



INSTRUCTIONS

GEI-83908

AUTOTRANSFORMER

TYPE XJA12A

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

GENERAL  ELECTRIC

DESCRIPTION

The Type XJA12A relay, which consists of a tapped autotransformer unit, is designed primarily to provide external reach adjustment for zone-packaged distance relays such as the CEY51A and CEY52A. It is used to adapt one terminal of standby relays for use as a replacement for a particular one of several different relay terminals on lines of different lengths, without having to change the internal reach settings of the replacement relays. The relay consists of an autotransformer and four terminal blocks which are used to set the different restraint voltages for the several lines with which it is to be used.

APPLICATION

Two Type XJA12A relays with a suitable selector switch are used with an installation of zone-packaged distance relays on a bus-tie breaker, or on a spare circuit breaker, which is to be used as a replacement for any one of several circuit breakers on lines of different lengths. Typical external connections for the application of the XJA12A with the CEY51A and CEY52A are shown in Figure 2. Note that only two XJA12A relays, connected in open delta, are required to provide the three phases of adjustable restraint voltage to the two zone-packaged relays.

The required tap settings for each line are preset in the Type XJA12A relay. When the spare set of relays are required to protect a particular line, operation of the selector switch to the proper position will then select the necessary tap settings to protect that line. This arrangement permits the switching of a single set of zone-packaged distance relays with the associated circuit breaker to maintain protection of any one of several lines originating in a particular station while the regular equipment is out of service for maintenance or for other reasons.

For the purpose of protecting more than one length of line the stand-by distance relays associated with the Type XJA12A would be set to operate on the shortest line, i.e., the line that requires the largest restraint voltage. As the distance relay is switched into lines of longer lengths, the preset taps on the Type XJA12A are selected by means of the selector switch so as to supply less voltage to the autotransformer of the distance relay. Since the tap settings of the autotransformer of the distance relays have not been changed, the reduction of voltage across the autotransformer by means of the Type XJA12A results in less restraint voltage in the relay coils. The relay therefore has the equivalent of a different tap setting so that it will protect the longer length of line without changing its internal tap block setting.

As an example, three lines of different lengths are to be protected by one terminal of stand-by distance relays. The distance relays are set to protect the shortest line and therefore are connected through the selector switch contacts to the proper terminal stud and percent tap point in the XJA12A so as to apply 100 percent of the source potential to the distance relays.

To protect the next longer line, the distance relays will be connected to various studs of the Type XJA12A through the selector switch so that a reduced voltage will be supplied to the relay. The amount of the necessary reduction in voltage is accomplished by the tap setting of the Type XJA12A to its transformer. In the same manner the connections can be made so that the stand-by terminal of distance relays will be set to protect six other lines of different lengths. Thus, with this arrangement, eight lines of different lengths may be protected with one terminal of stand-by distance relays employing the Type XJA12A autotransformers and suitable selector switches.

In both the CEY51A and CEY52A relays the restraint and polarizing circuits are brought out to separate case studs. Thus it is possible to connect the XJA12A relays to control the restraint potential only while the polarizing circuits remain connected directly to the main PT's. This results in the same high torque level regardless of the XJA12A setting.

RATINGS AND BURDENS

The XJA12A is rated for 120 volts 60 cycles and has a rated maximum total output of 0.75 amperes. The burden imposed by one XJA12A at 120 volts 60 cycles is:

Burden of one XJA12A

R	X	Z
5903	9855	11488

This corresponds to:

WATTS	VARs	VA	P.F.
0.64	1.08	1.25	0.51

The burden imposed on the potential transformers by a three phase terminal of two XJA12A autotransformers connected in open delta is twice the burden of a single XJA12A. The total burden is an unbalanced load on the potential transformers.

CALCULATION OF SETTINGS

Assume that three lines (A, B, and C) are to be protected by one set of stand-by distance relays, Types CEY51A and CEY52A, and that the relays have base reach taps of 0.75/1.5/3 and 1/2/3 ohms respectively. Further assume that the line lengths in ohms and desired relay reach settings are as tabulated on next page.

TABLE I

LINE	LENGTH IN OHMS (Ø-N)	ZONE 1 SETTING (CEY51A)	ZONE 2 SETTING (CEY52A)
A	1.9	1.7	2.85
B	3	2.7	4.5
C	5	4.5	7.5

The listed settings are on the basis of zone 1 being set for 90 percent of the protected line, and zone 2 being set for 150 percent. Both relays should be set for the shortest line by means of its internal tapped restraint transformer, and highest base reach tap which is less than the required setting should be used. Thus in this example the zone 1 CEY51A would be set for 90 percent of the line A impedance, or 1.7 ohms, using the 1.5 ohm base reach tap; and the zone 2 CEY52A would be set for 150 percent of the line A impedance, or 2.85 ohms, using the 2 ohm base reach tap:

$$\text{Zone 1: } \frac{1.5}{1.7} = 88\%$$

$$\text{Zone 2: } \frac{2}{2.85} = 70\%$$

In these examples, and those that follow, it has been assumed that the line angle and angle of maximum torque of the relay are approximately the same. If these angles differ significantly, this must be taken into account in determining the tap settings, as described in the instruction books for the distance relays in question.

The tap settings for the XJA12A are then determined as follows:

LINE A

Since the relays have been set on the basis of the line A impedance, the selector switch contacts for the line A position should be connected to select the 90% and 10% taps to provide 100% restraint voltage to the two relays. Assuming that the No. 1 position of the selector switch in Figure 2 is used for line A, contacts 1 and 3, which connect to stud 12 of the Ø12 and Ø32 XJA relays respectively, are involved. Consequently to realize a 100% restraint voltage in position 1 of the switch, point A of the upper block in both XJA's should be jumpered to the 90% tap, and contacts 1 and 3 to stud 7 of the Ø12 and Ø32 XJA respectively, which in turn tie to the 10% tap of the lower block resulting in an overall restraint tap of 100%.

LINE B

The proper reach setting of the zone 1 and zone 2 relays to protect line B, as listed in Table I, must now be obtained by a tap setting in the XJA relay. This percent tap setting, based on the desired zone 1 reach, would be:

$$\frac{1.7}{2.7} = 63\%$$

Since zone 2 for line B is also 150% of the line impedance, the same 63% tap in the XJA will also provide the proper reach of the zone 2 CEY52A:

$$\frac{2.85}{4.5} = 63\%$$

If we assume that position 2 of the selector switch is used for line B, contacts 5 and 7 are involved. This tap B of the upper block of both XJA's should be connected to the 60% tap. Since the lower block provides 2% steps, the exact restraint cannot be obtained. The 5 and 7 contacts should be connected to studs 3 of the \emptyset_{12} and \emptyset_{32} XJA relays respectively, thus providing an overall percent restraint of 62%.

LINE C

The required reach of the zone 1 relay for line C is 4.5 ohms as listed in Table I. The percent tap setting in the XJA would be:

$$\frac{1.7}{4.5} = 38\%$$

The same procedure outlined above for line B would now be followed, using jumper connections to select the 30% tap on the upper block and 8% on the lower.

Some means must be provided in the overall circuit to open the trip circuits from the CEY relays when the selector switch is shifted between positions. Otherwise an undesired trip may result since these relays may operate due to the momentary loss of potential.

CONSTRUCTION

The Type XJA12A consists of a tapped autotransformer and four associated tap blocks all contained in an S2 double ended drawout case. The tapped transformer connects to the two tap blocks; the upper tap block selects 10% taps from zero (0) to ninety (90) while the lower block selects 2% taps from two (2) to ten (10). An eight (8) tap output selector block is positioned above the 10% tap block; the eight taps are identified by letters A through H and are connected to the top terminals of the XJA12A case as shown by the Internal Connections Diagram, Figure 1. A five (5) tap output selector block is positioned below the 2% tap block; the five taps are identified by letters A through E and are connected to the bottom terminals of the XJA12A case.

Jumper connections are provided from the autotransformer tap blocks to the output selector blocks. This completes the tap block assemblies.

The XJA12A case is suitable for either surface or semiflush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case and the cover screws have provision for a sealing wire.

The case has studs or screw connections at both ends for the external connections. The electrical connections between the XJA12A output selector blocks and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer blocks, attached to the case, have the studs for the external connections, and the inner blocks have the terminals for the internal connections.

The XJA12A mechanism is mounted in a steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This cradle is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The cases and cradles are so constructed that the XJA12A cannot be inserted in the case upside down. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is fastened to the case by thumbscrews, holds the connecting plug in place.

To draw out the XJA12A unit the cover is first removed, and the plug drawn out. The latches are then released, and the relay unit can be easily drawn out. To replace the XJA12A unit, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to check the XJA12A in place on the panel.

RECEIVING, HANDLING AND STORAGE

The XJA12A, when not included as a part of a control panel will be shipped in cartons designed to protect them against damage. Immediately upon receipt, examine for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in unpacking the XJA12A in order that none of the parts are injured or the adjustments disturbed.

If the XJA12A is not to be installed immediately, it should be stored in the original carton in a place that is free from moisture, dust and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in operation.

INSTALLATION

LOCATION

The location should be clean and dry, free from dust and excessive vibration, and well lighted to facilitate inspection and testing.

MOUNTING

The XJA12A should be mounted on a vertical surface. The outline and panel drilling diagram is shown in Figure 3.

CONNECTIONS

The Internal Connection Diagram for the Type XJA12A is shown in Figure 1. The desired output voltage for each line to be protected can be obtained by connecting the appropriate taps of the center terminal blocks to the output selector blocks. The 10% taps are connected to points on the upper output selector block, while the 2% taps are connected to points on the lower output selector block.

One of the mounting studs or screws of each relay case should be permanently grounded by a conductor of not less than No. 12 B&S gage copper wire or its equivalent.

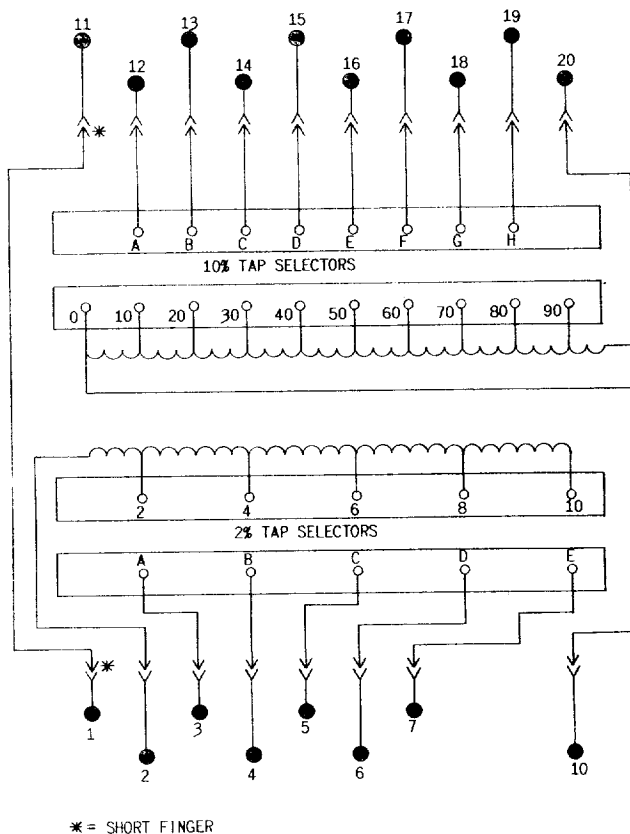
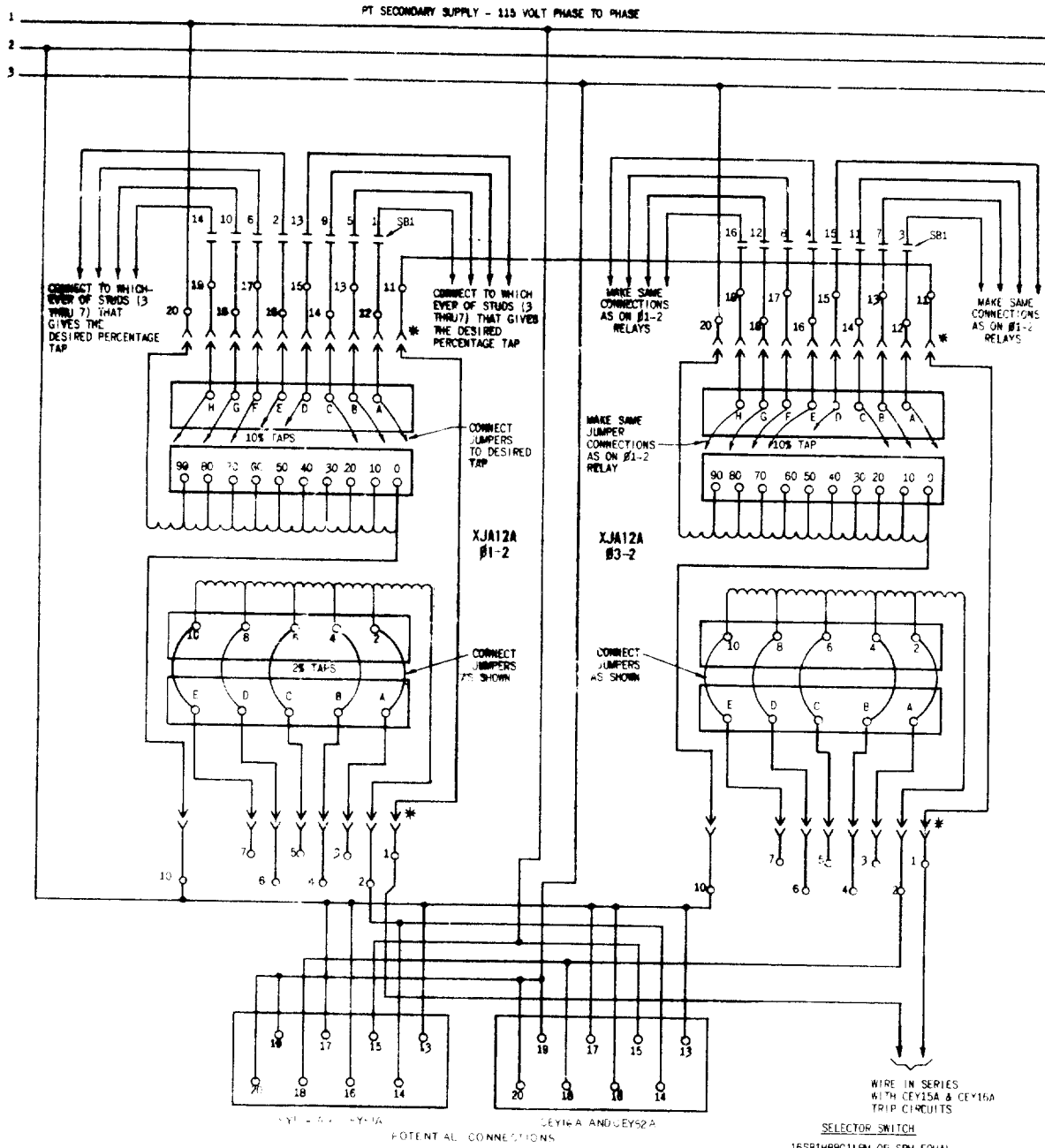


Figure 1 (0148A4033-1) Internal Connections For Type XJA12A Autotransformers



- NOTE 1 - IF FEWER THAN 8 STEPS ARE DESIRED, THE SAME SWITCH MAY BE USED BY NOT CONNECTING TO THE UNUSED STAGES OR A SIMILAR SWITCH WITH FEWER STAGES MAY BE OBTAINED.
- NOTE 2 - IN SOME APPLICATIONS TWO OR MORE POSITIONS MAY REQUIRE THE SAME 10% AND/OR 2% TAP SETTINGS. FOR EXAMPLE ASSUME POSITION 1 REQUIRES 62% WHILE POSITION 6 REQUIRES 68%. FOR THESE REQUIREMENTS CONNECT JUMPERS FROM A TO 60 AND FROM F TO 60 ON THE 10% BLOCK, OR CONNECT F TO 60 AND JUMPER STUD 12 TO 17 AND DO NOT CONNECT A TO ANY TAP. CONNECT SBI CONTACT 1 TO STUD 3 AND CONTACT 6 TO STUD 6. MAKE SIMILAR CONNECTIONS IN #3-2 RELAY.
- NOTE 3 - SELECTOR SWITCH MUST NOT BE OPERATED WHEN LOAD CURRENT IS FLOWING OR FALSE TRIPPING MAY RESULT DUE TO MOMENTARY LOSS OF POTENTIAL SUPPLY TO THE RELAYS.

SELECTOR SWITCH
16S81H8011RM OR 80M EQUAL

CONTACTS HANDLE END	CONTACTS	POSITIONS BACK VIEW							
		8	7	6	5	4	3	2	1
1	1								X
2	2								
3	3			X					Y
4	4				X				
5	5							Y	
6	6			X					
7	7							X	
8	8			X					
9	9							X	
10	10	X							
11	11							X	
12	12		Y						
13	13					X			
14	14	X							
15	15						Y		
16	16	X							

Figure 2 (0101C9619) External Connections for Type XJA12A Autotransformers

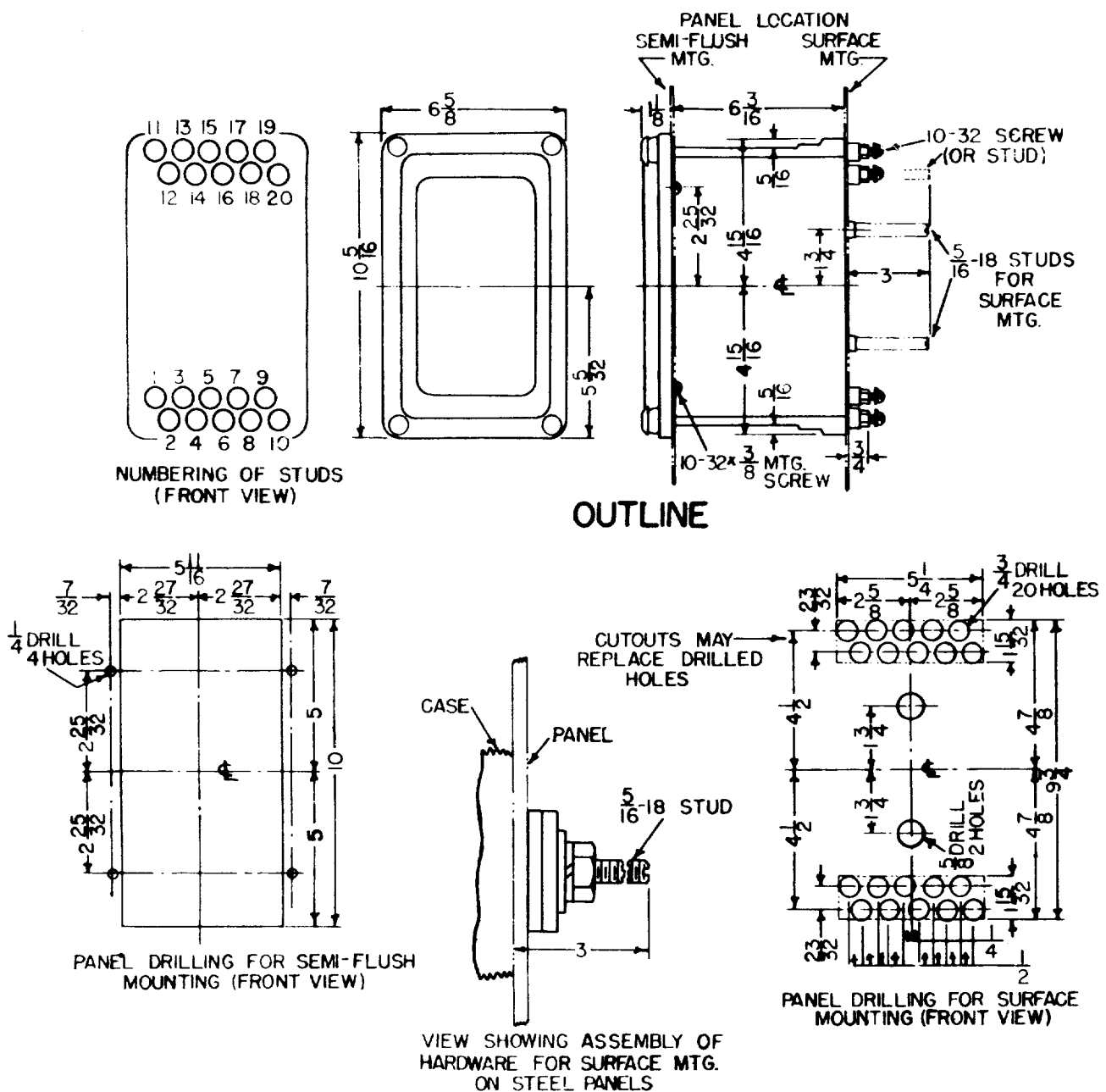


Figure 3 (K-6209272) Outline & Panel Drilling Dimensions for Type XJA12A Autotransformers



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