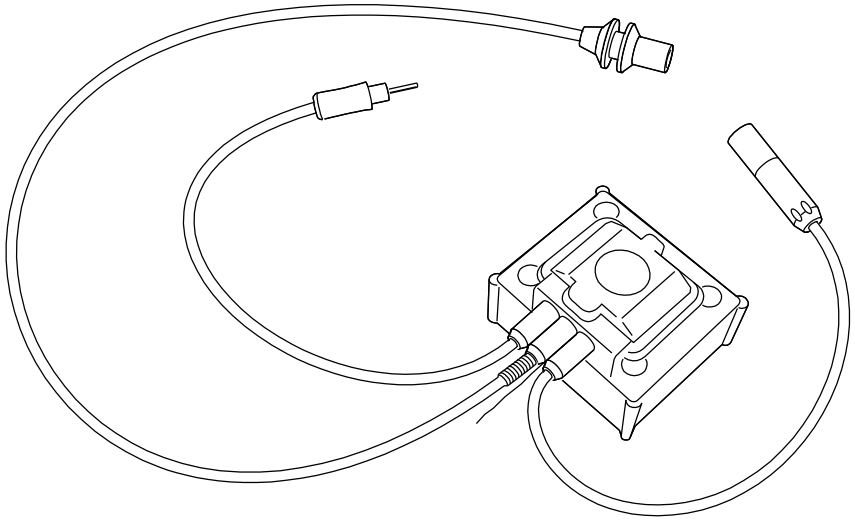
Instruction Manual

AM.06.112e

Edition 1.7

Series Transformer



Type RST

Series Transformer: Type RST

Overview

Introduction

In this Instruction Manual, you will find all the relevant information concerning the ADB Series Transformer, type RST.

Record of change

Record of change AM 06.112e:

Revision	Description	Editor	Checked	Date
1.0	First Edition	DSE	RB	
1.1	Length tape (Installation)	DSE		10/99
1.2	Translation in French, German and Spanish	DSE		11/99
1.3	Corrections	ET		02/01
1.5	Rebranding	EV		12/09
1.6	Addition of low power transformers	MR		05/13
1.7	Modification in warranty statement	TWE		MAY16

Contents

This chapter contains the following topics :

Read carefully before installing the RST!

Keep away from live circuits

- Do not change lamps or components and do not make adjustments inside equipment when the light circuit is on.
- Refer to the FAA Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities" for instructions on safety precautions in case no local safety precautions are available.

Resuscitation

Operating and maintenance personnel must familiarise themselves with resuscitation techniques and procedures applicable at the airport.

Use restriction notice

This Instruction Manual is the property of

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Guarantee

ADB guarantees that the performance of the series transformers described in this manual, when sold by ADB or its licensed representatives, meets the requirements of IEC 61823 and FAA specification AC 150/5345-47.

Any defect in design, material or workmanship, which may occur during proper and normal use over a period of one (1) year after installation or two (2) years after shipment, will be repaired or replaced by ADB free of charge, ex works. Operational failure or damage resulting from improper installation or maintenance not considered a result of proper use and is beyond the scope of the warranty.

Warranty does not cover natural wear and tear nor damage arising after delivery owing to faulty or negligent handling, excessive strain, unsuitable materials for Operation, deficient civil engineering Work, unsuitable soil conditions, and such chemical, electrochemical or electrical influences as were not assumed at the time of the Contract.

All liability for consequences of any inexpert alterations or repairs carried out by Purchaser or a third party shall be waived.

ADB. shall in no event be liable to Purchaser for any further claims, particularly claims for damages not affecting the goods themselves.

The above constitutes the limits of ADB’s liabilities in connection with the series transformers covered by this manual.

Table of contents

Instruction Manual RST

Overview

Introduction

This chapter deals with the elementary information on the Series Transformer, type RST. It starts with some general information, elaborates on the installation and maintenance and provides you with a parts list.

Contents

This chapter contains the following topics.

General Information and Requirements

Overview

Introduction In this section, you can read important general information and requirements

Contents This section contains the following topics.

What is the RST used for?

Airfield lighting circuits

The RST has been developed for use in airfield lighting series circuits. Using a series transformer remedies the major drawback of the simple series system. So, if one lamp fails, the primary winding of the transformer assures the continuity of the circuit, thus allowing all the other lamps to remain lit.

The RST also completely isolates the lights from the high voltage series circuit.

Scope

This Instruction Manual covers the ADB RST Rectangular Series Transformer manufactured in full compliance with:

- **FAA**: Advisory Circular AC 150/5345-47 and L-830 / L-831
- **IEC**: 61823
- **ICAO**: Aerodrome Design Manual, Part 5, paragraph 3.2.1.7

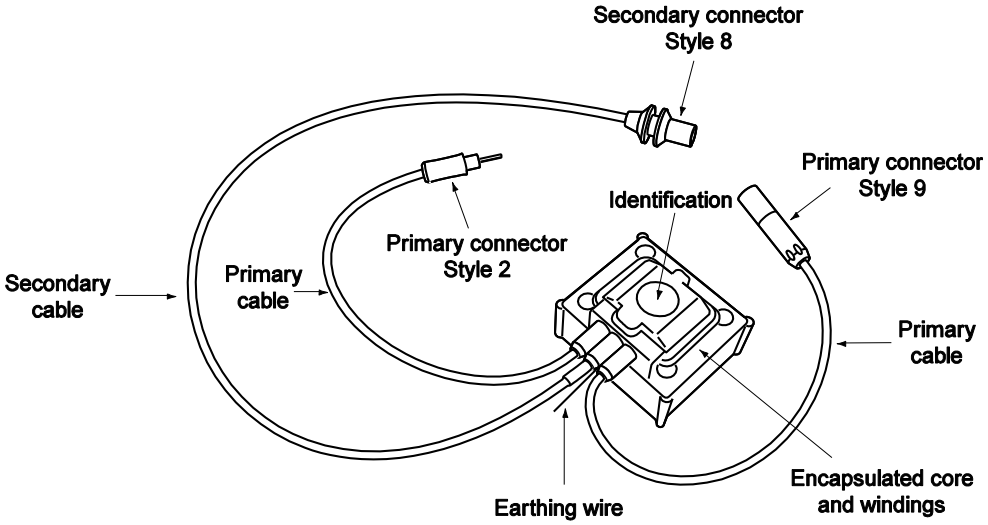
Technical Description of the RST

One unit

The RST is one complete, encapsulated unit. Both the primary and secondary cables are moulded with the body.

Illustration

This is an illustration of the RST Series Transformer.



Earthing wire

The RST can, optionally, be fitted with an external earthing wire, connected internally to one end of the secondary winding.

Core

The RST basically consists of a rectangular magnetic core, made of low-loss grain oriented laminations, insulated by a thermoplastic sheath.

Windings

Primary and secondary windings are made of enamelled copper wire and are completely separated from each other, NOT concentrically wound.

This is particularly important with regard to the safety of the operating personnel: there is neither the possibility of a direct contact nor a possible creeping path between the high voltage primary winding and the secondary winding.

Watertightness

The cables are connected to the windings before the transformer is encapsulated. Therefore, the RST is perfectly watertight and can be buried directly in the ground or sustain the occasional flooding of a deep base.

Continued on next page

Technical Description of the RST, *Continued*

Encapsulation

The RST is completely encapsulated with Thermoplastic Elastomer (TPE) and thus presents an exceptional resistance against shocks and rough handling, although the latter is to be avoided whenever possible. TPE has a particularly good resistance against acid, alkali and oil and resists ozone and UV radiation, coupled to excellent electrical insulation properties.

Connectors

The primary and secondary cables are fitted with a factory-moulded plug and receptacles according to FAA L-823.

The connectors are protected with caps to prevent damage or contamination during transportation storage and installation.

Electrical characteristics

For detailed electrical characteristics see catalogue leaflet A06112e.

Power rating	10/15, 20/25, 30/45, 65, 100, 150, 200, 300W
Frequency	50 or 60Hz
Primary current	6.6A
Secondary current	6.6A
Max primary service voltage	5000V RMS
Max secondary service voltage	600V RMS

Installation

Overview

Introduction

This section gives you instructions on how to install the RST Series Transformer. Refer to site drawings and specifications for the specific installation instructions.

Procedure

Refer to following standards:

- FAA Advisory Circular AC 150/5370-10 ”Standards for specifying construction of airports”
- ICAO Airport Design Manual, part 5 ”Electrical Systems”
- IEC 61820 (draft); IEC 61823

Contents

This section contains the following topics.

General information on the installation of the RST

Packaging

The RST's are shipped in containers, either seaworthy or on IATA pallets.

Connectors are protected by watertight caps taped to the connectors. The caps are to remain in place until the transformer is connected to mating connectors.

Unpacking

To unpack the transformer, proceed as follows:

Step	Action
1	Check whether there is any external damage to the packaging, which might lead to detection of equipment damage.
2	Unpack the transformers upon receipt.
3	Examine the RST Series Transformers to make sure that no damage has occurred during shipping.
4	

If...	Then...
you notice any damage to the equipment	file a claim form with the carrier immediately. Make sure that the carrier inspects the damaged equipment as well.

Installation of the RST

Precautions

The RST Series Transformers are designed for direct burying in the ground. However, it is recommended to install them in a steel base or in a concrete pit to make them easily accessible for routine checks or repairs. It also keeps the connections clean and prevents possible damage by rodents.

Never carry the transformer using its cables as carrying handles !

Installation of the RST in a base or pit

When installed in a steel base or a concrete/masonry pit, the transformer and its connectors are to be kept above the standing water level. Use a suitable water resisting spacer (e.g. a brick) extending above the bottom of the duct entries (drainage).

Remarks

The RST transformers will function properly and reliably when installed properly.

Keep in mind that:

- the voltage of series circuits is lethal
- humidity and contamination negatively affect insulation properties
- a perfect installation is required, not only to extend the actual lifetime of the equipment but also to ensure the safety of the operating and maintenance personnel.
- keep exterior surfaces of the connectors clean

Primary cables: electrical connection

Overview

Introduction

This subsection elaborates on the two basic methods of jointing: jointing using FAA L-823 connectors and in line jointing.

Warning!

Only personnel qualified to work on high voltage equipment is allowed to perform installation and operation.

Before connecting the series transformer, make sure that the series circuit is disconnected from the regulator and both ends are grounded (e.g. with a cut-out SCO).

Contents

This subsection contains the following topics.

First method: L-823 connectors system

Installation standards

Several FAA installation standards provide guidelines, in particular FAA AC 150/5370-10.

FAA installation procedure

The FAA installation procedure requires perfectly clean and dry connectors, both on the transformers primary leads and on the series circuit cable.

Follow the procedure below:

Step	Action
	De-energise the series circuit before installing the RST (see manual of regulator)!
1	Prepare a 4-inch/10cm long piece of PVC electrical tape "Scotch 33" or equivalent. *NOTE:* ADB nr 7637.55.123
2	Fold this PVC electrical tape in two (lengthwise) with the adhesive on the inside.
3	Uncap the transformer's and the series cables' L-823 connectors and check for moisture and contamination.
4	Put a very small film of silicon grease on the cylindrical, watertight mating surfaces. Do not put silicon grease on the external surface of the connectors.
5	Insert the folded PVC electrical tape and the primary plug into the mating receptacle, allowing the tape to provide an escape to the trapped air. Then withdraw the tape, leaving the connectors fully engaged.
6	Wrap the connectors with self-vulcanising rubber tape "Scotch 130C" in one layer, half overlapping on a distance extending 1 ½ inch on both sides of the jointing surface. *NOTE:* ADB nr 7637.10.130 or equivalent
7	Wrap the whole package in a double layer of half overlapping PVC electrical tape "Scotch 33" or equivalent. *NOTE:* ADB nr 7637.55.123 or equivalent

Continued on next page

First method: L-823 connectors system, *Continued*

Using a heat shrinkable watertight sleeve

The principle is identical to the taped FAA system, except that the tapes are replaced by a heat-shrinkable tubing with an internal self fusing adhesive sealant.

Follow the procedure below:

Step	Action
	De-energise the series circuit before installing the RST (see manual of regulator)!
1	Prepare a 4-inch/10cm long piece of PVC electrical tape “Scotch 33” or equivalent *NOTE:* ADB nr 7637.55.123
2	Fold this PVC electrical tape in two (lengthwise) with the adhesive on the inside
3	Uncap the transformer's and the series cables’ L-823 connectors and check for moisture and contamination
4	Put a very small film of silicon grease on the cylindrical, watertight mating surfaces. Do not put silicon grease on the external surface of the connectors.
5	Slip a 3 ½ inch/9cm long special heat-shrinkable tubing over the ends of the transformer primary leads.
6	Insert the folded PVC electrical tape and the primary plug into the mating receptacle, allowing the tape to provide an escape to the trapped air. Then withdraw the tape, leaving the connectors fully engaged.
7	Position the heat-shrinkable sleeve symmetrically above the connectors jointing surface.
8	Use a gas or electric heater to shrink the sleeve. Start from the middle and extend to each end. This will allow the escape of air and excess of fusible sealant.

Continued on next page

First method: L-823 connectors system, *Continued*

Using an ADB watertight screw coupling

The principle is almost identical to the taped FAA system, except that a removable screw coupling is used instead of tapes or self fusing adhesive sleeves.

The advantage is that maintenance does no longer has to cut tape or sleeve. This screw coupling is compatible with cylindrical, 23.8 mm outer diameter FAA L-823 connectors.

Follow the procedure below:

Step	Action
	De-energise the series circuit before installing the RST (see manual of regulator)!
1	Prepare a 4-inch/10cm long piece of PVC electrical tape “Scotch 33” or equivalent. *NOTE:* ADB nr 7637.55.123.
2	Fold this PVC electrical tape in two (lengthwise) with the adhesive on the inside.
3	Uncap the transformer's and the series cables’ L-823 connectors and check for moisture and contamination.
4	Put a very small film of silicon grease on the cylindrical, watertight mating surfaces. Do not put silicon grease on the external surface of the connectors.
5	Slip a screw cap, a rubber gasket and the screw coupling body over the transformer’s primary lead or over the mating series cable’s connector.
6	Insert the folded PVC electrical tape and the primary plug into the mating receptacle, allowing the tape to provide an escape to the trapped air. Then withdraw the tape, leaving the connectors fully engaged.
7	Slide the screw coupling body accurately over the connectors mating surface and push the rubber gaskets against the body's ends.
8	Screw and fully tighten the screw coupling caps in order to fully press the rubber gaskets.

Second method: in-line jointing (without connectors)

In-line jointing

Some consultants still advise this method to provide interfaces between screened cables and

- a set of mating connectors, or
- the primary leads of transformers.

Double joint boxes, resin filled, are available for that purpose.

Advantages of the L-823 connectors system

However, as connector kits have tremendously improved over the last 10 years, in-line jointing is usually replaced by the L-823 connectors system. The latter has obvious advantages regarding maintenance of series systems. Indeed, the series loop can thus be opened at any transformer.

Secondary cables: electrical connection

Overview

Introduction This subsection elaborates on the two basic methods of jointing.

Contents This subsection contains the following topics.

Introduction

Peak secondary voltage

Even though the voltage at the loaded secondary side of the series transformer is very low, the connectors, cables and lamp holders (if any) must be able to sustain the transformer's open circuit peak voltages generated when a lamp fails.

Therefore, cleanliness and watertightness are also mandatory for secondary circuits.

Two concepts

Two concepts exist, both following the actual service conditions:

- the secondary connector is installed at a frangible coupling/section level (elevated lights).
- the secondary connector is not located at a frangible coupling/section level (inset lights) and is thus subject to occasional immersion.

Earthing

This only applies to the RST Series Transformers, fitted with an earthing wire. A flexible, insulated wire connects the transformer's earthing wire to a reliable grounding system. The size of the ground wire must be in compliance with the local regulations and assure adequate reliability (e.g. corrosion resistance).

Earthing materials

We strongly recommend the use of :

- insulated wire, especially in galvanised steel bases (to prevent zinc/copper electrolytic corrosion).
- copper conductor (NOT aluminium!)
- tinned copper, compression-type, insulated connecting sleeve between the transformer's earthing wire and the grounding network (AM-P, Burndy or equal)

Watch out!

Make sure not to mechanically over-stress the transformer's earthing wire, which may affect watertightness entailing a drop in insulation resistance and generate, dangerous leakage currents.

We recommend to tie-up the flexible grounding wire to the secondary cable of the transformer by means of one or two nylon ties.

First method (Elevated lights)

How to connect the secondary plug

The plug must be able to disconnect from its receptacle in case the frangible coupling breaks.

Install the connection as follows:

Step	Action
1	Uncap the transformer's L-823 connector and check for moisture and contamination.
2	Put a very small film of silicone grease around the lighting fixture plug cylindrical watertight mating surface. Do not put silicone grease on the connectors themselves.
3	Push the plug home into the transformer’s receptacle.
4	Wrap a double layer of half overlapping, black PVC electrical tape “Scotch 33” or equivalent over the jointing surface. NOTE : ADB nr 7637.55.123

Second method (Inset Lights)

How to connect the secondary plug

In this case, the plug receptacle assembly is located away from a frangible joint, generally in a steel base or transformer pit. Thus, since no possible disconnection is necessary, the connection can be mechanically "anchored". Moreover, the connection must remain watertight in case of occasional flooding of the steel base or transformer pit.

Proceed as prescribed in the first method but use in step 4 a self-vulcanising rubber tape “Scotch 130C” or equivalent. Alternatively, the tape may be replaced by a 2-inch/5cm long self-sealant heat-shrinkable sleeve.

Maintenance

Overview

Introduction In this section, you find concise information on how to maintain the RST.

Contents This section contains the following topic.

Maintenance of the RST

Components of the RST

The transformer itself does not require maintenance. In case of defect, the RST has to be exchanged.

Check at least twice a year the insulation resistance of the series circuit in order to detect possible defects (e.g. earth leakage) in the cable, the connectors and/or the series transformers.

Caution!

Only qualified personnel, authorised to work on high-voltage equipment is allowed to perform maintenance on the RST Series Transformers..

When performing maintenance tasks, make sure to switch off the power supply of the constant current regulator and circuit selector. This will prevent that the constant current regulator and the circuit selector are activated by accident, thus preventing serious injury or even death.

Parts List

Overview

Introduction This section covers the list with standard RST Series Transformers.

Contents This section contains the following topics.

Introduction

Reference designation

Each part has a reference code number. When you order RST Series Transformers, always mention the correct reference code number , which is moulded on the RST itself.

Orders

All spare part orders have to be placed with the ADB or local representative.

n.v. ADB s.a.
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RST Series Transformer with and without earthing wire

RST without earthing wire

Power (W)	Primary/Secondary Current (A)	Frequency (Hz)	Code number
10/15	6.6 / 6.6	50	1ST01066D000
20/25	6.6 / 6.6	50	1ST01066D000
45	6.6 / 6.6	50	1ST045665000
65	6.6 / 6.6	50	1ST065665000
100	6.6 / 6.6	50	1ST100665000
150	6.6 / 6.6	50	1ST150665000
200	6.6 / 6.6	50	1ST200665000
300	6.6 / 6.6	50	1ST300665000
45	6.6 / 6.6	60	1ST045666000
65	6.6 / 6.6	60	1ST065666000
100	6.6 / 6.6	60	1ST100666000
150	6.6 / 6.6	60	1ST150666000
200	6.6 / 6.6	60	1ST200666000
300	6.6 / 6.6	60	1ST300666000

RST with earthing wire

Power (W)	Primary/Secondary Current (A)	Frequency (Hz)	Code number
10/15	6.6 / 6.6	50	1ST01066DE00
20/25	6.6 / 6.6	50	1ST01066DE00
45	6.6 / 6.6	50	1ST045665E00
65	6.6 / 6.6	50	1ST065665E00
100	6.6 / 6.6	50	1ST100665E00
150	6.6 / 6.6	50	1ST150665E00
200	6.6 / 6.6	50	1ST200665E00
300	6.6 / 6.6	50	1ST300665E00
45	6.6 / 6.6	60	1ST045666E00
65	6.6 / 6.6	60	1ST065666E00
100	6.6 / 6.6	60	1ST100666E00
150	6.6 / 6.6	60	1ST150666E00
200	6.6 / 6.6	60	1ST200666E00
300	6.6 / 6.6	60	1ST300666E00

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