253-TYPE RELAYS

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the following relays.

RELAY	NO. OF CELLS	EXTERNAL RHEOSTAT	ADJUST FOR	ADJUST VARIES WITH TEMP.
253A	10	No	Operate	Yes
253A	11	No	"	"
253A	11 to 24	Yes	"	"
253B	8 or 11	No	"	"
253B	9 to 24	Yes	"	"
253C, 253D	(Note)	Yes	Oper. & Rel.	No

Note: The number of cells with which 253C and 253D relays may be used varies with plant design.

1.02 This section has been reissued to provide correct references to other Plant Series sections. In this process marginal arrows have been omitted.

1.03 Reference shall be made to Section 020-010-711, covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.04 A relay is said to ***release*** when the armature moves from the pole piece and comes to rest against the backstop, allowing the contacts to close with reliable contact.

1.05 The ***release voltage*** is the maximum voltage which will allow the relay to release.

1.06 A relay is said to ***operate*** when voltage is applied to its winding and the armature leaves the backstop and comes to rest against the pole piece causing the contacts to break.

1.07 The ***operate voltage*** is the minimum voltage which will cause the relay to operate.

1.08 The temperature variation characteristic of the 253A or B relay is accomplished by means of a bi-metallic strip sensitive to temperature changes. This strip varies the air-gap when the relay is in the released position thus changing the voltage at which the relay will operate. It is designed to cover the temperature ranges at which batteries are customarily operated, namely between 40F and 100F, and will not perform satisfactorily at other temperatures.

2. REQUIREMENTS

Electrical

2.01 ***Stabilized operate voltage and temperature*** shall be obtained with the cover in place before applying the requirements.

2.02 ***The 253A and 253B relays for 8, 10 or 11 cell batteries without rheostats*** in the relay coil circuit to reduce the charge, shall meet the operate values shown in Fig. 3, 4 or 5 as indicated.

2.03 ***The 253A and 253B relays for batteries with rheostats*** in the relay coil circuit to reduce the charge, shall meet the operate values shown on a per cell basis in Fig. 6 unless otherwise specified on the circuit requirements table.

2.04 ***The 253C and 253D relays*** shall meet the requirements on the circuit requirements table.

Use voltmeter and thermometer.

Mechanical

Note: Mechanical requirements, except the cleaning of contacts, are for readjust only. They should be checked only when the relay fails to meet the electrical requirements, and when changes other than adjustment of series rheostats are necessary.

2.05 *Cleaning:* The contacts shall be cleaned periodically; and other parts shall be cleaned whenever the mechanical requirements are checked.

2.06 *Contact Alignment:* The point of contact shall fall wholly within the circumference of the opposing disc.

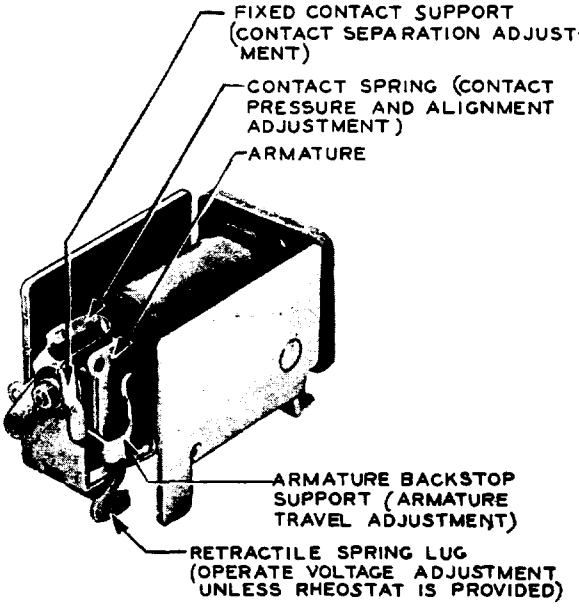
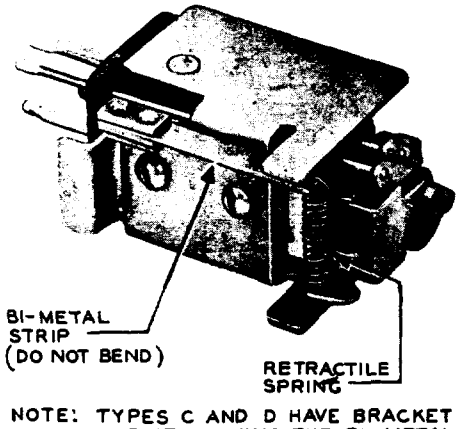


Fig. 1 – 253-Type Relay (End View All Types)



NOTE: TYPES C AND D HAVE BRACKET FOR STIFFENING THE BI-METAL STRIP AND THE ADJUSTMENT DOES NOT VARY WITH TEMPERATURE.

Fig. 2 – 253-Type Relay (Bottom View A and B Types)

2.07 ***The armature travel, contact separation and contact spring pressure*** shall be

(a) ***253A and 253B***

	OPERATED ARMATURE TRAVEL	OPERATED CONTACT SEPARATION	RELEASED CONTACT SPRING PRESSURE
Min.	Approx. 1/32"	.005"	10 grams
Max.		.012"	15 grams
Gauge	Eye	74D or 66D	70H

(b) ***253D except with 8 cells and 253C***

Min.	.028"	.010"	3 grams
Max.	.032"	.012"	5 grams
Gauge	92J or 66D	92A & 92B or 74D	70F

(c) ***253D with 8 cells***

Min.	.015"	See	4 grams
Max.	.017"	Note	6 grams
Gauge	92D & 92E	92A & 92B	70F

Note: The armature in closing shall leave the backstop and travel 0.010"-0.012" before touching the contact spring and opening the contacts.

3. ADJUSTING PROCEDURES

3.001 ***List of Tools, Gauges, Materials and Test Apparatus.*** (Equivalents may be substituted.)

Tools

Adjuster, spring, 264 Tool or 371 Tool

Burnisher, contact, 265C Tool

Gauges

Gauges, gram, 70F and 70H

Gauge nest, thickness, 66D or 74D

Gauges, offset, thickness, 92A, 92B, 92D, 92E and 92J

Thermometer, 0-220F, Eimer and Amend Co., No. 32155

Meter, M9B or Voltmeter, d/c, Weston Model 280, Range 150-60-3 volts

Materials

Paper, cleaning, KS-7187

Test Apparatus

Test Set, 35 type. (See Section 100-101-101.)

3.002 Since the temperature of the relay affects its operation, the relay should not only be warmed, as covered in 3.01, but should also be kept warm by being energized at approximately the operate voltage. The cover should be left off only as necessary for adjustments.

3.003 The position of the armature as regards operate or release can be ascertained with the cover on by noting the positions of other relays which are affected by the 253 relay or, by opening the circuit through the winding which will release the relay if it is already operated. The operation or release of the relay can be detected by sound or by its effect on the associated relays.

3.004 The voltage of operation, or release should be read just as the action takes place, and not afterward as the operation or release will change the voltage in some cases. For this reason, several operations are required to obtain the voltage reading.

3.005 If successive operations or releases give inconsistent readings, or the relay releases but the contacts fail to make electrically, the trouble may be due to foreign matter between contacting surfaces.

3.006 Before adjusting a relay rheostat, turn the rheostat adjustment back and forth several times to remove any foreign matter from the contacting surfaces.

Electrical

3.01 ***Stabilized Operate Voltage and Temperature*** (Reqt 2.01)

(1) The electrical connections for warming the relay, or checking the operate or release voltage, are outlined on the circuit requirement tables of the particular power plant application. These connections usually arrange for disconnecting the charging supply and the relay winding from the local battery with the load being left on the battery. Test battery supply of higher voltage than the relay limits is connected in series with a variable resistance, usually a 35 type test set, across the relay winding. Normally the charging supply is used as the test voltage, unless it is from a rectifier in which case the test voltage may be obtained from the local battery in series with a few dry cells to boost the voltage.

(2) Warm the relay for at least an hour with the voltage at the desired operate value, or, if the circuit arrangement is such that the relay has already been energized for an hour

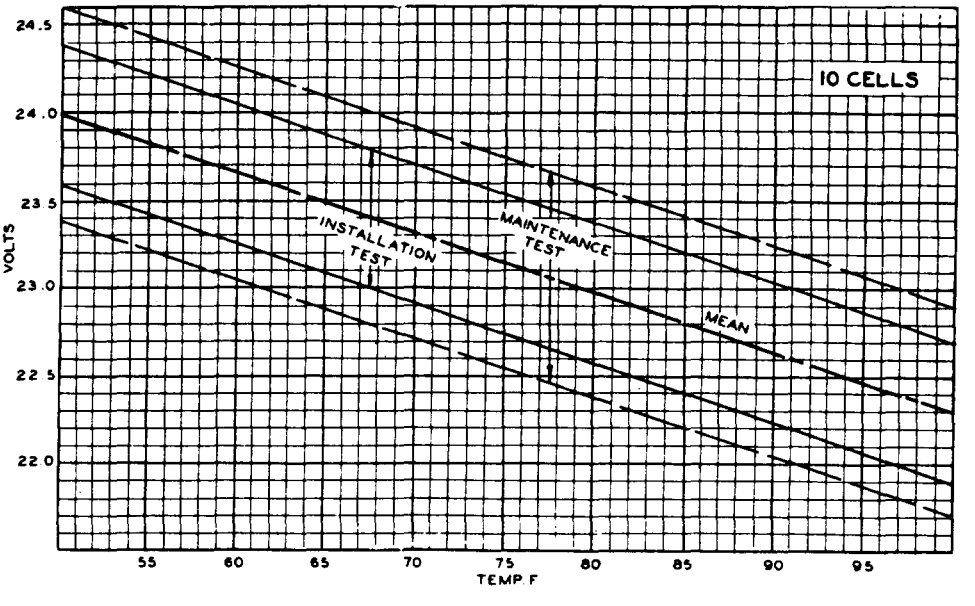


Fig. 3 – 253A Relay Operate Limits (Without Rheostat)

or more, warm for at least 20 minutes with the voltage at the desired operate value. In adjusting the warming voltage on a 253C or 253D relay, it may be found that the relay operates at a value lower than the desired operate value. If this is the case, release the relay and adjust the warming voltage just under the existing operate value so that the relay will warm in the released position.

(3) After the warm-up period, and with the relay still energized, place the bulb of the thermometer near the outside of the relay cover and determine the temperature of the air immediately surrounding the relay. When the temperature has been ascertained, refer to the proper figure giving temperature operate limits for the particular installation and adjust as outlined in 3.02, 3.03 or 3.04 as the case may be.

3.02 ***253A and 253B Relays Without Rheostat for 10-, 8- or 11-cell Batteries*** (Reqt 2.02)

Installation Test

(1) Set up the connections, stabilize the relay, and determine the temperature and operate voltage of the relay as outlined in 3.01. If the operate voltage is within the installation test limits specified for the temperature shown in Fig. 3, 4 or 5 for the type battery being used, no further action is required. If it is not within the limits, readjust as follows.

(2) To readjust the operate value, leave the voltage on the winding at the last operate value. To permit the checking of the trial adjustments immediately after adjustment with the cover off, it is first necessary to determine the effect on the operate voltage resulting from removing the cover. For example, assume that a relay requiring adjustment operated at 25.0
The cover should then be removed and after about three minutes the relay should be retested. The new operate voltage might be 25.2
the increase due to cover removal being.... .2
Assume it is desirable to obtain a final cover-on readjustment close to a mean of 24.0
For a cover-off trial adjustment add 2
This would indicate a cover-off readjust close to 24.2

If the relay were adjusted to this value and the cover replaced, the operate voltage would be expected to drop to about 24 due to cover replacement for the final check. It should rarely be necessary to make an additional adjustment.

(3) After the cover-off operate voltage is determined, and before readjusting the operate voltage, check the mechanical requirements and make any necessary adjustments.

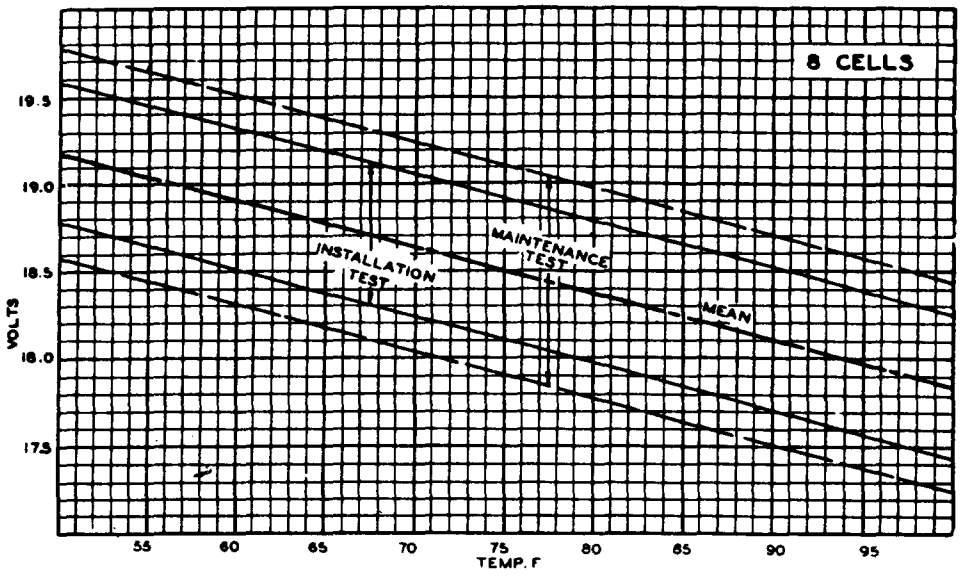


Fig. 4 – 253B Relay Operate Limits (Without Rheostat)

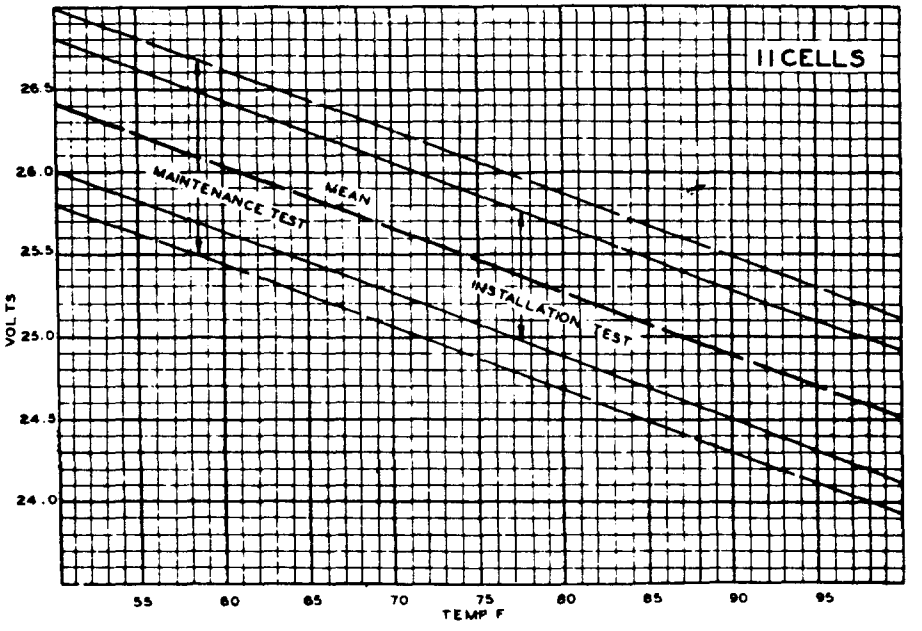


Fig. 5 – 253A Relay Operate Limits (Without Rheostat)

(4) To adjust the operate voltage, hold the armature against the pole face and carefully adjust the retractile spring lug with a 371 tool to change the tension on the retractile spring. Increase the tension to raise the operate voltage and decrease the tension to lower it. Only a slight change should be made at a time. Trial adjustments may be checked immediately with the cover off as covered above.

Readjust as necessary.

(5) After adjustment, replace the cover and, after approximately a minute, check and record the operate value. Compare this with the desired value. Repeat at one- or two-minute intervals until readings show practically no change over a five-minute period as the final check.

Maintenance Test

(6) The maintenance test is less critical than the installation test. If a recommended thermometer is not available, the temperature may be estimated, or the value shown on the room thermometer may be used. Where test connections of the circuit requirement table as referred to in 3.01 are not convenient, connect the relay winding across the battery and raise and lower the test voltage on the winding by controlling the charge rate. In some instances, such as during heavy load periods, it may not be possible to raise the voltage sufficiently by this means and dry cells may have to be added in series with the battery to secure the desired test voltage.

(7) Where the relay winding is not normally energized, leave the voltage on the winding at approximately the desired operate value for 20 minutes or more before checking the operate voltage.

(8) If the operate voltage, based on room or estimated temperature, is outside of the maintenance test limits in Fig. 3, 4 or 5, no attempt at readjustment, either electrical or mechanical, should be made without checking the temperature adjacent to the relay with the recommended thermometer. If the operate voltage is still outside the limits based on an actual temperature reading at the relay, readjust as outlined in (2), (3), (4), and (5).

3.03 *253A and 253B Relays with Rheostats* (Reqt 2.03)

(1) Set up the connections, warm the relay to stabilize the voltage, and determine the temperature as outlined in 3.01.

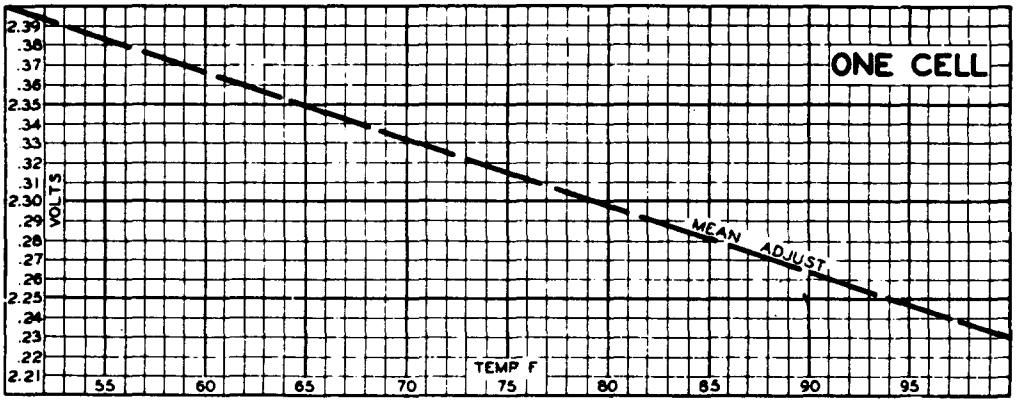


Fig. 6 – 253A and 253B Relays in Series with Rheostat — Operate Limits per Cell Basis for Charge Rates of 10 to 35 Per Cent of 8-Hour Discharge Rate of Battery

(2) Check the operate voltage of the relay and readjust the rheostat as required to give the proper operate voltage for the temperature of the relay as shown on a per cell basis in Fig. 6.

(3) If the specified voltage cannot be obtained by adjustment of the rheostat, check the circuit connections and mechanical requirements and make any necessary adjustments.

3.04 *253C and 253D Relays* (Reqt 2.04)

(1) Set up the connections and stabilize the relay as outlined in 3.01.

(2) Leave the cover on the relay and adjust the operate and release values with the rheostat, as required, to meet the values specified in the circuit requirement tables.

(3) If difficulty is encountered, check the mechanical requirements. After this check and adjustment where necessary, make a preliminary operate and release adjustment by means of the rheostats while the cover is off to see that the armature pulls up against the pole piece in operating and comes to rest against the backstop on release. Replace the cover; and after it has been in place for at least ten minutes, with the voltage just under the operate value, make the final adjustment.

Note: When the relay is functioning properly, without interfering with other equipment, it is best left alone. For example, when a 253C relay operates between a regulated tube rectifier float voltage and a model 260 voltage alarm relay to cut in and out a supplementary charger, it will not be necessary to readjust the 253C relay as long as it does not interfere with the operation of the rectifier or the alarm.

Mechanical

3.05 *Cleaning* (Reqt 2.05)

(1) Clean the contacts with the contact burnisher.

(2) The contact surfaces between the armature and backstop, the armature and pole piece, and the armature and contact spring should be cleaned by pulling clean strips of bond paper between these surfaces.

3.06 *Contact Alignment* (Reqt 2.06)
3.07 *Armature Travel, Contact Separation and Contact Spring Pressure* (Reqt 2.07)

(1) The armature travel should be measured between the armature and backstop with the relay in the operated position. Care must be taken in inserting the gauge to avoid the rivet heads in the back of the armature. If a 66D gauge is used, it should be so inserted that the upper rivet head will be in the slot of the gauge. The amount of armature travel before causing the contacts to open on the 253D relay with eight cells can be measured

by placing the proper gauges between the backstop and armature with the relay released. The opening of the contacts can be detected by the effect on associated relays. The contact separation and armature travel should be adjusted by adjusting the fixed contact support and the backstop support using a 371 tool. The contact spring pressure and contact alignment are adjusted with the relay released by shaping the spring. The tool should not be applied on the spring at the point where the button on the armature contacts the spring. After making all adjustments individually, recheck them.