a relay is tested using voltage as the performance criteria, values obtained should be adjusted for temperature. Manufacturer's values are based on a relay coil temperature of 68 degrees F. See accompanying chart (Pg. 16) for temperature correction factor. Temperature corrections are not required if current is used as the performance criteria.
 2. Using the Model 330-5 DC Relay Slide, complete tests as follows:
 - i. With the Polarity Switch in the "NORMAL" position, rotate the Testing Potentiometer clockwise until the voltage and/or current readings are at least equal to the working values stated on the tag. At this point press the "Charge" button and retain it in position for approximately one second or as required by your instructions.
 - ii. Rotate the Testing Potentiometer counterclockwise, gradually reducing the voltage and current until the relay armature drops away. Voltage and current readings shown on the Slide meters are the drop-away values. They must be within manufacturer's specifications and should be recorded.
 - iii. Move the polarity switch to the "OFF" position for one second, then return it to the "NORMAL" position.
 - iv. Gradually rotate the Testing Potentiometer clockwise until the heel contacts of the relay just close with the front contacts. Voltage and current readings shown on the two Slide meters are the pick-up values. They must be within the manufacturer's specifications and should be recorded.
 - v. Continue rotating the Testing Potentiometer clockwise until the relay armature is against its stop. Voltage and Current readings shown on the two Slide meters are the working values. They must be within the manufacturer's specifications and should be recorded.
 - vi. Replace any disconnected wiring, close any test nuts and/or return the relay to its plug base.

CHAPTER 4, CONTINUED

FOUR YEAR TEST OF BIASED DC NEUTRAL RELAYS

- A. SAFETY.** The following safety considerations must be kept in mind when conducting signal device tests.
1. Know where any trains are and how your tests will affect their operation or the safety of the public.
 2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
 3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.
- B. Purpose.** Insure that Biased DC Neutral Relay operating characteristics are within manufacturer's tolerance.
- C. Procedure for Four Year Test of Biased DC Neutral Relays:**
1. Preliminary Measures.
 - i. All circuit wires must be removed from the positive control terminal of the relay before testing it.
 - ii. Plug-in relays must be unplugged before testing, or if a test nut can remove all the positive control voltages, loosen the test nut.
 - iii. If a relay is tested using voltage as the performance criteria, values obtained should be adjusted for temperature. Manufacturer's values are based on a relay coil temperature of 68 degrees F. See accompanying chart (Pg. 16) for temperature correction factor. Temperature corrections are not required if current is used as the performance criteria.
 2. Using the Model 330-5 DC Relay Slide, complete tests as follows:
 - i. With the Polarity Switch in the "NORMAL" position, rotate the Testing Potentiometer clockwise until the voltage and/or current readings are at least equal to the working values stated on the tag.
 - ii. Rotate the Testing Potentiometer counterclockwise, gradually reducing the voltage and current until the relay armature drops away. Voltage and current readings shown on the two Slide meters are the drop-away values. They must be within the manufacturer's specifications and should be recorded.
 - iii. Move the Polarity Switch to the "OFF" position for one second.
 - iv. Move the Polarity Switch to the "REVERSE" position and rotate the Testing Potentiometer clockwise until the voltage applied is 3 times the working voltage (If this voltage value is equal to or greater than the supply voltage, you may just use the "CHARGE" button.) The relay must not pick up at any time during this portion of the test.
 - v. Move the Polarity Switch to the "OFF" position for 1 second then return it to the "NORMAL" position.
 - vi. Starting below the pick-up values, gradually rotate the Testing Potentiometer clockwise until the heel contacts of the relay just close with the front contacts. Voltage and current readings shown on the two Slide meters are the pick-up values. They must be within manufacturer's specifications and should be recorded.

CHAPTER 4, CONTINUED

FOUR YEAR TEST OF BIASED DC NEUTRAL RELAYS, CONTINUED

- vii. Continue rotating the Testing Potentiometer clockwise until the relay armature is against its stop. Voltage and current readings shown on the two Slide meters are the working values. They must be within the manufacturer's specifications and should be recorded.
- viii. Replace any disconnected wiring, tighten any test nuts, and/or return the relay to its plug base.

CHAPTER 4, CONTINUED

TWO YEAR TEST OF POLARIZED DC RELAYS

- A. SAFETY.** The following safety considerations must be kept in mind when conducting signal device tests.
1. Know where any trains are and how your tests will affect their operation or the safety of the public.
 2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
 3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.
- B. Purpose.** Insure that Polarized DC Relay operating characteristics are within manufacturer's tolerance.
- C. Procedure for Two Year Test of Polarized DC Relays:**
1. Preliminary Measures.
 - i. All circuit wires must be removed from the positive control terminal of the relay before testing it.
 - ii. Plug-in relays must be unplugged before testing, or if a test nut can remove all the positive control voltages, loosen the test nut.
 - iii. If a relay is tested using voltage as the performance criteria, values obtained should be adjusted for temperature. Manufacturer's values are based on a relay coil temperature of 68 degrees F. See accompanying chart (Pg. 16) for temperature correction factor. Temperature corrections are not required if current is used as the performance criteria.
 2. Using the Model 330-5 DC Relay Slide, complete tests as follows:
 - i. With the Polarity Switch in the "NORMAL" position, rotate the Testing Potentiometer clockwise until the voltage and/or current readings are at least equal to the working values stated on the tag.
 - ii. Rotate the Testing Potentiometer counterclockwise, gradually reducing the voltage and current until the relay neutral armature drops away. Voltage and current readings shown on the two Slide meters are the neutral relay armature drop-away values. They must be within the manufacturer's specifications and should be recorded.
 - iii. Move the Polarity Switch to the "OFF" position for one second, then return to the "NORMAL" position.
 - iv. Gradually rotate the Testing Potentiometer clockwise until the heel contacts of the relay just close with the front contact. Voltage and current readings shown on the two Slide meters are the neutral armature pick-up values. They must be within the manufacturer's specifications and should be recorded.
 - v. Continue rotating the Testing Potentiometer clockwise until the relay armature is against its stop. Voltage and current readings shown on the two Slide meters are the working values. They must be within the manufacturer's specifications and should be recorded.

CHAPTER 4, CONTINUED

TWO YEAR TEST OF POLARIZED DC RELAYS, CONTINUED

- vi. Rotate the Testing Potentiometer until the voltage and/or current readings are at least equal to the working values shown on the relay tag.
- vii. Rotate the Testing Potentiometer counterclockwise until the voltage and current readings are zero.
- viii. Move the Polarity Switch to the "OFF" position for one second, then move it to the "Reverse" position.
- ix. Rotate the Testing Potentiometer clockwise until the relay polar armature reverses against its stop. Voltage and Current readings shown on the two Slide meters are the reverse polar and working values. They must be within the manufacturer's specifications and should be recorded.
- x. Continue rotating the Testing Potentiometer clockwise until the relay neutral armature is against its stop. Voltage and current readings shown on the Slide meters are the relay neutral armature reverse working values. They must be within the manufacturer's specifications and should be recorded.
- xi. Now rotate the Testing Potentiometer until the voltage and/or current readings are at least equal to the working values stated on the relay tag, then rotate the Testing Potentiometer counterclockwise until both Slide meters read zero.
- xii. Move the Polarity Switch to the "OFF" position for one second, then move it to the "NORMAL" position.
- xiii. Gradually rotate the Testing Potentiometer clockwise until the relay neutral armature is against its stop. Voltage and current readings shown on the two slide meters are the neutral armature normal working values. They must be within the manufacturer's specifications and should be recorded. Note that these values must not exceed those recorded for the relay neutral armature reverse working (2. x. above).
- xiv. Polar armatures must remain in the last energized position with all power, in either direction, removed from the coils. When the relay polar armature is switched, the neutral armature must remain energized on relays equipped with neutral retaining features.
- xv. Replace any disconnected wiring, tighten any test nuts, and /or return the relay to its plug base.

CHAPTER 4, CONTINUED

FOUR YEAR TEST OF ELECTRO-CODE RECEIVER RELAYS

A. SAFETY. The following safety considerations must be kept in mind when conducting signal device tests.

1. Know where any trains are and how your tests will affect their operation or the safety of the public.
2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.

B. Purpose. Insure that Electro-Code Receiver Relay (7-H or 7-K card) operating characteristics are within manufacturer's tolerance.

C. Procedure for Four Year Test of Electro-Code Receiver Relays (7-H or 7-K card):

NOTE: The following procedure is not in exact accordance with the manufacturer's guidelines. Due to capacity limitations of the 330-5 slide, a saturation current of 2 times the pick-up current is all that can be achieved, instead of 4 times.

1. Turn Electro-code receiver power switch to the "off" position. Open the front cover and remove the 2C2R module. Turn the power switch back "on".
2. Open the track wire test nut. This test nut will be located on the CTB-1C or CTB-1D current test module. If a current test module is not used, disconnect the negative track wire isolating the Electro-Code Receiver from the track.
3. Connect the 330-5 Relay Slide to the Electro-Code Receiver track terminals.
4. Rotate the Testing Potentiometer on the Slide clockwise, raising the current to the Electro-Code Receiver to a level 2 times the pick-up current listed on the label. Maintain this current level for 15 to 20 seconds, to insure practical saturation of the coil. During saturation, observe that the LED indicator on the receiver module is illuminated, verifying proper polarity. If the LED is not lit, reverse the 330-5 Slide leads connected to the track terminals and repeat this step.
5. Following saturation, slowly reduce the current into the Electro-Code Receiver by rotating the 330-5 Slide Testing Potentiometer counterclockwise until the LED just goes out. Note the current value displayed on the Slide ammeter. This value should be within manufacturer's specifications and should be recorded as the drop-away value.
6. Slowly increase the current into the Electro-Code Receiver by rotating the 330-5 Testing Potentiometer clockwise until the LED just turns on. Note the current value displayed on the Slide ammeter. This value should be within manufacturer's specifications and should be recorded as the pick-up value.
7. Replace any disconnected wiring, tighten any test nuts, and /or return the relay to its plug base.

CHAPTER 4, CONTINUED

USE OF MODEL 330-5 SLIDE AS A STAND ALONE VOLTMETER

- A. SAFETY.** The following safety considerations must be kept in mind when conducting signal device tests.
1. Know where any trains are and how your tests will affect their operation or the safety of the public.
 2. Insure that no unsafe conditions are created by your use of the Model 330-5 DC Relay Slide.
 3. Insure that a proceed signal is not mistakenly displayed to any train or engine. This would include any upgrade to an approach signal.
- B. Purpose.** Take DC Voltage (0 to 19.99 VDC) readings with the Model 330 DC Relay Slide. Particularly, you can use the this application of the Slide to confirm that you have disconnected the positive feed to the relay by connecting the Slide per Paragraph C, below.
- C. Procedure for using the Slide as a Voltmeter:**
1. Slide must be connected to a power source on the "10-16 VDC Input Terminals" in order to provide operating power to the "VOLTMETER".
 2. Set the Polarity Switch to the "OFF" position.
 3. Connect one set of leads to the "Relay" Terminals on the Slide, matching polarity color indicators on the leads and terminals.
 4. Turn the power switch "ON"
 5. Observing polarity, connect the Slide Terminals to the voltage source being checked. Voltage should not exceed 20.0 VDC, or damage to the slide may occur.
- NOTE: Again, this procedure is useful to check for voltage on a relay coil before you "Slide" it.

TROUBLE SHOOTING

- A.** An operational check that can be conducted at any time to determine that the Slide is generally operating properly is as follows:
1. With a power source connected, turn the unit on.
 2. With the Testing Potentiometer fully counterclockwise, and the Polarity Switch in "Normal" the Slide Ammeter and Voltmeter should read zero or very low.
 3. With nothing connected to the "Relay" Terminals, press the "Charge" switch and note a positive reading of slightly less than the voltage on the 10-16V DC Input Terminals.
 4. Switch the Polarity Switch to "Reverse", press the "Charge" switch again, and note the approximate same value on the voltmeter but is shown as "-" or negative.
 5. Leaving the Polarity Switch in "Reverse", short the the "Relay" terminals, and turn the Testing Potentiometer clockwise until 1.9A DC is displayed on the Ammeter.
 6. Switch the Polarity Switch to "Normal" and observe a similar reading on the Ammeter.
- B.** Slide won't work, LED is on:
1. Are relay test leads connected properly, both at the Slide and the Relay itself. See drawing at front of manual.
 2. Is the Polarity switch in the right position? (Not "OFF")
 3. Check the Output fuse (3AG 3A 250V Fast Acting).
- C.** Slide won't work, LED is off:
1. Is power switch "ON" ?
 2. Is power source connected properly?
 3. Check the Input Fuses (3AG 3A 250V Fast Acting).
 4. Check fuses in adapters and battery packs.

CHAPTER 5

CALIBRATION AND REPAIR SERVICES

- A.** S&C Distribution Company recommends that the Model 330-5 DC Relay Slide be calibrated every year at a location that employs instruments meeting United States National Institute of Standards and Technology (NIST) standards. Said calibration can be accomplished by a qualified test equipment calibration station, by S&C Distribution Company, or possibly by qualified railroad personnel (Write for free calibration Instructions).
- B.** Calibration service is available at S&C Distribution Company. With this calibration service the slide is sealed and a Certificate of Calibration and Traceability is provided.
- C.** If you choose to send the unit to us for calibration, contact us at 1-708-444-4908, to obtain a Return Goods Authorization and other pertinent information, indicating at the time whether or not you want a certificate of calibration and traceability.
- D.** If repair of the Model 330-5 DC Relay Slide is required, we recommend that the unit be returned to S&C Distribution Company for this service. For repair service, contact us at 1-708-444-4908, to obtain a Return Goods Authorization and cost information.

CHAPTER 6**ORDERING REFERENCES**

Description	Part Number
Model 330 Signal Relay Slide	330-5
Plug-in Battery Pack, 7.0AH, Harness, Connector and Charger	330-10
Plug-in Battery Pack, 3.0AH, Harness, Connector and Charger	330-23
Battery, 1.2AH, will fit in Soft Case, with fuse leads, and Charger	330-28
AC to DC Power Supply, 13.5VDC, 1.7A Max Output, with 12 Ft Cord	330-11
Shoulder Harness for Model 330 Slide	324-20
Adapter for plug-in relays, simplifies testing out of the rack	330-18
Searchlight Signal Tip/Rock Battery Adapter. Allows use of Battery pack to tip/rock searchlight signals	330-17
Lead Set, 5 ft. claw clips, for battery connection	330-15
Above, but special length (Specify)	330-15X
Lead Set, 8 ft. alligator clips, for battery connection	330-16
Above, but special length (Specify)	330-16X
Battery-to-Slide Power Connector	330-13
Case, Padded, w/lead pouch, for 330 DC Relay Slide	330-12
Charging Adapter, Lighter Plug to Coaxial Power Plug	324-12
Charger, 90 to 264V input, 12V, 750MA Taper and Float Charger	324-40
Charger, 100 to 240V input, 12V, 1.8A Taper and Float Charger	324-42

ORDER FROM:

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